THE DEGREES OF KNOWLEDGE

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JACQUES MARITAIN

THE DEGREES OF KNOWLEDGE

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TRANSLATOR'S NOTE

In the original M. Maritain makes considerable use of the close kindred which exists between the actual forms of certain French words and that of Scholastic Latin. This involves considerable difficulties in translation into a tongue not so closely related. At times, rather than risk a misunderstanding of a philosopher who naturally lays great stress on verbal exactitude, I have followed this angle of the sense rather than smoothness in the English. Philosophy can never make easy reading, and Gavin Douglas' plea is as pertinent to-day as in his time:

For there be Latin wordis many ane
That in our tongue ganand translation's nane
Les than we mynis thar sentence and gravity;
And yet scant weill exponit...
For objectum and subjectum also
He war expect culd find me termis two....

In particular I would draw the reader's attention to the opposition between *rational* and *real* being, corresponding to that between *ens rationis* and *ens reale*; and that, in general, it is in this sense that the word *rational* should primarily be understood.

In the original the main text, which is here integrally translated, is followed by nine Appendices: these, owing to their great length and highly technical character, have here been omitted. I have given a brief summary of their content. No new matter is introduced in them, and in the main they consist of critical and technical discussions of points treated in the text, with long quotations in support and enlargement of individual stages in the argument.

BERNARD WALL

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PREFACE

THE TITLE of this book sufficiently declares its design. The disparate and the confused are alike alien to the nature of the mind. 'No one', says Tauler, 'knows better the true meaning of distinction than they who have entered into unity,' and in the same way no one can be aware of the real meaning of unity without an equal grasp of the sense of distinction. Thus every attempt at metaphysical synthesis, particularly in relation to the complex riches of knowledge and the mind, must distinguish in order to unite. And it is exactly towards such a discernment of the various degrees of knowledge, their organisation and internal differentiation, that reflective and critical philosophy is primarily directed.

Idealist philosophers usually choose some particular class of sciences as a generic type of the universe of knowledge and construct in relation to this type their entire epistemology. Not only does this entail the systematic neglect of vast regions of apprehension, but it tends also to reduce the diversity of the life of the spirit to a noetic monism, which is certainly more sterile, if less pardonable, than the ontological monism of the first philosophers. (For, after all, the mind, they claim, does know itself, and what excuse can idealism offer if it despises the very structure of thought itself?)

In revenge many realists seem disposed to pay for their possession of things by an abandonment of the problems proper to the mind, and we see to-day a new 'cultural' dogmatism identifying with dialectic materialism the anti-idealism which it professes.

I hope to show here that Thomist realism, while saving by a truly critical method the values of the knowledge of things, allows of an intimate exploration of the universe of reflection, and the establishment, if I may say so, of a metaphysical topology: thus 'the philosophy of being' is at the same time and *par excellence* a 'philosophy of the spirit'.

More even than the physical universe and corporeal organisms, the

spirit possesses—though immaterially—dimensions, a structure, and internal hierarchy, of causality and values. Contemporary idealism, which ends by refusing to acknowledge any nature or proper structure in the spirit, in order to make of it either a pure movement or a pure liberty, in reality only achieves flattening it out in its entirety on one single level of intellection, as if in a two-dimensional universe, a world of infinite platitude. Nevertheless we have justification for thinking that the four dimensions of which St. Paul speaks—*quae sit latitudo, et longitudo, et sublimitas, et profundum*[1]—concern not only the sphere or hypersphere of the contemplation of the saints, but generally the whole organisation and fundamental structure of the things of the spirit, in the natural or supernatural orders.

Taken from the noetic angle which I have chosen, we may say that *length* symbolises for us the way in which the formal light which characterises a type of knowledge falls on things and determines in them a certain line of intelligibility; *breadth* corresponds to the ceaselessly growing sum of objects thus known; *height* to the difference of level created among the various forms of knowledge by the degrees of intelligibility and immateriality in the object, from which follow, for each object, its typical and original manner of procedure; as to the fourth dimension, *depth*, it presents to us those more hidden diversities which depend on the way in which the spirit, in its liberty, diversifies still more its objects and its manner of conforming to reality according to their final ends. The difference between speculative and practical philosophy is the simplest example of this diversification, but it is not the only one.

But it is not only the structure, it is the movement also and the élan of the spirit which need to be brought to light, and that admirable law of dissatisfaction with the very security of acquired certitudes by which, starting from the experience of the senses, the mind enlarges, raises, transforms itself from stage to stage, absorbing itself in contradictory and yet united spheres of knowledge, while testifying to the fact that the striving of an immaterial life for its perfection is a striving towards an infinite amplitude, that is to say, in the last resort, towards an object, an infinite reality which it must needs in some manner possess.

[1]Eph. iii, 18.

In this book I have endeavoured to indicate the reasons for this movement and these transitions and the main phases through which they pass.

. . .

It is obvious, therefore, why this book must explore very varied fields of enquiry. After a form of general introduction, whose theme is at once the grandeur and the misery of metaphysics, the first problems to be dealt with are those which concern the experimental sciences and the degrees of knowledge which they represent. At this point, before going further, it becomes necessary to turn to knowledge as such, and to establish (chapter ii) the principles of a philosophy of the intelligence; so we enter into the dominion of that critical metaphysic, on whose foundation the whole body of the book is based. The two following chapters have as their subject the philosophy of nature considered particularly in its relations with the sciences, notably with physics, and metaphysical knowledge, particularly with regard to its noetic structure and its relations with negative theology. With knowledge by faith and the 'super-analogy' which is proper to it, we pass on to the degrees of supra-rational knowledge, whose highest form is mystical experience. Chapter v is consecrated to these problems, while chapters vi and vii deal with two eminent cases of what has just been described as 'the depth' of the things of the spirit: the question of the nature of Augustinian wisdom and the distinctive features and proper perspective of the 'practically practical' science of contemplation as it is found in St. John of the Cross. The last chapter forms the conclusion to the whole book and deals with that doctrine of *All and Nothing* set out by the Mystical Doctor, and with the supreme degree both of knowledge and of wisdom which is accessible to man in this life.

It is by design that I have endeavoured to cover so wide a field of problems and sketched the outline of a synthesis which starts with the experience of the physicist and ends with that of the contemplative, whose philosophic stability is guaranteed by the rational certitudes of metaphysics and critical philosophy. Only in this way is it possible to exhibit the organic diversity and the essential compatibility of the zones of knowledge traversed by the mind in this great movement in quest of being, to which each one of us can only contribute a tiny fragment and

that at the risk of misunderstanding the activities of his comrades absorbed in other tasks equally fragmentary, but which are reconciled in the unity of the whole in the thought of the philosopher, almost despite themselves, like brothers ignorant of their fraternity. From this point of view one could say also that the particular work to which metaphysics is called in the world of to-day is to put an end to that form of incompatibility of temper which the humanism of the classical period roused between science and wisdom.

Certainly some will reproach me with the fact that I have not remained throughout in the realm of pure philosophy and in the latter chapters have taken into consideration certitudes which in themselves belong to another order. I shall not endeavour to clear myself from such a criticism, for I am in fact convinced that when the philosopher takes as his subject the study of anything which bears on the existential conditions of man and his activity as a free personality—and that is exactly what is involved in a study of the degrees of knowledge which are in themselves above philosophy and imply by their essence a personal relation between the knowing subject and its final end—he can only proceed scientifically as long as he respects the integrity of his subject and, therefore, those realities of a supernatural order which are in fact implied in it. I have already endeavoured to make this clear in an essay on the notion of christian philosophy.[1] No philosophical pretensions can abrogate the fact that man as we know him is not in a state of pure nature, but of a nature at once fallen and redeemed. The first obligation for a philosopher is to recognise what is; and if in some cases he can only do so by adhering by faith to the First Truth, which although reasonable is nevertheless due to a grace which transcends reason, he is still a philosopher (though not *purely* a philosopher) when he makes use of this adherence in the discernment and scrutiny of the essential characteristics and underlying reasons of what is before his eyes. Thus, although he borrows from a higher light which he joins to that of his reason, he proceeds always in accord with his proper mode, not as a theologian but as a philosopher, analysing the given subject in order to penetrate to its ontological principles, integrating in his investigations information ob-

[1] *De la philosophie chrétienne* 1933. As I have shown in an appendix to this little book, moral philosophy *adequately understood* is by necessity *subordinate* to theology.

tained from the theologians just as he applies that obtained from the biologists or the physicists.

Where the unbelieving reader is unable to accept the truth of the principles of solution which I have assumed, he will at least comprehend the methodological reasons which rendered necessary such recourse, and can judge from outside the logical structure of the whole which is presented to him. Many of the parts of that whole—all in fact which are concerned with the degrees of rational knowledge—rely on reason alone; and the doctrines of science, notably those concerning the physico-mathematical knowledge of nature, the philosophy of nature, the divine names and the rational knowledge of God, which are there put forward, if they do not constitute the highest part of the edifice are nevertheless central to it, as the doctrine of critical realism is its foundation.

I may add that this book was not conceived as a didactic treatise, but much more as a meditation on certain themes which are linked up by a continuous movement. This is why certain themes of major importance in themselves, such as mathematical and theological knowledge, have not been made the objects of special chapters, without, for all that, the omission of any consideration or characterisation of them. They would both demand a more special study, alien to the philosophic design which is here pursued. Particularly in relation to the foundations of mathematics much more preliminary work is still required, in my opinion, before thomist philosophy can propound a systematic interpretation in which all the critical problems offered by modern developments in the mathematic sciences find a solution. I have nevertheless attempted (chapters i, iii, iv) to make clear in this connection a number of points which seem to me particularly important, and which already indicate in a fairly clear manner in what spirit, in my opinion, a philosophy of mathematics should be elaborated.

Those who consent to read the following pages closely will perhaps perceive that while rigorously keeping to the formal line of St. Thomas' metaphysic, and rejecting any form of accommodation or diminution designed to make Thomism *acceptable* to the irrationally prejudiced, I have on many points attempted to clear the ground and restrict to some extent the frontiers of the thomist synthesis. The

inconvenience of these forms of work, where many indications and many alluring distractions ask to be taken up and pursued, is that they need, in order to bring forth their full fruit, a spirit of collaboration and philosophical continuity in the reader on which it is generally vain to reckon. Be that as it may, such work is in the spiritual tradition of Thomism, a doctrine which is essentially progressive and apt in the assimilation of fresh material—does it not proffer a singular proof of its irrepressible vitality in having resisted for centuries that pedagogy industriously charged with the desire to force it into some ready-made framework?

Matchless in its coherence, closely knit in all its parts as it is, Thomism is nevertheless not what we call 'a system'. When one says that it is distinguished from all other philosophical doctrines by its universalism, this must not be taken as a simple differentiation of extent, but rather as one of nature. The word system evokes the idea of a mechanical connection or of a more or less spatial assemblage of component parts, and consequently a choice which, if not arbitrary, is at least personal, as it is in all artificial constructions. A system unfolds or progresses from piece to piece, starting from its initial elements. On the other hand, it is the essential demand of Thomism that all construction and mechanism should be rigorously subordinated to the immanent activity and vital movement of intellection: it is not a system, an *artefactum*, it is a spiritual organism. Its internal links are the vital connections by which each part lives by the life of the whole. The principal parts are not the initial ones, rather those which are dominant or central, each of which is already virtually the whole.[1] Thought does not there make a personal

[1]Such for example are the *tria principia* on which Reginald the Dominican wrote in the seventeenth century a remarkable book (which is unfinished): *ens est transcendens; Deus solus est actus purus; absoluta specificantur a se, relativa ab alio*. These three principles contain all Thomism: but all Thomism is necessary to comprehend them. Thus Reginald's book, with its inevitable didactic dissections, is itself in relation to the doctrine that it expounds like an anatomical plate beside a living body. Doubtless it is the same in a certain measure with every great philosophical doctrine: none are exclusively and by nature a system, an *artefactum*; thought in itself tends to the vital and the organic. But in all of them the price paid for unity and coherence is that the aspect of a 'system' prevails over that of 'living organism'. What I should hold as most remarkable in Thomism and should call its particular privilege is that, while being sovereignly close-knit and a whole, with it on the contrary the character of a living organism prevails over its systematic aspect. It follows from this that in no other case is the difference so deep or so sensible between the doctrine itself and its didactic exposition.

choice among the elements of the real, it is an unlimited openness to them all.

The truth is that Thomism is a universal work. One is not a thomist because one has chosen it in the emporium of systems as one among several others, as one may tentatively choose a pair of shoes at a bootmaker's until one sees another brand more suited to one's feet. On those lines it would be more stimulating to fabricate one's own system, made to one's own measure. One is a thomist because one has abandoned the attempt to find in a system fabricated by one individual, that individual who is called *Ego*, philosophical truth, and because one intends to seek for the truth—albeit by oneself and by one's own reason—learning from every form of human thought, so that nothing that is may be neglected. Aristotle and St. Thomas only hold for us their privileged positions because, in their supreme susceptibility to the lessons of the real, we find in them principles and a scale of values thanks to which, with no risk of eclecticism or confusion, the whole effort of universal thought may be saved.

How can those philosophers for whom the category of the out-of-date is a metaphysical criterion, for whom thought must necessarily grow old and be forgotten, understand that if we consult the ancients it is to recover a freshness of observation which to-day is lost? None of the treasures of experience, none of the advantages and graces of the latter age of thought, can replace the rightful grace of its youth, that virginity of observation, that intuitive uprush of the intelligence as yet unwearied by the spiced novelties of the real.

Distinguishing between the *per se* and the *per accidens*, thomists believe that the progress of philosophy advances not only in the heart of the doctrine which they hold for surely based, but also, as though by accident, through the proliferations of all those unstable systems, whose uncertain structure allows them to fling themselves more rapidly (and perish in the so doing) on the novel aspects of truth which the march of time brings to light.

Nevertheless, such an advance can only by nature be at most a becoming, a movement or a potentiality, incapable of being grasped in its entirety at any moment of its progress, since there is no moment when it is not out hunting among opposed formulations and contrary systems, drawn by that modicum of truth which they all contain.

Is philosophy only this, and can it only know this state of virtuality? If it so happens that there exists among men a doctrinal organism founded on the vital assurance of true principles, this will, after greater or less delay, incorporate into itself, progressively *realise in itself*, this virtual philosophy, which will become by the same act and just to that extent capable of being grasped, demonstrated, livingly formed and organically activated. It is in this way, in my opinion, that Thomism is destined in the course of its own progress to actualise the progress of philosophy.

11th June, 1932.

POSTSCRIPT TO THE SECOND EDITION

The text of this second edition is practically a reproduction of that of the first. Certain additions and modifications have been made in the notes. Certain bibliographic references in the notes to books which have appeared since the publication of the first edition are indicated by an asterisk.

With regard to the theory of judgment (cp. *infra*, chap. ii), I would not wish to fail to draw attention to Mgr. Sentroul's *Kant et Aristote* (Paris, Alcan, 1913, a new, revised and augmented edition of his thesis of 1905 on *L'Objet de la métaphysique selon Kant et Aristote*), which rightly insists (pp. 61-73, 291-306) on the fact that a true judgment is an identification in the mind which responds to an identity in the thing, or 'the conformity of an identification with an identity'. The same ideas are put forward in an article on 'La Vérité et le progrès de savoir' (*Revue néo-scholastique de philosophie*, May-Aug., 1911).

With regard to my definition of the philosophy of nature, I should mention that, in his little book *De subjecto naturalis philosophiae*, Cajetan has shown very clearly why it is necessary to assign as the proper subject of the philosophy of nature (which is neither part of metaphysics nor a form of knowledge rightly 'subordinate to' metaphysics) *being* taken under the formal reason of *mutability*, which restrains it without depriving it of its analogical character; and why the expression *ens sensibile*, though legitimate in itself, is less

formal and less philosophic than the expression *ens mobile*: this in effect 'liberates at one stroke the philosophy of nature from the enterprises of Parmenides and Melissa'.

Finally, in order to avoid a possible misunderstanding of the subject of chapters i and iii, it is perhaps not unuseful to emphasise that in the course of the allusions there made to the new physics, I have adhered to the standpoint of those critical and philosophic problems which are the object of this book. If we were considering them from the point of view of the history of science and were endeavouring to characterise from that angle the evolution of the contemporary theories of physics, without doubt it would have been necessary to emphasise the name of Planck and the physics of the Quanta, rather than that of Einstein and the theory of Relativity.

In fact we have a right to think that if Einstein has overpassed and powerfully renewed Newtonian and classical physics, he has nevertheless remained, like Lorenz and Poincaré, on the same path of progress,[1] so that the relativist revolution is, in regard to the development of physics, less radical and less essentially an innovation than the discovery by Planck of radiation by *quanta*. It is in its abandonment of the macroscopic point of view and its entry into the world of the Quantum theory of the atom that the new physics has most decidedly broken away from the physics and mechanics of the ancient world. Hence the exceptional historical importance of the theories of Louis de Broglie, Schrödinger and Heisenberg.

But here we are only considering the new physics in regard to the noetic structure of the physico-mathematical knowledge of nature, and the relations and distinctions which it is necessary to mark between it

[1] 'The theory of Relativity constitutes, in short, the apotheosis of the old macroscopic physics, while, on the other hand, the Quantum theory has arisen from the study of the corpuscular and atomic world.' (Louis de Broglie, 'Relativité et Quanta', *Revue de métaphysique et de la morale*, July-Sept., 1933). In these very suggestive pages M. Louis de Broglie recalls how the theories of Relativity and of the Quantum now confront one another after having grown up almost independently, and points out the difficulties of any reconciliation between them. The philosopher will keep in mind with particular interest his words on the necessity which the physicist finds of recognising 'the existence of a privileged sense of temporal variability and the persistence of physical unities in time': there follows from this, even in *non-quantic* relativity, a certain dissymmetry between time and space.

and the philosophy of nature. Moreover it is necessary to attach particular importance to the physics of Relativity, because they bring into question notions which, since they play a fundamental part in the philosophy of nature, such as those of space and of time, are, by that very fact, particularly subject to and in particular danger of any confusion between the two mental disciplines.

1st May, 1934.

INTRODUCTION

THE GRANDEUR AND MISERY OF METAPHYSICS

ONE MIGHT have thought that, in epochs of speculative incompetence, metaphysics would at least shine out by its modesty. But the same period which ignores its grandeur, ignores alike its misery. Its grandeur is that it is wisdom: its misery, that it is human.

It is true that it utters the name of God. But it does not know His name. For we cannot describe God like a tree or a conic section. Truly Thou art a hidden God, Thou the true God of Israel! So Jacob asked in the morning of the angel: 'Tell me, what is thy name? And he received the answer: Why askest thou my name?'[1] 'It is impossible to utter this truly wonderful name, which is above every other name in this age and in all the ages to come.'[2]

Whether they be neo-Kantians or neo-positivists, idealists, Bergsonians, logistics, pragmatists or neo-Spinozists, or neo-mysticists, one ancient sin works in the roots of all modern philosophies—the old error of *nominalism*. Under varied forms, with more or less perception, they all criticise knowledge by concepts for not being a supra-sensible intuition of the uniquely existent, like the *scientia intuitiva* of Spinoza or the theosophical visions of a Boehme or a Swedenborg which Kant—with so much regret—denounced as illusory. They cannot forgive it for the fact that it does not, like the senses, know an immediate contact with existence: but only with essences and possibilities, and only attains actual existence by falling back upon the senses. They fundamentally misconceive the value of the abstract, that immateriality more enduring than all outward things, for all that it is impalpable and unimaginable,

[1] Gen. xxxii, 29.

[2] Pseudo-Dionysus, *De Divinis Nominibus*, i, 6 (St. Thomas, lesson 3. Cp. St. Paul, Eph. i. 21).

which the spirit seeks for at the heart of things. What is the cause of this incurable nominalism? Because with a taste for the real they lack the sense of being. Being as such, detached from the matter in which it is incorporated, being with its pure objective necessities, its laws which do not weigh, its constraints which do not bind, its invisible evidences, is for them—only a word.

How can one speculate about geometry in space if one does not *see* the figure in space? How is it possible to dissertate on metaphysics if one does not *see* the quiddities in the intelligible? This difficult feat of mental gymnastics is undoubtedly necessary for the poet; it is no less so for the metaphysician. In both cases nothing can be attempted without a certain original talent. A Jesuit friend of mine asserts that man, since Adam's fall, has become so inapt in his intelligence that the intellectual perception of being ought to be regarded like a mystical gift supernaturally accorded to certain privileged persons. This of course is truly a pious exaggeration. Nevertheless it remains the fact that this intuition is for us an awakening from dreams, a sudden step out of sleep and its dreaming milky way. For man can sleep in many fashions. Each morning he wakes from animal sleep; from human sleep when the intelligence strips off its bonds (and from divine sleep at the touch of God). The birthright of the metaphysician as of the poet is a grace of the natural order. The one, who throws his heart into things like an arrow or a lighted match, sees by divination—in the very stuff of the sensible, inseparable from it—the flash of the spiritual light which shines for him with the glance of God. The other, turning away from the sensible, sees by science, in the intelligible detached from perishing things, that same spiritual light held captive in some idea. Abstraction, which is death for the one, is the breath of the other's nostrils; imagination, the discontinuous, the unverifiable, by which he perishes, are the other's life. Both living by the rays which fall from the creative Night, the one feeds on a linked intelligibility multiform as the reflection of God in the world, the other on a like intelligibility only divested and determined by the very being of things. They play see-saw together, each rising to heaven by turns. The spectators mock at this game; they are sitting on the solid earth.

'You are like a dabbler in black magic,' it has been said to me, 'who

commands us to fly with our arms.' No, I ask you to fly with wings. But we have no wings! Arms? Atrophied wings, which is quite another matter. They would spring again if you only had a little courage, if you understood that the earth is not the only foothold and that the air is not a void.

To invoke against a philosopher a mere factual impossibility, a particular historical condition of the intelligence, to say, 'what you offer us is possibly the truth, but our mental structure has become such that we can no longer think in the terms of your truth, for our minds "have changed like our bodies"[1]' is no argument at all. It is nevertheless the best that can be opposed to the present rebirth of metaphysics. It is only too true that eternal metaphysic does not fit in with the modern mind, or more exactly that the latter does not fit in with the former. Three centuries of mathematical empiricism have so bent the modern mind to a single interest in the invention of engines for the control of phenomena —a conceptual network, which procures for the mind a certain practical domination over and a deceptive understanding of nature, where thought is not resolved in being but in the sensible itself. Thus progressing, not by adding fresh truths to those already acquired, but by the substitution of new engines for engines grown out of date; manipulating things without understanding them; gaining over the real, pettily, patiently, conquests which are always partial, always provisional; acquiring a secret relish for the matter which it seeks to trap, the modern mind has developed in this lower order of scientific demiurgy, a form of multiple and marvellously specialised sensitiveness, and admirable hunting instincts. But, at the same time, it has become miserably enfeebled and defenceless in regard to the proper objects of the intellect which it has basely renounced, and has become incapable of appreciating the universe of rational evidence otherwise than as a system of well-oiled cogs. Hence it must necessarily be opposed to all metaphysics—the old positivist game—or take up with some pseudo-metaphysic—the new form of positivism—one of those metaphysical counterfeits where the experimental method, in its grossest form, as with the pragmatists and the pluralists, or more subtly, as in Bergsonian intuition, or more

[1] Ramon Fernandez, 'L'Intelligence et M. Maritain', *Nouvelle revue française*, 1st June, 1925.

religiously, as in the integral action of the Blondelians with their attempt to experience everything mystically, invades the domain of pure intellection.

All this is true. The current of the modern mind runs against us. Oh well, hills are there for the climbing! The intellect has not changed, it has only drifted into habits. Habits can be corrected. They have become second nature, you say? Nevertheless, the first nature is always there; and the syllogism will endure as long as mankind.

It is less difficult for the philosopher than for the artist to be in disagreement with his period. There is little parallel between the two cases. The one pours his spirit into a creative work, the other ponders on the real with the understanding mind. It is in the first case by depending on the intellect of his time and pressing it to the limit, in the concentration of all his languor and all his fire, that the artist has a chance of reshaping the whole mass. But for the philosopher the first question is to grip hold of the object first of all, to cling on to it, lost to everything else, with such tenacity that a break is at last affected in the opposing mass, making possible a new alignment of forces and a new orientation.

It is equally true that metaphysics brings no harvest to the yield of experimental science. It can boast of no discoveries and no inventions in the world of phenomena. Its heuristic value, as the phrase goes, is entirely nil. Nothing can be expected of it from that point of view. One does not do manual work in heaven.

Here exactly is its greatness: have we not known it for a thousand years? Metaphysics is useless, as old Aristotle said, it serves no purpose for it is above all servitude; useless because *supra-utile*, good in itself and by itself. For, let it be understood, if it could serve the science of phenomena, could yield for its harvest, it would be vanity by that very fact, in wishing to go beyond that science while not in itself surpassing it. Every metaphysic, be it that of Descartes, of Spinoza or of Kant, which measures itself, not against the mystery of being, but only by the state of positive science at any given moment, is radically false in principle. True metaphysics, in its own way and aware of its own limitations, can also say: my kingdom is not of this world. It holds to its axioms in despite of the world, which strives to hide them from it: for

what says the phenomenal, the lying flood of the brutally empiric, if not that what is is not and that there is more in the effect than in the cause? It contemplates its conclusions as it ascends from the visible to the invisible, it suspends them in a realm of intelligible causation, which is implicit in this world and which nevertheless transcends it, in no wise contradictory to the system of sensible sequences studied by experimental science, but which remains strictly different: the movement of my pen over the paper—my hand—the imagination and internal sense —the will—the intellect—and the First Cause, without whose motion nothing created could act; such a series is in no way opposed to, though it in no way assists, the determination of vasomotor modifications or the associations of images which are in play while I write. Metaphysics demands a certain purification of the intellect; it also presupposes a certain purification of the will, and the strength to devote oneself to what serves no object, to useless Truth.

Nothing nevertheless is more necessary to man than this useless thing. What we need is not truths which will serve us, but a truth which we may serve. For this is the food of the mind, and the mind is the best part of ourselves. Unuseful metaphysics brings order—not the so-called law and order of a policeman, but the order which springs from eternity—into the speculative and practical intelligence. It gives his equilibrium and his motion back to man, which are, as we know, to gravitate towards the stars with his head while hooked on to the earth by his two legs. It reveals to him the hierarchy of authentic values through all the extent of being. It gives a centre to his ethics. It maintains justice in the universe of knowledge, making clear the natural limits, the harmony and subordination of the various sciences: and this is far more important for human beings than the most luxuriant proliferation of the mathematics of phenomena: for what is the use of gaining the world and losing right reason? We are so weakly that the limpid peace dispensed by a sane metaphysic may perhaps be less favourable to experimental discovery than the dreams or the sharpness of a spirit submerged in the sensible; it may be that the natural sciences prefer to fish in troubled waters. Perhaps we have also the right to hold ourselves sufficiently burdened with the benefits of the dispersion.

Metaphysics places us in the world of the eternal and the absolute,

makes us pass from the spectacle of things to the knowledge of reason—more sure in itself and more clear than the certitudes of mathematics, though less easily grasped—to the science of the invisible world of the divine perfections discovered in their created reflections.

Metaphysics is not a means, it is an end, a fruit, a true and delectable good, the knowledge of a free man, the most free and most natively royal knowledge, the entry into the large leisure of that great activity, speculation, where the intelligence alone can breathe, on the mountain-top of causation.

For all that it is still not even the roughest sketch of the joy of our rightful home. This wisdom is won by the methods of science: and therein is great travail and vexation of spirit. For the ancient malediction, *maledicta terra in opere tuo*, weighs more tragically on our reason than on our hands. Forward! Unless by some blessed chance of that Fortune on whom the pagans were not wrong to meditate, the exploration of the supremely intelligible promises most of all a lot of useless labour, and the terrible sadness of the vision of gashed and mutilated truths.

The gods are jealous of metaphysical wisdom—that heritage of doctrines to which we are alone able to attain without too great an intermingling of error is itself constantly misunderstood—man's grasp on it is ever precarious—and how could it be otherwise? Is there a more splendid paradox than this of a divine science won by human means, a free exercise of liberty, such as is proper to spirits, culled by a nature 'in every sense enslaved'?

Metaphysical wisdom possesses the most pure degree of abstraction because it is at the farthest remove from the senses; it opens out onto the immaterial, on a world of realities which exist and can only exist in separation from matter. But our means of ascension mark also our limits. Of necessity and by its nature, abstraction, the condition of all human science, involves, with its multiplicity of partial and complementary views, its slow elaboration of concepts, all the complications and the immense machinery, which are so much heavier than the air, of the winged apparatus of discourse. Metaphysics wishes purely to contemplate, to overpass reason and enter into pure intellection, aspires to the unity of a simple gaze. It approaches it like an asymptote, and cannot

achieve. What metaphysician, not to speak of the ancient Brahmins, has felt more keenly than Plotinus this burning desire for the supreme unity? But the ecstasy of Plotinus is not this supreme act, rather is it the vanishing point of metaphysics, and metaphysics alone does not suffice to procure it. The good fortune which Plotinus knew four times during the six years that Porphyry lived with him suggests a brief contact with an intellectual light in its nature of greater force, the spasm of a human mind in contact with a pure spirit. If we believe Porphyry when he says that his master was born in the thirteenth year of the reign of Severus, that he heard Ammonius at Alexandria, that he came to Rome when he was forty, that he died in the Campagna, and when he describes to us his state of health and way of life, his kindness to the orphans committed to his care, his way of teaching, of composing, of pronouncing Greek, his handwriting, etc., why do we not believe him when he says that the philosopher was inspired by a daemon who lived with him, and which showed itself, in a sensible form, at his death? 'At that moment a serpent passed under the bed in which he was lying and glided into a hole in the wall; and Plotinus gave up his soul in death.'[1] What would be astonishing would be if the metaphysical *eros*, there where Christ does not dwell, did *not* call forth some form of collusion with superhuman intellectual natures, *rectores hujus mundi*.

But let us return to our theme. I said that metaphysics suffered not only from the common necessity of abstraction and discourse: it suffers also from an infirmity proper to itself. It is a natural theology, whose object *par excellence* is the Cause of all causes. The Principle of everything that is, this is what it would know. And how can it fail to desire that this knowledge should be perfect and complete, the absolute and

[1]Porphyry, *Life of Plotinus*, ii, 25. Later (chap. x), Porphyry tells us how an Egyptian priest who had come to Rome proposed to make visible to Plotinus the spirit who dwelt within him, and evoked this daemon, who turned out to be a god. 'It was not possible', he continues, 'to interrogate this daemon or hold him for any long time visible to the sight, because one of his friends, a witness of this scene to whom the birds had been confided and who was holding them in his hands, stifled them from jealousy or perhaps terror. Thus Plotinus was assisted by one of the most godlike daemons: constantly he directed thither the sublime glance of his spirit. This was the cause of his writing his treatise, *On the Daemon in whom we have received participation*, where he endeavours to give the reasons for the differences among the beings who come to the assistance of man.'

fulfilling knowledge whereby it may know him in his essence, in that which makes the substance of his actual life? If the desire to see the First Cause is natural to man—while all the while 'conditional' and 'ineffectual', for this desire precisely lacks in us any natural proportion with its object—it is specially natural to the metaphysician, who cannot, if he is worthy of the name, fail to feel the sharpness of its sting. But metaphysics can only enable us to know God by analogy, not by what He is in Himself, in the community of the transcendental perfections which are found—in infinitely different ways—at once in Him and in things: a true, a certain, an absolute knowledge, the highest delight of the reason, and one which it is worth the pain of being a man to know, but which remains infinitely far from being vision, and which only accentuates the burden of the mystery. *Per speculum in aenigmate.* We understand only too well how the most perfect fruit of the intellectual life leaves man still unsatisfied.

In fact, stated in the most general terms, the intellectual life does not suffice for us. It demands a complement. Knowledge brings to our souls all forms and all good things, but stripped of their proper existence and reduced to the condition of objects of thought. Present, as though grafted in us, but in a mode of being which is essentially incomplete, they cry out to be completed, they engender in us a driving force, the desire to reunite them with their rightful and real existence, to possess them not in idea, but in reality. The love thus roused projects the soul towards a union which will be real, which the intellect alone, except in the extreme case of the vision of God,[1] is incapable of procuring. Our intellectual life is thus fated—unless by some inhuman deviation—to end by avowing its indigence, and one day pour itself out in desire. It is the problem of Faust. If human wisdom does not upset into heaven and the love of God, it will relapse on Marguerite. Mystical possession of the most holy God in eternal charity, or physical possession of the poor flesh in the fleetingness of time, one or the other must be the end

[1]By the beatific vision the soul becomes God 'intentionally' (*secundum esse intelligibile*), not substantially, but it is united with him in a *real* union (*unio secundum rem*), since it is *by the infinite essence of God himself* immediately actuating the intellect in the intelligible order that it holds this union and that it sees. Thus the intelligence supernaturalised by the light of glory is like the hand whereby the blessed lay hold on God.

and be the sorcerer never so adept he cannot escape the horns of this dilemma.

This then is the misery of metaphysics (and also its greatness). It rouses the desire for the supreme union, spiritual possession consummated in the very order of reality, and not only in idea. And it cannot satisfy it.

It is another wisdom that we preach, to the Jews a scandal and to the Greeks madness. Exceeding all human effort, the gift of deifying grace and the free largess of the uncreated Wisdom, it has its origin in the *insane love* of that Wisdom for each one of us, its end in the unity of the spirit with Him. One alone gives us access thither, Jesus the crucified, the Mediator raised between heaven and earth. When, alike crucified upon a gibbet, with his hands and his feet cut off, they asked al Hallaj, 'What is mysticism?' he replied, 'You see here its lowest degree.' 'And its highest?' 'Thou canst not come thither: yet to-morrow thou shalt see what cometh. For it is to the divine mystery, where it is, that I bear witness, and that remains hidden from thee.'[1] Mystical wisdom is not beatitude, the perfect spiritual possession of divine reality; but it is its beginning. It is an entrance here below into the incomprehensible light, a taste, a touch, a sweetness of God which will not pass away, for what the seven gifts of the Holy Ghost began in faith they will continue in the wisdom of beatitude.

We cannot pardon those who deny or who corrupt this; gone astray in inexcusable metaphysical presumption, since they know the divine transcendence and yet will not adore it.

The doctrines which certain Westerners offer us as the wisdom of the East—I am not referring to oriental thought itself, whose exegesis demands a multitude of distinctions and the finest discrimination—in

[1]Louis Massignon, *Al Hallaj martyr mystique de l'Islam, exécuté à Bagdad, le 26 mars, 922*: Paris, 1922. I cite the case of al Hallaj here because, in so far we may risk conjecturing the secret of hearts, everything leads one to think that this great Moslem mystic, who was condemned for teaching the union of love with God, and who witnessed to the last point to his desire to follow Jesus, was possessed of both grace and the infused gifts (that he belonged to 'the soul' of the Church) and so was able to be raised to authentic mystical contemplation. This is the view reached by the R.P. Maréchal, in his review of M. Massignon's admirable book (J. Maréchal, *Recherches de science religieuse*, May-Aug., 1923). Cp. *infra*, chap. v, p.

themselves arrogant and facile, present a radical negation of the wisdom of the saints. Claiming to reach the height of contemplation by metaphysics alone, seeking for the perfection of the soul apart from charity, whose mystery is to them impenetrable, substituting for supernatural faith and the revelation of God by the Incarnate Word—*unigenitus Filius, qui est in sinu Patris, ipse ennaravit*—a self-styled secret tradition inherited from unknown masters of knowledge, they lie: for they say to man that he can add to his stature, can enter by his own power into the superhuman. Their esoteric hyper-intellectualism is nothing but a specious and pernicious mirage. It reduces reason to absurdity and the soul to the second death.

There is another way in which vain philosophy can be the foe of wisdom: not by subjecting the wisdom of the saints to metaphysics, but in more or less confusing them, and, in the worst cases, cleverly confounding it with a metaphysic which is corrupt to the core. It is in this way that an attentive and penetrating mind, after fifteen years of fervent research and all the effort of the most minute and impassioned erudition, has been led to a tragic disfiguration of the very mystical hero whose inward drama he had desired to retrace. Alas! As though a philosopher, assisted by even the most exhaustive historical information or the most intuitive of Bergsonian sympathies, could penetrate to the heart of the life of a saint, relive by himself the soul of St. John of the Cross! Here all the false keys of philosophy break, for the simple reason that there is no keyhole; the only entry here is through the wall. Whatever my friendship for you, my dear Baruzi, I must own that in attempting to illuminate St. John of the Cross with a Leibnitzian glow, in wrenching from his contemplation what for him was the life of his life —infused grace and the work of God in his soul—in making of him I know not what lame giant of the metaphysics of the future, still held by 'extrinsic' superstitions, but living above all to procure for himself, by a process of detachment in which the spirit of man does all the work, a more and more delicate intellectual comprehension of God, and succeeding so well in this that he leads us 'in some manner beyond christianity',[1] you have drawn an image of the saint which he himself would

[1]Jean Baruzi, *Saint Jean de la Croix et le problème de l'expérience mystique*, second edition, p. 230.

have held in abomination, and whose crying falsity, combined with so much zeal, is for the rest of us a subject of astonishment and sorrow.[1] It is not *by faith*, Baruzi, that this '*just man*' of yours lives. This 'theopath' is not suffering from God, but from the sickness of the Sorbonne.

The contemplation of the saints is not in line with metaphysics, it is in line with religion. This supreme wisdom does not depend on the effort of the intellect in quest of the perfection of knowledge, but on the gift of the whole man in quest of a perfect rectitude with regard to his End. It has nothing to do with that 'stultification' which Pascal

[1]Dom. Phil. Chevalier, *Vie spirituelle*, May 1925, and R. Garrigou-Lagrange, *ibid.*, July-Aug., 1925; and the little book of Roland Dalbiez, *Saint Jean de la Croix après M. Baruzi*.

In the second edition of his book Jean Baruzi has had the merit of suppressing some shocking passages and the preface indicates that he is more appreciative to-day of the scale and difficulty of the problems on which he touches. Nevertheless, at the bottom, his thought has in no way developed. Does he not still say (p. 674) that 'when the mystic has attained a certain noetic purity, he separates himself from what Leon Brunschvieg, with profound observation . . . calls "naturalistic psychism" and adopts instead "intellectualist idealism"'? Misunderstanding the very essence of the mysticism of St. John of the Cross, it is not surprising that he likens it (by certain superficial analogies taken for basic ones, pp. 676-7) to the mysticism of Plotinus (which in itself is sufficiently distant from what M. Leon Brunschvieg calls 'intellectualist idealism'), and that he should hold that, independent of any question of influence, John of the Cross unites with neo-Platonism 'by the most intimate movement of his thought' (p. 677).

In the preface to the second edition, he defends himself against ever having had any intention of 'transposing from the mystical to the metaphysical plane', or of representing 'John of the Cross as absorbed in a God opposed to the living God of Christianity'. I myself have never criticised his intentions; but his philosophy and the interpretations which it inevitably suggests.

If he has loyally underlined that 'this divine birth takes place in the heart of Christianity' (p. 656), the whole of his book has been conceived on the theme that it is *contingently* (with regard to the very mysticism of St. John of the Cross) that this is so: in point of fact this experience is christian, but by a combination, a synthesis between what is essentially mystical and what is essentially christian. 'The soul is nevertheless without limits and God himself is boundless. But the naked soul, the God without mode, here combines for the soul touched by mystical grace, with the God in three Persons of theological Christianity. . . . This *synthesis* is accomplished in him, more livingly than perhaps in any other catholic mystic, because to an intense love of a God who is Father, Son and Holy Spirit *is joined* the pure adhesion to the essential Divinity, to the "Deity", and, although the term does not figure in his language—to the One' (p. 674-5. The italics are mine). Cp. *infra*, chap. viii, pp. 464-9.

It is a dangerous temptation for a philosopher, when retracing and rethinking the history of another mind, to believe that it is his office to lead that mind to the full truth

recommended to the proud (its presence is a sign that pride has already fallen); but it knows so well that it no longer dreams of knowing. This highest knowledge presupposes the renunciation of knowledge.

The saints do not contemplate in order to know, but to love. And they love not for the sake of loving but for the love of Him that they love. It is because they are in love with God that they aspire to that union with God which love desires, loving themselves only for his sake.[1] Their aim is not to exult in their own intelligence or nature and so

of its nature, to which in itself it is supposedly unable to come. History reminds the philosopher than there is no other God than God, and that it is not in our power to re-engender the creative Ideas. There is also an equal risk of imposing on the hero of one's imagination obedience to one's own gods. In Baruzi's eyes the most authentic spiritual flight of St. John tends to a pure knowledge, which by infinitely surpassing, by an incessant auto-destruction of knowing, every mental condition and every perceptible datum, makes us transcend our nature not indeed by entering into the depth of *supernatural realities* mystically attainable in their own proper mode, but only by entering into a *mode* (without modes) of knowledge, into a realm of non-knowledge higher than our manner of experience and comprehension, and where we can know better the same realities as are the objects of metaphysics and philosophy, 'Being' (p. 448), 'things' (p. 584), 'the universe' (pp. 585, 685), 'the divine One' (p. 675). (On p. 639 and p. 645 it is a question of 'cosmic ecstasy' and 'cosmic discovery'.) Baruzi severs 'mystical faith' from 'dogmatic faith' (p. 448, cp. pp. 510–11, 600–1, 659), which is directly contradictory to the thought and the experience of John of the Cross; and if he does not ignore the part played by love in his mysticism, he singularly reduces its rôle and does not show its bearing; his exposition invincibly gives the impression that love in this form of mysticism, as in neo-Platonism, is a sort of metaphysical *nisus* destined to make us 'enter into a new world' (p. 611), simply the means of a transcendent 'noetic'; whereby he exhibits a complete misunderstanding of the most central and most personal stuff of St. John of the Cross, his sovereign and vital certitude of the primacy of love.

Some lines of Jean Baruzi (*Final Note* to the second edition, p. 727) obliged me to give these precise details. If I have criticised him sharply it is because in my eyes the problems upon which he touches, and which for him also are of capital importance, do not belong to the regions of pure erudition, but involve essential truths; and also the esteem with which, despite all my charges, I regard Baruzi's great endeavour, makes me deplore that so much human labour makes him run the risk of concealing from himself the message of the very saint he intended to honour.

[1]Then the love of self *secundum rationem proprii boni* does not disappear, but its act gives place to that of the love of charity where a man loves himself *propter Deum et in Deo* (*Sum. theol.*, ii-ii, 19, 6; 19, 8 ad. 2; 19, 10), and which, in fulfilling and raising it up, contains in itself the natural love which each bears to his own being and, more than to his own being, to God (i. 60, 5; ii-ii, 25, 4).

abide in themselves: it is to do the will of Another and contribute to the good of Goodness.[1] They do not seek for their soul. They lose it, they have it no more. If in entering into the mystery of divine sonship, in becoming *somewhat of God himself* they gain a transcendent personality, an independence and a liberty which nothing in this world can touch, it is by forgetting all this so that not they but their Beloved lives in them.

As for the antinomies which the 'new mystics'[2] discover in traditional mysticism—because they have made for themselves an artificial idea of it, vitiated by solemn modern prejudices about the life of the spirit—I freely grant that indeed they characterise a great deal of philosophical pseudo-mysticism. (And the neo-mystics themselves will have some difficulty in escaping from them!) Brought into contact with authentic mystical life they lose all their significance. This is no 'creative will' in search of the direct exaltation of pure adventure and an infinite surpassing, no 'magic will' seeking the exaltation of itself in mastery of the world and achieved possession. Here love (our philosophers always forget it and yet it is key of it all), here charity makes use of knowledge—which it itself, under the action of the Spirit of God, makes savourous and present—to adhere more utterly to the Beloved. Here the soul seeks neither self-exaltation nor abolition; it seeks to be united with Him who first loved it. For here God is not a word but a reality, a Reality, rather a Super-reality, which exists from the beginning, before us, without us: not humanly, not angelically, but only divinely comprehensible, and who makes us divine for that end; a Super-spirit whose seizure does not limit but makes illimitable the finite spirit, Thou living God, our Creator. One question, John Brown, before you begin any discussion of mysticism: your Mr. Peter Morhange, is he created?

The contemplation of the saints does not proceed from the spirit of

[1]Cp. St. Thomas Aquinas, *Sum. theol.*, ii-ii, 26, 3 ad. 3: 'Hoc quod aliquis velit frui Deo, pertinet ad amorem, quo Deus amatur amore concupiscentiae; magis autem amamus Deum amore amicitiae, quam amore concupiscentiae; quia majus est in se bonum Dei, quam bonum, quod participare possumus fruendo ipso; et ideo simpliciter homo magis diligit Deum ex charitate, quam seipsum.' Cp. also Cajetan, *In II-II*, 17, 5.

[2]Cp. Henri Lefebvre, 'Positions d'attaque et de défense du nouveau mysticisme', *Philosophies*, March 1925.

man: but from infused grace. (It is impossible to respond to the questions which torment our epoch without recourse to the terms and notions of sacred science.) This contemplation is, I say, indeed our perfect fruition, but in so far as we are born of Water and the Spirit. It is by its essence supernatural, a work which emanates certainly from the core of our being and our natural powers of activity, but in the degree to which our substance and our natural activities themselves are passive in the hands of Almighty God and are by him and by the gifts which he grafts into them raised above themselves towards a divine object, as such absolutely inaccessible by the sole powers of nature.[1] A supremely personal, a free and active work, a life which springs up for eternity, but which is for us a non-action and a death, because, supernatural not only in its object, but by the very mode of its procedure, it emanates from our spirit as moved by God alone and belongs to that *operating grace* whose whole initiative is with God. And because faith is the root and foundation of all supernatural life, the latter is inconceivable apart from faith, 'outside which there is no immediate and proportionate means' of contemplation.[2]

Finally, the contemplation of the saints exists not only *for* divine love, but also *by* it. It presupposes not only the theological virtue of Faith, but also theological Charity, and the infused gifts of Intelligence and Wisdom, which do not exist in a soul devoid of charity. The same God attained by faith in concealment and as if at a distance, since for the intellect there is always distance where there is not sight, love attains immediately by itself and in himself, uniting our hearts to the very thing that is hidden from faith; and it is the divine things thus enracinated in us by charity, it is God become ours by charity, that mystical wisdom, under the motion and the actual direction of the Holy Ghost, experiences by and in love as given to us within us, and affectively knows, 'in virtue of an incomprehensible union,'[3] in a night above all distinct

[1]Those philosophers who, apropos of the doctrine of 'obediential potency', speak of *supernatural addition* have either never read the thomist theologians or, if they have read them, have not understood them. Cp. John of St. Thomas, *Curs. theol.*, i, P. q. 12, disp. 14, a. 2. (Vivès, vol. ii.)

[2]Cp. St. John of the Cross. *Ascent of Mount Carmel*, ii, 8. See *infra*, chap. vii, p. 404.

[3]Pseudo-Dionysus, *Divine Names*, vii, 3.

knowledge, all images and all ideas, because infinitely transcending all and everything that any creature is ever capable of thinking. *Vere tu es Deus absconditus, Deus Israel Salvator.* It attains to God as the hidden God, as God the Saviour, this secret wisdom which is the richer the more it is hidden, which secretly purifies the soul in secret. While remaining wholly under the control of theology,[1] totally depending on it for its conditions and its foundations on human soil, for the multitudinous notions and conceptual signs by which divine Truth is manifest to our intelligence; without any abandonment of revealed dogmas (on the contrary!) knowing better than by concepts the very things which the

[1]At least in the communicable enunciations by which human language translates mystical experience—*i.e.* in what is not, properly speaking, the mystical experience itself, but rather the theology with which it is impregnated (see *infra*, chap. vii)—mystical experience is controllable by theology. The theologian thus judges the contemplative not as a contemplative, but in so far as the contemplative descends into the field of conceptual expression and rational communication. In the same way an astronomer judges a philosopher's utterances about astronomy.

But in itself mystical wisdom is above theological wisdom, and it is the man of the spirit who, not of course in the order of doctrine, but in that of experience and of life, judges the speculative theologian. *Spiritualis judicat omnia, et a nemine judicatur* (I Cor. ii, 15).

As for judging in fact the secret and incommunicable substance of the mystical experience itself and the discernment of spirits, that is not the affair of the speculative theologian, but of the men of the spirit themselves, and of the theologian in the degree to which he is himself a spiritual and possessed of the practical sciences (see chap. vii) of the mystical way .'Such indeed', writes John of St. Thomas, 'is the apostolic law: *Believe not every spirit, but test the spirits to know if they are of God* (I John, iv). And again: *Despise not prophesyings, but prove all things and hold fast that which is good.* (I Thes. v). ... This examination should normally be made in common with others.

'This is not to say that the gift of the Holy Ghost should be submitted to the virtue of prudence, or is inferior to it, or receives its determination from it, for those who judge of these revelations or these truths should not act according to the laws of human prudence, but according to the laws of faith to which the gifts of the Holy Ghost are submissive, or according to the gifts themselves, which may be found more excellently in some than in others. If, nevertheless, human or theological reasons are employed in the examination of these things, they are considered in a secondary degree and only as they minister to the better explication of what concerns faith or the instinct of the Holy Spirit.

'This is why in the examination of spiritual and mystical things it is not only necessary to have recourse to scholastic theologians, but also to spiritual men possessed of mystical prudence, who know the spiritual ways and know how to discern spirits. (John of St. Thomas, *The Gifts of the Holy Ghost*, French trans. by R. Maritain, v, 22.)'

conceptual formulas of dogma communicate to our human intellects, how can it not surpass all distinct notions, every sign which can be expressed, to cling in the experience of love to that very reality which is the first object of faith? Here we are at the antipodes of Plotinus. Here is no question of an intellectual elevation above the intelligible, of rising by metaphysics with its careful ladder of dialectic regulations to the abolition—which is still itself natural—of natural intellection in a super-intelligibility of angelic ecstasies. This is a question of a loving self-elevation above the created, of self-renunciation and renunciation of all other things in order to be borne on by charity, in the trans-luminous night of faith, under divine direction, to a sovereign supernatural knowledge of the boundlessly supernatural, where love will transform us into God. For, 'indeed, indeed we have only been created for this love.'[1]

No, metaphysics is not the doorway into mystical contemplation. That door is the humanity of Christ, by which grace and truth have been given unto us. 'I am the door,' he has said himself, 'if any man enters in by me he shall be saved, and he shall go in and out and he shall find pasture.' Entering through him the soul mounts and penetrates into the obscure and naked contemplation of the pure Godhead, and descends again in the contemplation of the divine Humanity. And here, as there, the soul finds pasture, and feeds upon its God.

In every sign, concept or name, there are two things to consider: the object itself which is made known and the manner in which it is made known. In all the signs used by our intelligence in order to know God, the *manner* of significance is both deficient and unworthy of God, being proportionate, not to God, but to what is not God, in the degree to which the perfections which pre-exist in a pure state in God exist also in things. In the same imperfect manner in which created things show forth God from whom they proceed, our ideas, which attain first of all and directly created things, make God known to us. The perfection which they signify, and which can—in a transcendental order—exist in an uncreated as in a created state, has essentially to be signified by them as it exists under limited, imperfect and created conditions. In the same way, all the names by which we name God, while all signifying one and the same unutterably one and simple reality, are nevertheless not

[1] St. John of the Cross, *Spiritual Canticle* (second redaction), str. 28.

synonyms, since they signify, in the way in which they are divided up and shared among creatures, the perfections which pre-exist in God in a state of sovereign simplicity. God is subsistent Goodness as He is subsistent Truth and subsistent Being itself, but the Idea of Goodness, of Truth and of Being, if it subsisted in a pure state, would not be God.

It follows from this that the names and concepts which properly belong to God keep all their intelligible value and significance in being applied to him: what they signify is *completely* in God, with all that it constitutes for our intelligence ('formally' is the phrase of the philosophers); in saying that God is good we intrinsically qualify the divine nature, and we know that it contains all that goodness necessarily implies. But in that perfection in pure act—which is God Himself—there is infinitely *more* than our concept or our name can conceive. It is in a mode which infinitely overflows our manner of conceiving that it exists in God ('eminently' is the philosophical phrase). In knowing that God is good we yet remain ignorant of the divine Goodness, for it is good as nothing else is good, true as nothing else is true; he is like nothing that we can know. 'Thus', says St. Thomas, 'the word wise, when it is applied to a man, *describes* and encloses in some manner the thing signified: but not when it is applied to God; then the signifying word remains uninclusive and uncircumscribing, and he exceeds the significance of the name'.[1]

All knowledge of God by ideas or concepts, whether acquired, as in metaphysics and speculative theology, or infused, as in prophecy—all purely intellectual knowledge of God this side of the beatific vision, though it may be absolutely true, absolutely certain, and may constitute an authentic and supremely desirable form of knowing, remains irremediably deficient, disproportionate by its very mode of grasping and signifying the object signified and known.

It is clear that if it can't be given to us to know God, not yet *sicuti est*, by his essence and in sight, but at least in the very transcendence of his deity, making use of a manner of knowing appropriate to the object known, such knowledge cannot be obtained purely intellectually. To transcend all ways of conceiving while remaining on the plane of

[1] *Sum. theol.*, i, 13, 5.

the intelligence, and thus of the concept, is a contradiction in terms. Progress beyond must be by love. Love alone, I mean supernatural love, can effect this transition. The mind here on earth can only overleap all modes in a renunciation-of-knowing, where the Spirit of God, making use of the connaturality of charity and the effects produced in the affections by the divine union, gives to the soul by love the experience of exactly that which no notion either can or may approach. 'Thus, delivered from the sensible world and the intellectual alike, the soul enters into the mysterious obscurity of a holy ignorance and, renouncing all the gifts of science, loses itself in Him who can neither be seen nor seized; wholly given to this sovereign object, belonging neither to itself nor to others; united to the unknown by the most noble part of itself and by reason of its renouncement of all science; finally, drawing from this absolute ignorance a comprehension which the understanding could never have won.'[1]

It seems that the whole of the modern epoch is set under the sign of the disunity of the flesh and the spirit, a progressive dislocation of the human form. It is only too clear that the passage of humanity under the dominion of Money and Technics[2] is marked by a progressive materialisation of the intellect and the general world alike. On the other hand, the spirit, with which our social and discursive activities dispense more and more, can itself claim to be dispensed from directing the fortunes of the organic functions of human life, and enjoy a sort of deliverance—at least, virtually. Jean Cocteau's phrase, 'Photography has delivered painting' can be applied all round. Printing has freed the plastic arts from the pedagogic functions which were incumbent on them in the age of the

[1] Pseudo-Dionysus, *Mystical Theology*, chap. i, 3.

[2] In themselves technical inventions ought to open the way to a life less preoccupied by the material, but by the fault of man they tend rather to the oppression of the spiritual. Does this mean that we ought to renounce technical discoveries or else give ourselves up to vain regrets? That has never been my opinion. But reason must assert her human regulative power. And if it can, without having recourse to purely despotic, and as such inhuman, solutions, that materialisation of which I have spoken may be surmounted, at least for a time. I am in no way claiming to plot out the curve of necessity for events, but merely endeavouring to disengage, in regard to the actual point in time where we are, the significant tendencies of the curve followed up to the present, and pointing out the fact that human liberty *can* change it.

cathedrals. The phenomenological sciences have freed metaphysics from the necessity of explaining the stuff of sensible nature and from many illusions pursued by the optimism of the Greeks. We can certainly congratulate ourselves on this purification of metaphysics. There are less grounds for rejoicing in the observation of this fact that, in the practical order of the government of things, in the very degree to which heavier material work is demanded of the intelligence, it has divided itself from the life which it has outside time. The earth has no longer need of an angelic mover, man drives it forward with the strength of his own arms. Spirit is gone up into heaven.

Man, for all that, is flesh and spirit, not bound together, but united in one substance. If human things cease to be shaped in human fashion, either seeking their shape in the energies of matter or in the exigencies of a disincarnate spirituality, it implies for man a terrifying metaphysical dismemberment. We may well believe that the shape of this world will pass away on the day when this tension will have reached such a point that it breaks our hearts in pieces.

As to the things of the spirit, their 'liberation' runs the risk of being an illusion—a much worse state than servitude. The constraints implied by the service of men were good for them; though burdensome, they endowed them with their natural weight. What is this supposed 'angel-transformation' of art and knowledge? Is it not more than possible that all this 'purity' will end by losing itself in frenetic brutality? It can only discover itself, only truly be, in the fold of the Holy Spirit. There where the Body is the eagles will gather. If the Christianity of yesterday is in defeat, the Church of Christ continues advancing; little by little she also is delivered, freed from the care of the cities which reject her, from the temporal providence which she exercised according to her rights, for the healing of our wounds. Stripped, dispossessed, when she flies into the wilderness she will take along with her all that remains in this world, not only of faith and charity, but of philosophy, poetry and virtue, which then will be fairer than ever before.

The powerful interest of the present crisis arises from the fact that it is more universal than any other, and lays each one of us under the obligation of a decisive choice. We have come to the parting of the

ways. The West by its prevarications, because it has abused divine grace and let fall the gifts which it should have made fruitful for God, having failed to maintain the order of charity, finds that it has lost also that of reason, which is everywhere corrupted, and which no longer suffices for anything. The malady of rationalism has brought about a discord between nature and *the shape of reason*. Nowadays it is becoming very difficult to remain human. We must take our stand either above reason and so for it, or below reason and against it. But the theological virtues and the supernatural gifts are the only things which are above reason. On every side—among the new humanists as from the partizans of dialectic materialism (as yesterday from the followers of Barrès)—we hear the cry: spiritual ideals, spiritual things! But, gentlemen, what spirit are you invoking? If it is not the Holy Spirit, you might just as well invoke the spirit of wood alcohol or the spirit of wine. All this self-styled spirituality, all these super-rational claims, if they are not rooted in charity, only lead in the end to animalism. Hatred of reason will never be anything but the insurrection of the tribe against specific differentiation. Dreaming is the exact opposite of contemplation. If purity consists in a perfect abandonment to life according to the senses and the mechanism of the senses, there is more of it in a brute beast than in a saint.

The world, that world for which Christ would not pray, has made its choice in advance. To deliver himself from the *forma rationis*, to flee far from God, in an impossible metaphysical suicide from the cruel and saving order of the eternal Law, is the vow which twists the flesh of the old man, as it was that of the eldest son of the morning when he fell like lightning from heaven. To express this absolutely, as fully as is possible for a being who, for the greater part of his time, does not know what he is doing, needs a form of heroism. (The Devil also has his martyrs.) It is an honour without future, rendered to one more than dead... As for the mass of mankind, to judge by the ordinary conditions of human nature, one might well believe that they were riding for the same fall, but with neither will nor courage, anaesthetised by the ideal. That fall is so terribly easy!

But is it always an error to judge only according to nature. Grace is there, and has surprises in store for us. While the old world continues

its glissade, the truly new is already with us, that secret invincible urge of the divine sap in the veins of the Mystical Body, which endures and does not grow old, the blessed awakening of souls under the signs of Our Lady and the Holy Spirit. O Wisdom stretching from one horizon of the world to the other, who bringest together in one the farthest extremes! O Promise bringing beauty to these times of our misery, who fills our hearts with joy! Unfaithful as they have been to their vocation, turning from the Church of their baptism, everywhere blaspheming the name of Christ in giving the name of 'christian civilisation' to that which is only its corpse, the Church loves the nations without need of them, who have such need of her. It is for their good that the Church, making use of the only culture in which human reason has almost achieved success, has tried for so long to impose a divine form on earthly matter, and to rouse and so maintain in perfection, in the gentle order of grace, human life and that of the reason. If European culture is in danger, she will save the essentials and know well how to raise up to Christ all that can be saved of other cultures. She harkens stirring in the heart of history another world, which no doubt will persecute her as the old one has done (is it not her mission to suffer persecution?) but in which she will discover the possibilities of new action.

Understood in the sense that Europe would be nothing without the Faith and that its *raison d'être* has been and remains to give the Faith to the world, Hilaire Belloc is right when he says that Europe is the Faith. But in the absolute sense, no. Europe is not the faith and the faith is not Europe; Europe is not the Church and the Church is not Europe. Rome is not the capital of the Latin world, but of the world. *Urbs caput orbis.* The Church is universal because she is born of God, with her all the nations of the world are at home: the arms of Her Master extended on the cross are extended over all races and all civilisations. She does not bring 'the benefits of civilisation', but the Blood of Christ and supernatural Beatitude. A marvellous epiphany of her catholicity seems in preparation in these present days, of which the progressive development in the missionary countries of a native priesthood and episcopate may perhaps be regarded as the forerunning sign.

For long asleep on the borders of history and now stricken with our follies, the East is as sick as the West. But here as there, we shall see

everywhere where a living faith strikes root, an adherence to what is truly above reason, to the uncreated Truth and the wisdom of the saints, bringing in its train (though certainly not without effort) the restoration of the order of reason itself, implicit in the very conditions of supernatural life. Thus the Gospel and philosophy, mysticism and metaphysics, the divine and human life are in concert. It is not to a European, but to a Bengali that we owe the great project of Brahmanandav, continued by his disciple Animananda: the foundation in Bengal of a contemplative congregation, whose members, religious mendicants resembling Hindu *sannyasis*, will carry all over India an Indian exemplification of catholic sanctity who, without ignoring the Vedantas, will base their intellectual life on the doctrines of St. Thomas.[1] I delight in this homage to the virtue of Thomism. Thomism, the gift to the entire world of mediæval christianity, belongs neither to one continent nor to one century; it is universal like the Church and like truth.

I for one can never despise the distress and expectation of those who feel that all is lost and who wait for the things to come. But the real question is: which do they in reality expect—Antichrist or the Parousia? We—we look for the resurrection of the dead and life of the world to come. We know what we await and that it surpasses all intelligence. There is a difference between not knowing what one expects and knowing that what one expects cannot be conceived.

'Adrian, yet a pagan, asked the martyrs, "What reward do you hope for?"

' "Our lips", they replied, "cannot say it nor men's ears hear."

' "You know nothing of it then? Neither from the law nor from the prophets? Nor from any other scripture?"

' "The prophets themselves could not conceive it as it needs to be understood: for they were but men who worshipped God and what they had received from the Holy Spirit they uttered again in words. But of that glory it is written: eye hath not seen and ear hath not heard,

[1]Michel Ledrus, S.J. *L'Apostolat bengali*, Louvain, 1924. In China an entirely Chinese catholic congregation, the Little Brothers of St. John Baptist, was founded by Fr. Lebbe in 1928. Generally, those who know China best think that the best of its ancient spiritual heritage in these days can find only in Catholicism any chance of escaping from the elementary materialism which the young are imbibing from the West.

neither hath it entered into the heart of man to conceive the things which the Lord hath prepared for them that love him."

'Hearing these things Adrian leapt into the midst of them, crying: "Count me also among those who confess the faith with these saints, I also am a christian." '[1]

[1]Boninus Mombritius, *Sanctuarium seu vitae sanctorum*, new edition by the monks of Solesmes, Paris, 1910.

PART ONE

THE DEGREES OF RATIONAL KNOWLEDGE

Chapter I. Philosophy and Experimental Science

Chapter II. Critical Realism

Chapter III. Our Knowledge of the Sensible World

Chapter IV. Metaphysical Knowledge

Chapters II to IV concern Speculative Philosophy, *i.e.* the philosophy of Nature and Metaphysics according to the principles of critical realism.

CHAPTER I

PHILOSOPHY AND EXPERIMENTAL SCIENCE

1. OBJECT OF THIS CHAPTER

IN HIS important book, *De l'explication dans les sciences*, Emile Meyerson declares that 'genuine science, the only science that we may know, conforms in no way and in none of its forms to the positivist scheme of things'.[1] I have not undertaken here the enterprise of showing that the system of critical intellectualism or critical realism,[2] while preserving in philosophy itself and metaphysics their essential forms as sciences, corresponds much more exactly to that vast logical universe which the modern developments of science have revealed: such work would demand a whole treatise. I wish only to draw out in summary fashion from the philosophical point of view the rudiments of such a scheme, such at least as it appears to me to be in the light of the history of science. I will not endeavour to conceal the lacunae in such a sketch: it is indeed subject to many revisions and additions. Such as it is however and despite its insufficiency, I trust that it will enable the reader to appreciate, taken in relation to his own experience, the value of a doctrine which the inertia of many of its partizans and the negligence of modern scientific criticism have caused to be misunderstood for too long.

This chapter is devoted to the relations between experimental science and philosophy; in other words, to a consideration first of all of the experimental stage of knowledge (or that which is particularised according to the various sciences and phenomena of nature) in relation

[1] Emile Meyerson, *De l'explication dans les sciences*, Paris, 1921.

[2] These phrases seem the best description for a philosophy for which no simplifying label is adequate, because it has for object a vantage point where empiricism and idealism, realism and nominalism are alike surpassed and reconciled. On the notion of critical realism see *infra*, chap. ii.

to the higher stages, where knowledge is at once universalised and unified. It is like an introduction to the three following chapters, where an attempt is made to envisage the general conception of philosophical knowledge in critical realism, a standpoint which will imply at once a deeper treatment of these problems and a wider synthesis.

Reserving for the next chapter an examination of the bases of the thomist noetic, its principles and metaphysical substructure are here taken as hypothetically admitted; *i.e.* the assumption of the existence of things apart from the mind and the possibility of the mind's awareness of things and of its power to construct, by its own rightful activity rising from the senses, a true knowledge, in conformity with reality. Those readers for whom these propositions remain in doubt can in any case accept them as provisionary postulates, and will recollect that they are not in doubt for science itself; it is realist by nature. If the experimental sciences do not therefore constitute an ontology of nature, at least, in the observation of so well-informed a philosopher as the one quoted above, a background of ontological values is in fact invincibly prerequisite to them.

OF SCIENCE IN GENERAL

What idea can we form of science in general, taken as of the foremost limit envisaged by the mind when it is aware of striving towards what men call knowledge?[1] The idea which Aristotle and the ancients had of it is very different from that of the moderns, because, for the

[1]It is clear that these personal limits can only be culled, by reflective abstraction, from the various sciences which have been already built up among men. Nevertheless it is not merely a question of a simple residuary mean (a statistical 'totality') reached by *abstractio totalis* or the abstraction of a logical generality, but of a pure type (an ideal 'formality') reached by *abstractio formalis* or the abstraction of the formal constituents. (See *infra*, p. 46-7). The various existing sciences such as they are, from which this pure type is disengaged, are far from presenting an adequate realisation of it.

It is to a succedaneum of this *abstractio formalis* (a conception which is lacking to most modern philosophers) that E. Husserl has recourse when he applies himself (cp. *Méditations cartésiennes*, pp. 7-11) to 'live' by meditative scientific effort and so grasp the 'intention' of science, which in fact is only possible by more or less implicit reflection on the really existing sciences. On the other hand, the cartesian method followed by Husserl obliges him to provisionally characterise as invalid the sciences from which he derives his very idea of science. If on the contrary I hold to the perspective of

latter, it is the high position occupied by the experimental, the positive, the natural sciences, the sciences of phenomena as people like to call them, which attracts to itself the notion of what science is; whereas, for the ancients, it was the eminent dignity of metaphysics which *orientated* this notion. It is therefore very necessary to guard against any tendency to apply the aristotelian-thomist conception of science as such, and without precautions, to the whole vast mass of noetic material which our contemporaries habitually call by that name. To do so may lead to the worst misunderstandings. However, both for the ancients and the moderns—in this they are in accord—the clearest, the most achieved type of science, the one most perfectly adapted to our understanding,[1] is furnished by mathematics; and it is possible to hold that, on condition, I do not say of being corrected and adapted, but rather of being sufficiently penetrated and clarified, the critical intellectualist or critical realist theory of science, whose principles were laid down by the metaphysicians of antiquity and the middle ages, can alone enable us to see our way clearly through those epistemological problems which in these days have become a veritable chaos.

How then can we define science in general according to its ideal type? We can say that science is a form of knowledge perfect in its mode; more precisely, a form of knowledge where, constrained by evidence, the mind assigns to things their reasons of being, the mind being only satisfied when it has attained not only to a thing, to a given datum, but when it grounds this datum in being and intelligibility. *Cognitio certa per causas*, said the ancients, knowledge by demonstration (in other words, mediately evident) and explicative knowledge. We see

that spontaneous realism postulated in fact by the sciences themselves, it is because I am presupposing that critical reflection (which I treat in the next chapter) can take cognisance of the validity of knowledge in general and, in consequence, of the less general and less indeterminate validity of the various sciences.

[1]That mathematics constitutes in itself the type of science most perfectly adapted to the human intellect (it has its infant prodigies), is exactly true in regard to classical mathematics; it is not exact of a mathematics where the axiomatic has entirely excluded intuition. It is as true that the axiomatic method, precious as it may be, 'cannot suffice in itself' nor 'justify itself solely by its own existence. . . . It is impossible, without removing its profound significance and its inward life, to isolate an abstract science —such as mathematics—from its intuitive origins'. (F. Gonseth, *Les Fondements des mathématiques*, Paris, 1926.)

at once that it is a knowledge so based that it is necessarily true, that it cannot not be true or in conformity with that which is.[1] For it would not be a knowledge perfect in its mode, an *irrefragable* knowledge if it could be found false. This is true for the pure type of the sciences, however hypothetical it may be for their developments and the very large measure of the probable and the conjectural with which they back their certitudes and which they propound nevertheless with rigour.

But if this knowledge is necessarily true must not the object which it assumes also be necessary? How can a variable and contingent object give rise to a stable knowledge which cannot be found false? In the same way a thing could not be *explained*, would not have given up its reasons to us, if the reasons posited for its being should prove to be otherwise. This is the problem which from the very beginning has faced philosophical reflection, and which led Plato to the construction of his world of divine Ideas. We must not try to escape by some half-hearted reply which would obscure the primary exigencies of scientific knowledge. Let us agree from the start—we shall see in a moment how this assertion must be understood and delimited—that there is only a science of the necessary, or that the contingent as such cannot be the object of science. Science bears directly and in itself on a necessary object.

The difficulty is at once apparent. The object of science is necessary. But the real, the concrete course of things, allows of contingence; this table need not be here to-day, I myself who write need not be here at this moment. Does science then not bear on the real? No, it does not bear directly on the real in the raw, on the real taken in its concrete and singular existence. (In this sense, M. Goblot is right in insisting on the difference between *reality* and *truth*.) But no more does it bear on a platonic world separated from things. It is indispensable to distinguish the *thing* with which science is occupied (this table for example) and the precise *object* (the 'formal object') on which it is based and from which it derives its stability (*e.g.* the geometrical principles of this table considered in terms of its form, or the psychico-chemical properties of the

[1]Taken in itself, its systematic attachments being abstracted, the notion proposed by E. Husserl of scientific truth 'conceived as a body of predicated relations founded or to be founded in an absolute manner' (*Méditations cartésiennes*, 1931, p. 10) does seem to be very far removed from this conception.

wood of which it is made, or the laws of its manufacture)—an object which does not exist in separation from the thing (unless for our minds) and which nevertheless is not confounded with it.[1] Science bears directly and in itself on the abstract,[2] on ideal constancies and supra-momentary determinations, what can be called the intelligible objects which our mind seeks in the real and to disengage from it. They are there, they exist, but not in the state of abstraction and universality which they hold in the mind—on the contrary, under concrete and singular conditions. Human nature exists in each one of us. But it is only in the mind that it is a universal nature, common to all men. In each one of us it is the nature of Paul or the nature of John, etc

It should be observed that scientific law always only expresses (more or less directly, more or less distorted) the properties or the exigencies of a certain ontological indivisible which in itself does not fall under the ken of the senses (is not observable) and which remains for the natural sciences an x (which is nevertheless indispensable) and which is none other than what philosophy designates by the name of *nature* or *essence*.[3]

[1]It is distinguished from it by a rational distinction.

[2]I do not ignore the fact that the idea of abstraction and of abstract natures is repugnant to the avowed or unavowed nominalism of many of our contemporaries. Are they, for all that, aware of the curious spectacle which they present when, denouncing the vanity and worn-out quality of such a notion, they themselves talk of 'science', 'the mind', 'method', 'mathematical reasoning', all those objects of thought which it is oddly difficult not to recognise as abstract natures? They are in pursuit of a phantom, for the critical intellectualism of an Aristotle or a St. Thomas never, as they imagine, made scientific abstraction consist in fitting an individual object into a logical pigeonhole or a hypostasied generalisation of its characteristics, but in disengaging from it the reality which can be thought and made consistent for the mind, the complex intelligibility of which it is the carrier. This latter is what the scholastics called *abstractio formalis* (see *infra*, p. 46).

From this *abstractio formalis* the scientific mind can in no way escape. Whatever be the mode of intellectual procedure, even if it only postulates the equation of phenomena and the fixing of their empirico-mathematical connections, and renounces any search for the essence, abstraction is always present, and it is it which allows the establishment of rules of measurement and the calculus by which phenomena are adapted to a mathematic formulation, and it is by it that that empiric specification of phenomena is disengaged, which is itself a substitute for the essence and presupposes its existence.

[3]Let me quote two significant passages used by E. Meyerson: 'Whatever can be said of the modern scientific schools, where there is above all a dread of the appearance of metaphysical argument, mitigated atomism, just as much as pure atomism, implies the

By virtue of the ontology (or spontaneous philosophy) immanent in our reason, we *know in advance* that the complex of phenomena or of relations chosen as an object of observation has its support on such natures or essences, such an ontological *x*. The experimental sciences do not penetrate to these essences in their intelligible constitution, and even the question of knowing whether the more or less provisional and unstable categories which they construct and on which they work in the course of their reasoning corresponds exactly to them, remains often decidedly doubtful. Nevertheless, the *raison d'être* for the necessity of the stable relations among the elements chosen by the mind from phenomena formulated by the sciences and on which they construct their foundations resides exactly in these presupposed *ontological non-observables*. The necessity of these laws comes from the fact that they are concerned rightly and in the end with essences or natures, and that these essences or natures are the ground of intelligible necessities: for every nature or essence, by its intrinsic constitution, necessarily possesses such properties (as the diagonal of the square is incommensurable with the side) or tends necessarily to produce a given determined effect in given conditions (as 'heat' causes the expansion of 'solids'). What is rightly meant by the law of the expansions of solids by heat? Does it mean that, in some concrete case, the expansion of a certain piece of iron placed above a certain flame is a necessary and inevitable thing? No, that particular flame might not have been lighted, that piece of iron might not have been placed there, it might have been protected by some insulator, cooled by some current of water, etc. What the law means is that a *solid* (an abstract object which I consider in this piece of iron) holds in the secrets of its nature something unknown (at least in the present sphere of my observation, which perhaps some day experience will oblige me to make more precise[1]) which necessarily and immutably causes it to expand according to certain specific co-efficients under the action of *heat* (an abstract object which I consider in this flame and which I can define, thanks to a difference in certain pointer readings).

claim to penetrate in some manner to the essence of things and to their inward nature' (Cournot, *Traité de l'enchaînement*, Paris, 1861). 'We seek for the essence or the necessity of each thing and the two expressions are equivalent, for, when we know the essence, we see that the being to which it belongs cannot be . . . different from what it is' (Sophie Germain, *Considérations générales sur l'état des sciences et des lettres aux différentes époques de leur culture*, 'Œuvres philos.', Paris, 1878). Bertrand Russell, for his part, says that 'logic and mathematics compel us to admit a form of realism in the scholastic sense of the word, that is, to admit that there is a world of *universals* and of truths which do not bear directly on this or that particular existence. This world of universals must exist, although it cannot exist in the same sense in which the given particulars exist' (*L'importance de la logistique*, Rev. de Met. et de Mor., May 1911).

It goes without saying that I need not realise these abstractions as such, heat could rather appear to me as the kinetic energy of a multitude of molecules moving about in disorder, in such a way that on the corpuscular scale the law in question becomes a statistical one, only enunciating the stability of the resultant average. But if the essence or nature with its *determinatio ad unum* so recoils (and perhaps *ad infinitum*) from the gaze of the scientist, it does not, for all that, disappear from the field of the real. Absolute hazard is a contradiction in terms; an intersection not predetermined by predeterminations presupposes predetermination. To know at what age one dies according to such and such a percentage, an actuary only relies on statistics and the law of the greatest numbers. But behind this law and behind statistics there is the nature of the human body, and the nature of all manner of physical, moral and social things, in the midst of which that body is placed and to the accidents of whose action it is subject. Chance only gives rise to fixed numbers because there are originally predetermined elements, which are not by chance, among which it can play. If the 'primary' laws or specific determinations are succedanea of natures or essences not attained in themselves, statistical laws are succedanea at two removes and presuppose, like the others, that these natures *are* the final bases of the stability of knowledge.

To the question, why does the necessity of laws, the objects of science, not extend to every particular event which happens here on earth, it is therefore necessary to reply: because the world of existence in act and of concrete reality is not the world of pure intelligible necessities. These essences or natures are certainly contained in existing reality, whence they (or their succedanea) are drawn by our minds, but not in a pure state. Every existing thing has its nature or essence, but the

[1]Such a reservation is necessarily understood in regard to every law established by induction. And the law of the dilation of solids by heat has been established purely inductively before being attached to a physical theory of heat.

existential position of things is not implied by their nature, and events occur among them which in themselves are not derived from these natures and which no one nature essentially implies. Existent reality is thus composed of *nature* and the *adventitious*: that is why there is a meaning in time and its duration constitutes (irreversible) history—for history implies these two elements; a world of pure natures does not change with time, platonic archetypes have no history, and a world of pure chance would lack any orientation, a thermo-dynamic equilibrium has no history.

NECESSITY AND CONTINGENCE

We see, therefore, that the true notion of abstraction and of the universal gives us the explanation for which we sought. If we do not distinguish between the individual thing and the universal essence we can not comprehend how the *event* can be *contingent* while the *law* recognised by science is *necessary*, how things flow and change while the object of science is in itself immutable and enduring. It is so because contingence depends on the singular as such (and in fact, in the visible world, on matter, the principle of individualisation) while science is based, not on the singular as such, but on universal natures which are realised in the singular and which the mind draws from the singular by abstraction.

Science deals with things, but with things, thanks to abstraction, as part—whether this is clearly perceived or blindly grasped—of the universal natures which are realised in things and the necessities proper to those natures. And this—and not the flux of the singular—constitutes its object.[1] Contingence is rightly concerned with singular events and it is only 'according to the reasons of universal natures' that the necessities recognised by science apply to singular things. This is why the necessary laws of science do not essentially affect every singular event in the course of nature. A workman has cut this stone into a cube, being a cube it must necessarily have the geometric properties of a cube; but it might have been cut otherwise. This bridge has been faultily constructed

[1] *'Illa proprie ad singularia pertinent quae contingenter eveniunt; quae autem per se insunt vel repugnant, attribuuntur singularibus secundum universalium rationes.'* (St. Thomas, *In Perihermeneias*, book i, chap. ix, lect. 13, sect. 6.)

because the engineer calculated the resistances badly, or the materials were bad because the contractor cheated the state: it is fated that, because of the natures of iron and of stone, one day the bridge will collapse; but the miscalculations of the engineer or the lack of honesty in the contractor, or that a prudent inspector might not have given orders for its repair, or that such and such a pedestrian should be crossing at the moment of the accident, all these things are entirely independent of any natural necessity and belong to the contingent. These contingencies of the singular escape the grasp of science. These necessities of the universal are the proper object of its grasp.[1]

Thus the *universality* of the object of knowledge is the condition of its *necessity*, in itself the condition of perfect knowledge or science. Exactly as knowledge can only be of what is by necessity, there can only be knowledge of the universal.[2]

This is the meaning in the teaching of Aristotle, following Plato, that there can only be science, absolutely speaking, of incorruptible and sempiternal things, but he corrected Plato by adding that these incorruptible and sempiternal things (incorruptible and sempiternal in so

[1] 'It can be predicted with certainty that half the children born to-day will live beyond the age of *n* years; yet this does not tell you what age young X will reach. The eclipse of 1999 is as certain as the life-scale of an insurance company; the leap that an atom is going to make is as uncertain as my life or yours.' (A. S. Eddington, *The Nature of the Physical World.*) It seems as though the ever increasing importance of the place taken by statistical laws (I am not speaking here of the 'uncertain relations' of corpuscular mechanics, which will be in question later on, but simply of the multitude of fortuitous shocks which ultimately depend on 'the leap of an individual atom or molecule') could be regarded as an illustration of aristotelian ideas on the link between the contingent and the singular. Statistical law thus presents itself, as I have indicated above, as the succedaneum at two removes of the intelligible necessities inscribed in the universal which experimental science is not able to decipher.

[2] It is important here to avoid a too easy misunderstanding. I said that there is no *science* of the individual *as such*. This in no way signifies that it is impossible to have an *intellectual and indirect* knowledge (by means of 'reflection' from the senses—or by affective connaturality) of the individual as such. I will even admit, with John of St. Thomas, the existence of a rightful (indirect) concept of the singular.

Nor does this mean that it is impossible to have a *science* of the individual—but not *as such*, (*e.g.* in his singularity, its incommunicability in itself). Character-reading, graphology, the science of temperaments, etc., are sciences of the individual, which, to attain the singular, surround it with a network of sub-specific universal notions and in addition employ an art or experience where the *ratio particularis* plays an essential part.

far as they are essences or *negatively*) are those universal natures which only exist outside the mind in singular and perishable things, and that so it is possible to have 'by accident' a science of corruptible things: in so far as we apply the universal truths of science to singulars and the intelligence, 'leaving so to speak its proper sphere, returns, by the ministry of the senses, to those corruptible things where the universal finds itself realised'[1]. 'Although sensible things', says St. Thomas, 'are corruptible, taken in their individual existences, they have nevertheless a certain eternity when taken universally.'[2]

And so, since the demonstration and knowledge of sensible things can only be under the aspect of their universal natures, not of their individuality, it follows that this knowledge and demonstration bear only indirectly and 'by accident' on the corruptible, and in themselves on what is 'sempiternal'. The condition of the immutability and necessity of the object of knowledge is its universality.

The whole of this doctrine is admirably condensed by St. Thomas: 'The intellect may know the universal and necessary reasons of contingent things. This is why, if we consider the universal reasons of objects of knowing, all science is of the necessary', even though, taking things in their material aspect, and 'considering those things with which the science is occupied, certain sciences'—such as mathematics for example—'have necessities as their subject-matter, and others'—physics, for example—'contingent things.'[3]

A DIGRESSION ON 'NATURAL DETERMINISM'

Thus we see that the error of pseudo-scientific mechanism presupposes and includes the error of nominalism. If the universal does not, either directly or indirectly, stand for an essence or nature, but only for a collection of individual cases, it is impossible any longer to comprehend how scientific law can be of necessity and the succession of singular events contingent. What the mechanists fail to understand is that the

[1] Cajetan, *In Anal. Post.*, book i, chap. viii.

[2] 'Etsi enim ista sensibilia corruptibilia sint in particulari, in universalia tamen quamdam sempiternitatem habent.' (St. Thomas, *In Anal. Post.*, book i, chap. viii, lect. 16.)

[3] *Sum. theol.*, i, 86, 3.

law expresses nothing but the ordination of the cause, *taken abstractly in its universal nature*, to its effect—and that this ordination always remains the same, even if the position of the cause in actual existence is contingent, or if, in the flux of particular events, another cause presents an obstacle to the realisation of its effects.

If we suppose that no *free* (intelligent) agent exists in the universe then obviously any event happening here on earth (*e.g.* the fact that this squirrel is climbing on this tree at this moment or that the lightning strikes at any one moment on any one mountain) was infallibly predetermined by the concatenation of *all* the factors of the given universe from the beginning. But there is only necessity *de facto*, not *de jure*. Not only could this concatenation of factors have been other in the beginning, but, still more, none of the innumerable encounters between different causal successions which have been produced in the course of the evolution of the world up to the production of this event had its full and sufficient reason in the essential structure of the universe, nor in any particular essence; the secondary causes productive of this event *in themselves* might (even if they might not in relation to all the multitude of precedent and concomitant positions of fact, supposing that these in themselves were not disturbed) have been prevented from producing it, without the violation of any rational necessity. It is in itself a *contingent* event[1] (and in consequence the supposition of a free agent intervening to modify or prevent it implies not the least impossibility).

These remarks show in what sense it is possible to speak of *natural determinism*. This expression is legitimate if it is understood as meaning that every cause in nature is necessarily determined, or by its essence, to an effect (which can in fact be lacking if the cause is not posited or other causes intervene), and that such necessary determinations are the object of the sciences of nature—or, rather, their basic foundation (for the more they free themselves from ontology in their texture the more they also become remote from causality in the philosophical sense of the word).[2] But it is erroneous and a pure fit of stupidity to say that science presupposes 'the universal determinism of nature', if what

[1] On this question see my *Philosophie Bergsonienne*, second edition.

[2] See *infra*, chap. iii, pp. 182–6.

is meant is that all events which take place in nature are rendered inevitable and necessary the moment nature herself is posited and that such a universal necessity is the object of science, which should therefore deal with all individual happenings in the world, whereas on the contrary, taken as such, it is exactly those things which by nature evade its grasp.

It is curious to observe how a man like Fichte, for example, was led to construct his 'theory of science' and the immense and fragile fabric of his metaphysic of liberty, in no small degree by the desire for an escape from this 'universal determinism', when a more rigorous critique of it would have sufficed to show him that it was only a troublesome idea and only presented a pseudo-problem. One could make the same melancholy comment on the philosophy of Renouvier and, more generally, on the greater part of the modern systems which have sprung from Kantianism.

The aristotelian-thomist conception, on the contrary, by showing how in the course of singular *events* contingence is reconciled with the necessity of the *laws* recognised by science, enables us to see how it is possible to integrate into nature the liberty which is proper to spirits, which as such do not make part of the sensible and corporeal world, but which nevertheless have in that world their field of action.

ANOTHER DIGRESSION. HOW DO WE ATTAIN TO ESSENCES?

Let me finish off one digression in order to begin another. I have spoken of natures and essences. Does this imply that in my eyes the primary intellectual operation, abstraction, allows us to penetrate at the first shot to the *essence of things* by its intrinsic constitution? That it is sufficient to form an idea of fire, or better, of ignition, to penetrate at once the ontological secret of combustion? That would be chemistry 'without tears', with a vengeance!

A similar reproach forms the basis of the criticism directed by several contemporary philosophers against what one of the more serious of them has christened 'pre-cartesian thought'. It is humiliating enough even to have need to reply. For the charge comes in part from the flaws of a decadent scholasticism, in part from a superficial reading of some

elementary exposition, and most of all from a remarkable ignorance of philosophical tradition.[1]

Abstraction, as has often been pointed out, by the very fact that it transfers us from the plane of sensible and material existence to the plane of the objects of thought, introduces us into the order of intelligible being or of *what things are*, but it does not immediately attain to anything except the most general and poorest aspect of intelligible being, *e.g.* the idea of fire represents to us only *something, some determined being*, which produces certain sensible effects, such as burning and shining for examples. Abstraction shows us intelligible aspects which are certainly contained in things, but the discovery, even in the imperfect way which is native to man, and only by grace of the properties manifest to it, of the very essence of things, *e.g.* the signs which denote their rightful intelligible being and which give the reason of their other properties, is only arrived at—if it is arrived at!—by hard work; I would add that in a whole immense domain, that of the inductive sciences, we do not arrive at it and must rest content with succedanea and working equivalents.[2]

[1] Those philosophers whom I have in mind, if they must talk about St. Thomas without having read him (and read him with the scrupulous accuracy and thirst for information which they ask of others and which they might also well ask of themselves), only need, to disabuse themselves on this point, to divert their haughtiness by a quick study of the very clear pages which have been written on this subject by L. Noël (*Notes d'épistémologie thomiste*, p. 142) and by J. de Tonquédec (*La Critique de la connaissance*, pp. 42, 138, also *Immanence*, Appendix i). See also A. Forrest, *La Structure métaphysique du concret selon saint Thomas d'Aquin*, chap. iii, pp. 72–97; and *infra*, chap. iv, pp. 248–255.

[2] I should like to quote here a remarkable passage by M. Gaston Rabeau (*Réalité et relativité*, Paris, 1927, p. 203), apropos of M. Leon Brunschvieg's book, *L'Expérience humaine et la causalité physique*. 'The analysis of causality, of facts and sequences which science is seeking, gives us an idea of the interpretation of the real which in no way coincides with that rarefied Kantianism which has no fixed categories and where the functions of judgment are indefinitely variable. At bottom, what M. Brunschvieg makes clear is that the essence (by which I mean laws, theories etc.,) is not attained in one stroke, that experience suggests truths rather than imposes them, that the procedure of thought does not isolate the object of knowledge, and that it is necessary from time to time to return by a reflective act to the procedure employed to render them capable of use for more complex tasks. All this is incontestably true and presents no difficulty; it is only opposed to the phantasmagoria of a world of ready-made essences already existing in the mind, to the simple-mindedness of a philosopher who could imagine that he carries in his head the divine plan of the world. Elsewhere, in his

We achieve the possession of an intimate knowledge of the real in philosophy, where things are studied, not from the particular point of view of their specific diversity, but from the point of view of the transcendental *being* which saturates them. But if it is a question of particularising specific essences? In so far as physical realities are concerned, it is only with regard to ourselves and to human things that we can arrive at quidditative definitions and reach an intelligible knowledge of nature in a specific degree. For all the rest of the corporeal world and for all things below us we cannot arrive at the perception of intelligible constituents in themselves and must have recourse to a knowledge inductively constructed from sensible effects alone, which does not give us essences, but simply their exterior signs.

One thing is too often forgotten. If there is a metaphysic which appears to be *de jure* (if not *de facto*) incapable of recognising the proper procedure of the inductive sciences and which manifests an unheard-of dogmatism and intemperate ambition in the field of the knowledge of the corporeal universe, to the point of claiming possession of an exhaustive knowledge of the essence of matter which is presumably so laid bare before our minds, it is the metaphysic of Descartes and of Malebranche, that metaphysic from which, more or less camouflaged with experimentalism, the inevitably mechanistic ideal of most contemporary thinkers is derived: it is not the critical realism elaborated by the ancients.

So, having come to the closure of our second parenthesis, it is possible to define, as it should be done, the position I have already taken up.

L'Analytique transcendentale, M. Brunschvicg points out, as a concrete element which obstructs the deduction of the categories, that irreversible continuance which is the matter of real causality: he signalises the constants which are susceptible of serving as points of reference in various systems; he speaks of that irreducible something which is the very ground of experience. In short, he shows us the fact, with the intelligible nature which constitutes it, and the mind, which, in seeking to assimilate the facts, strives to reconstruct in separated and maladjusted fragments, the presentation of essences. This history of the drama of thought at grips with nature in the effort to reveal her secrets is potently attractive; and it only appears remote from our doctrines because this analysis is bound up with postulates which it does not in fact require.'

THE SCIENCES OF EXPLANATION (IN THE FULL SENSE OF THE WORD) AND THE SCIENCES OF AFFIRMATION

I have said that science as such, and therefore all science, bears, by its direct movement,[1] on natures or universal essences seen as such in these natures. Here a distinction is necessary:

There are sciences which deal with these essences *as known*, not certainly exhaustively, for we know nothing wholly,[2] but at least as known or manifest (externally[3]): these are the deductive sciences, mathematics and philosophy; though they are deductive assuredly for very different reasons: for in mathematical science the mind lays hold on the constituent elements of entities and constructs and reconstructs in its own right what it has drawn from sensible data or built upon them, treating what in the real (when they are *entia realia*) are the accidents or properties of bodies *as if* they were subsistent beings and *as if* the notions which it holds of them were free of any experimental origin; whereas, on the other hand, in philosophical knowledge, the mind lays hold of substantial essences, not in themselves, but by their rightful accidentals, and only advances deductively by a constant revitalisation by experience (the 'analytico-synthetic' method).

These sciences are rightly sciences of EXPLICATION, *διότι ἐστιν, propter quid est*, in the terminology of the ancients; they reveal the intelligible necessities immanent in the object; they make known effects by principles or reasons of being, by causes, taking the word in the full and general sense of the older world. It is possible, it is true, that, when

[1] In distinction to that rational movement by which it *returns* to the singular.

[2] For Thomists, if we could know essences exhaustively (*adequate ut sunt in se*) there would be *as many specifically different sciences* as there were essences so known. Thus our science itself, by the simple fact that it embraces a multitude of different natures under one light and in the same degree of abstraction, attests that the real remains unfathomable to it. Cp. John of St. Thomas, *Curs. Phil.*, log. ii, P. q. 27, a. 1. Reiser, book i, pp. 819 and 824: 'Ex hoc totum ex eo tandem provenit, quia nostrae scientiae imperfectae sunt et non omnino adaequantur ipsis rebus neque eas adaequate comprehendunt. Nam si quaelibet res perfecte comprehenderetur, quaelibet res fundaret scientiam sibi propriam et specie distinctam ab alia, neque scientia requireret coordinationem specierum, sed quaelibet res per suam speciem adaequatam perfecte repraesentata suas passiones demonstraret.'

[3] See *infra*, chap. iv, pp. 248–51 and 252–5.

confronted with a reality of such a height that its essence can only be known by analogy (as is the case of metaphysics before God), they have to confine themselves to a knowledge of the simple certainty of the fact (supra-empiric[1]), but then they have, so to speak, come out on the further side of explanation, and the fact remains that in themselves they seek to discover the essence of all things.

There are also the sciences which bear on essences *as concealed*, which can never in themselves reveal the intelligible necessities immanent in their object, inductive sciences which (at least in the degree to which they remain purely inductive, which is not the case with modern physics or 'experimental' science, as Mill and Bacon deceived themselves greatly by believing) can only be held to be sciences of empiric AFFIRMATION (a particular case of knowledge in the line of fact, ὅτι ἐστιν, *quia est*) and which remain on this side of explication in the rightful sense of the word. They enable us to know 'causes' or reasons of being by their effects, not in themselves, but by the signs which are our substitutes for them. We know that heat expands metals, that ruminants have cloven hoofs, and so blindly lay hold on some necessity whose reason we do not see—a well-founded experimental *constant* being the sign of some necessity, and in itself the sign of some essential connection. An inductively established law is thus much more than a simple general fact, it includes, without revealing, the essence; it is the practical equivalent of the essence or the cause which itself remains hidden.

The former sciences, the sciences of explication, set before the mind intelligible objects detached from the concrete existence which clothes them here on earth, essences delivered from existence in time. If no

[1]The *scire an sit* or *quia est* (knowledge by the record or the perspective of fact) is in no way limited to knowledge of an inductive type, for (in opposition to the *scire quid est* or *propter quid est*, which is knowledge in the record of or the perspective of reason of being) this expression includes all knowledge which does not arrive at grasping the essence itself in the totality of its intelligible constituents. For example it is in this way that in a discipline of a deductive type like metaphysics the *scire quia est* plays a very important part, since all knowledge of God which we have here on earth comes from this form of knowing.

As to the nominally inductive sciences, they belong, in the degree to which they are inductive, to the *scire quia est*, and constitute the particular type of this form of knowledge in the domain of natural knowledge.

triangle had ever existed it would still remain true that the sum of the angles of a euclidian triangle is equal to two right-angles. In this sense it may be said that these sciences proffer us eternal truths.

The other sciences, the sciences of affirmation, tend towards such truths, but do not achieve rising above existence in time, precisely because they do not attain to intelligible natures except in the signs and substitutes which constitute their field of experience, and that in a manner essentially dependent on existential conditions, in such a way that the truths enunciated by them not only affirm the necessary link between the predicate and the subject, but also presuppose the existence of this subject: the necessity which they bring to light not being seen in itself, remains absorbed in existence in time—and thereby, if I may say so, saturated with contingence.

Briefly, we can say that science in general deals with the necessities immanent in natures, with the universal essences realised in individuals in the concrete and sensible world. The distinction has been drawn between the explicatory or deductive sciences, which attain to these natures by discovery (constructively in mathematics, and from without to what is within in the case of philosophy), and the affirmative or inductive sciences, which only attain these natures as signs and substitutes, blindly so to say. These latter have assuredly a certain explicative value, without which they would not be sciences, but which consists in indicating the necessities of things by way of sensible experiments, not by assigning their intelligible reasons.

The distinction between these two categories of sciences is absolute: they are mutually irreducible.

It is clear that the sciences of the second category, the affirmative, inductive sciences, being less perfectly sciences, by failing to achieve the full expression of the type of a perfect science, are not in themselves self-sufficient; they reach out by nature towards the sciences of the first category, the sciences of explication in the full sense of the word, the deductive sciences. *They are indeed by necessity subject to their attraction.* In virtue of their very nature as sciences they inevitably tend to rationalise themselves, to become more perfectly explanatory, in other words, to approximate to a deductive type, and in that degree to become subject to the regulation of a discipline properly belonging to such a type,

either philosophical or mathematical. It is an important fact which we must never allow ourselves to forget.

Let us now endeavour to enter further into the domain of the sciences in order to discover their essential divisions and their hierarchy.

For this it is necessary to consider the various degrees of intelligibility of the objects of knowledge. If it is remembered that what philosophers call matter (the existent non-being of Plato) is in the last analysis nothing other than the ontological source of relative unintelligibility (or, in modern terms, irrationality), which affects the very substance of natural things and signifies so to speak the distance which separates them from the intelligibility in pure act proper to uncreated Being, we shall at once understand the fundamental thesis put forward so powerfully by St. Thomas: intelligibility goes with non-materiality. It is therefore by the diverse modes or degrees in which the objects of thought discovered in things by the operations of the intellect are freed from matter that it becomes possible to establish the essential divisions of science. (It is only on these essential divisions that I shall concentrate, without consequently making any claim to enter into the detail of their subdivision and classification; more, I shall only consider the speculative, leaving on one side the moral sciences, which, being concerned with the practical order and proceeding, in a 'composite' manner, to the point of the concrete determinations of an action, belong to an entirely different division of epistemology.)

II. THE THREE DEGREES OF ABSTRACTION

Here our clue is provided by the doctrine of *the three degrees of abstraction* or the three degrees in which things proffer to the mind the possibility of finding in them a more or less abstract and immaterial object, *i.e.* in regard to the way in which that intelligibility is itself derived from premises to conclusions, or, in the last analysis, by the particular mode of definition.[1]

The mind can consider objects only abstracted and purified from matter in so far as it is the foundation for the diversity of individuals in space, in as much as it is the principle of individualisation; in this case the object, in the very degree to which it is present to the mind, remains impregnated with all the signs produced by matter, abstraction consisting only in the removal of all those contingent and strictly individual particulars which are ignored by science. The mind thus considers bodies in their mobile and sensitive reality, clothed with their experimentally verifiable properties. Such an object cannot *exist* without matter and the qualities which are bound up with it, nor can it be *conceived* without it. This is the great dominion of what the ancients called *Physica*: the knowledge of sensory nature. It is the first degree of abstraction.

[1]Cp. John of St. Thomas, *Curs. Phil.*, Log. ii, P. q. 27, a. 1

But the mind can also consider objects abstracted and purified from matter in so far as it is the general ground of the sensible properties, whether active or passive, of bodies. In this case it considers only one property which it detaches from bodies—what remains when all the sensible is removed—quantity, number and extension taken as such: an object of thought which cannot *exist* without sensible matter, but which can be *conceived* without it, *e.g.* nothing sensible or experimental enters into the definition of an ellipse or a square-root. This is the great kingdom of *Mathematica:* the knowledge of quantity as such, in its

[1]A more detailed discussion of the notion of quantity and the proper object of mathematics follows on a later page (cp. chap. iii, pp. 173-6 and chap. iv, p. 250). It should be noted, however, at once, that in making quantity as such, or ideal quantity, the object in general mathematics, I in no way intend the exclusion from the domain of mathematics of all qualitative determination. On the contrary; if it is a question of the qualities or formal determinations included in the notion of the entities under consideration, or of those 'irrationals' which are at the origin of their construction, *e.g.* those primary specifications which serve to define the structure of a continuum or which in the last analysis spring from a given fact (as is the case for the three-dimensional nature of space in classical geometry), it is obvious that no science of quantity is possible without qualities. *Analysis situs*, the theory of abstract spaces, those properties of order which are at the bottom of topological notions, witness to the marked importance of this qualitative element as essentially affecting the domain of mathematics. But this is a question of the qualities proper to quantity as such, not of the qualities which refer to the nature or radical principle of the activity of bodies, which are reducible to the sensible order (physical qualities).

On the other hand it will be noted that for the scholastics the science of content and the science of numbers, while both belonging, generically, to the second order of abstraction, both present nevertheless in this very order a —specific—difference or level of immateriality: the latter is of higher abstraction and immateriality than the former (cp. John of St. Thomas, *Curs. Phil.*, log. ii, P. q. 27, a. 1; *Phil. Nat.*, i, P. q. 1, a. 2, Vivès, book ii, p. 16). Modern mathematics, while endeavouring to overcome this difference and accumulating thereby the most fruitful discoveries, can in the end only

rightful relations of order and measurement. This is the second degree of abstraction.

Finally, the mind can consider abstract objects from which matter has been entirely eliminated, where nothing remains of things but the being with which they are saturated, being as such and its laws: objects of thought which not only can be *conceived* without matter, but which can even *exist* without it, which may never have existed in material form at all, such as God and pure spirits, or which may equally exist in material and immaterial things, such as substance, quality, act and potency, beauty, goodness, etc. This is the great kingdom of *Metaphysica*: the knowledge of what is beyond sensible nature, or of Being as being. This is the third degree of abstraction.

It must here be pointed out, on the authority of Cajetan and John of St. Thomas, that these three degrees of abstraction apply to the form of abstraction called by the scholastics, *abstractio formalis*.[1] Actually there

enhance and underline its significance. For if geometry and arithmetic have become co-extensive, we are nevertheless justified in thinking that the numeric content in itself presupposes the primary and irreducible notion of extension, and that the irrational number, thanks to which 'the body of numbers' acquires 'the same plenitude or the same continuity as the straight line' (Dedekind), is in reality an arithmetical symbol of an arbitrarily chosen point on a straight line, an indivisible common to the two segments which continue through it (cp. F. Gonseth, *op. cit.*, p. 46). That vicious circle in the method ordinarily used for establishing the existence of irrational numbers, denounced by M. Weyl, only results from the endeavour to establish its existence solely by means of arithmetic, starting from rational and whole numbers. Either way one is obliged to fall back on the distinction between two 'schools' in mathematics and two only: 'the school of enumeration, Arithmetic, and the school of content, Geometry' (Gonseth, *op. cit.*).

It is important to observe in general that the three fundamental degrees of abstraction, which begin *ex parte termini a quo*, as the mind abandons such and such material conditions, only define the great primary determinations of speculative knowledge, within which other variations of level may be found, which spring *ex parte termini ad quem*, in the degree to which the mind itself is the object of a determined degree of immateriality (John of St. Thomas, *op. cit.*, log.). One specific form of knowledge, *e.g.* natural philosophy, can consider objects of very differing universality (cp. St. Thomas, *Comm. in de Sensu et Sensato*, lect. 1), which remain on the same plane of intelligibility as long as the *modus definiendi* remains the same for all. But if it is a question of another method of establishing specific notions, another mode of definition, it is another specific type of speculative knowledge which is in question.

[1] Cajetan, *Comm. in de Ente et Essentia*, procœmium, q. 1; John of St. Thomas, *Curs. Phil.*, log. ii, P. q. 27, a. 1.

are two forms of abstraction: *abstractio totalis*, in other words, the abstraction or extraction of the universal whole, by which we derive 'man' from Peter and Paul, 'animal' from man, etc., so progressing by larger and larger universals. This form of abstraction, whereby the mind rises above all simply animal knowledge of the singular perceived by the sense *hic et nunc*, and which commences in reality with the most general and indeterminate notions, is at the bottom of all human ways of knowing; it is common to all the sciences, all science advancing from this order towards greater determination, seeking, so to say, to bind up its object in the notion proper to it, not as obscured by a more or less common or floating one. But there is a second form of abstraction, *abstractio formalis*, the abstraction or extraction of the intelligible type, by which we separate the formal reasons and essence of an object of knowledge from contingent and material data. It is by the degrees of this *abstractio formalis* that speculative sciences differ from one another, the objects of the higher science presenting the form or regulative type for the objects of the inferior. Doubtless the objects of metaphysics are more universal than those of physics, but it is not in that form, as more general notions on the same plane, that the metaphysician considers them. It is as forms or intelligible types on a higher plane, as an object of knowledge of a specifically superior nature and intelligibility, and of which he acquires a rightfully scientific knowledge by means which are absolutely transcendent to those of the physicist or the mathematician.

If it is permissible to make use of figurative language, one could say that the work of the intelligence could be compared to an immaterial magic: from the flux of singular and contingent things apprehended by the senses the first glance of the intelligence evokes the world of corporeal substances and their properties; a second glance evokes another universe, the ideal world of extension and number: a third, yet another different world, the world of being as being and of all the transcendental perfections common to both bodies and spirits, where, as in a mirror, we may attain to purely spiritual realities and the principle itself of all reality.

How then are we to classify those sciences which I just now entitled sciences of affirmation, which do not achieve the discovery of the

natures seen by them? It is obvious that they belong to the lowest degree of abstraction. They form part of *Physica*. More, we can now distinguish in *Physica* two classes of sciences, which represent its extreme limits: these sciences of affirmation, primarily inductive sciences, which we can call the empiric sciences of sensible nature—and a science of corporeal being which is rightly explanatory, the philosophy of sensible nature.

In further definition, we may observe that though all our concepts are resolved in being, which is the first object attained (*in confuso*) by intellectual apprehension, the concepts of metaphysics are resolved in being as such, *ens ut sic*, those of mathematics in that form of being (detached from the real) which is ideal quantity, and those of *Physica* in mobile or sensitive being, *ens sensibile*; but for the philosophy of nature it is necessary, in the phrase *ens sensibile*, to put the accent on *ens*: an explicatory science, it discovers the nature and the reasons of being of its object. And if it is true that the nature of substances inferior to man is not accessible to our discovery in its specific diversity, it is necessary to say that the proper object of the philosophy of nature does not extend to this specific diversity of bodies nor to the multitude of their phenomena, and is only constituted by transcendental being in so far as it is determined and particularised by the corporeal world of the mobile and the sensitive. We see by this two things: first, that the philosophy of nature, despite the essential difference of order which divides them, has a certain continuity with metaphysics, and is by this superior to mathematics: secondly, that though philosophy certainly gives rise to a deductive science of corporeal *being*, it is unable to produce a deductive science of natural phenomena.

For the empiric science of nature, on the other hand, in the phrase *ens sensibile*, sensible being, the accent must be put, not on *ens*, but on *sensibile*. It is the sensible in itself, in the visible as itself in observable determinations in themselves, that it tends to resolve all its concepts, at least in the degree to which it tends to make itself an autonomous science *of phenomena*; then all definitions, *e.g.* that of a geosynclinal or a verbal blindness, are taken in reference to variable sensible affirmations, describing something presented by such definitely determined and observable properties. In the same way, empiric science tends to build up

for itself a conceptual vocabulary totally independent of that of those sciences which, like natural philosophy and metaphysics, determine their definitions with regard to intelligible being.

DIAGRAM OF THE SCIENCES

To assist in the consideration of a matter at once so complex and so abstract I have drawn out a diagram of the points dealt with hitherto.

The following points are particularly noticeable:

1. The second degree of abstraction is not only set at a point intermediate to the first and the third, as was naturally to be expected, it also

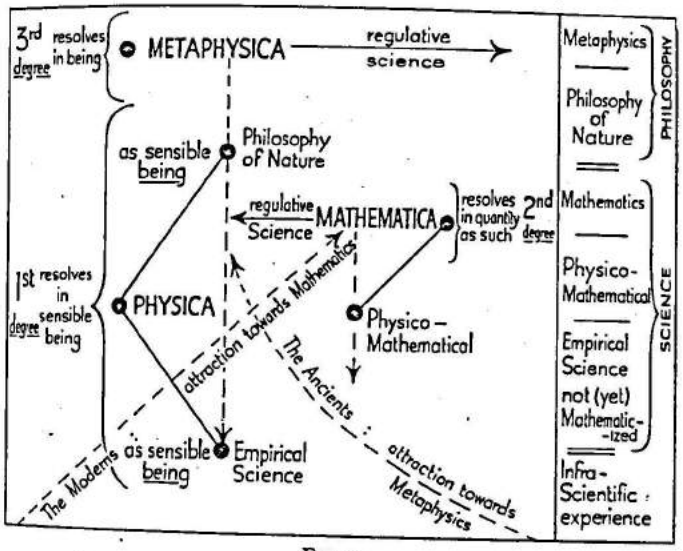


FIG. 1.

figures on a vertical line to the right. The reason for this is that mathematical abstraction is a thing all by itself. Although specifically different, *Physica* and *Metaphysica* have this in common that they only deal with intelligible objects which *can exist*, *i.e. real* beings, in so far as the word real designates not only actual existence but possible existence outside the mind. Mathematics on the contrary deals with an object which is not necessarily real, but which can just as well be (*permissive* is the phrase

of the ancients)[1] fictive or imaginary, a rational being as a real being. This capital difference means that the three degrees of abstraction do not form one sequence, and that the first and the third on the one hand and the second on the other determine their approach to things in opposite ways.

2. On the other hand, empiric science, the philosophy of nature, and metaphysics are found in the same hierarchical line. Although specifically different, the light of the first degree of abstraction is like a participation in that of the third[2]—an inferior and divided illumination, yet

[1]Cp. John of St. Thomas, *Curs. theol.*, i, P. q. 6, disp. vi, a. 2, n. 20, *Mathematica an sint bona.*

[2]It is in the degree to which it participates in the illumination of the third degree of abstraction that I have placed, in this synoptic table, the philosophy of nature on a higher level than mathematics. Yet the first degree of abstraction, from which it in fact originates, is inferior in immateriality to the second degree, a point which is also illustrated in my diagram.

This enables us to understand how the natural sciences presuppose mathematics ('Scientia quae se habet ex additione ad aliam, utitur principiis ejus in demonstrando, sicut geometra utitur principiis arithmeticae; magnitudo enim addit positionem supra numerum; unde punctus dicitur esse unitas posita. Similiter autem corpus naturale addit materiam sensibilem super magnitudinem mathematicam: et idea non est inconveniens si naturalis in demonstrationibus utatur principiis mathematicis. St. Thomas, *In lib. i de Coelo et Mundo*, lect. 3—'quaecumque impossibilia accidunt circa mathematicalia corpora, necesse est quod consequantur ad corpora naturalis; et hæc idea, quia mathematica dicuntur per abstractionem a naturalibus; naturalia autem se habent per appositionem ad mathematica: superaddunt enim mathematicis naturam sensibilem et motum, a quibus mathematica abstrahunt: et sic patet quod ea quae sunt de ratione mathematicalium, salvantur in naturalibus, et non e converso' (*ibid.*, lib. iii, lect. 3). From this point of view the three-dimensional character of real space (on this question of 'real' space, see *infra*, chap. iii, pp. 201–12) is guaranteed by the necessities which are discovered in the process of construction in mathematical intuition—which will always remain as the particular claim for classical geometry. 'Naturalis praesupponit a mathematico ea quae circa dimensiones considerat. Et ideo probare demonstrative, esse solum tres dimensiones, pertinet ad mathematicam, sicut Ptolemaeus probat per hoc, quod impossibile est conjungi simul lineas perpendiculares plures quam tres super idem punctum; omnes autem dimensio mensuratur secundum aliquam lineam perpendicularem' (*ibid.*, lib. i, lect. 2). If the idea of displacement is introduced, one can say: 'If we take a free solid and fix it at three points it is immovable; fix it at only two, and every point distant from the two others may describe a circle; fix it by only one point, and each point at a finite distance from this can move in a sphere.' (R. Poincaré, *Essai sur quelques caractères des notions d'espace et de temps*, Paris, 1931.)

On the other hand we can also comprehend how the philosophy of the continuum

capable in the philosophy of nature of penetrating beyond things, arrested in empiric science on the surface and by signs.

We know that, in pursuance of the great law of the attraction of the inferior by the superior, the empiric sciences of nature among the ancients were subject to the attraction of natural philosophy and metaphysics. Only being able to constitute themselves as sciences in so far as they were informed by a deductive science, it was from notions elaborated by natural philosophy and metaphysics that they sought this informing principle.

3. Every higher discipline forms a principle of regulation for those inferior to it. Metaphysics, since it deals with the supreme reasons of being, should be the regulative science *par excellence, scientia rectrix*. But mathematics is also a deductive science, a science of the *propter quid*. It therefore also tends to regulate the lower ranges of knowledge, if not to usurp the position of metaphysics itself. This is the cause of that struggle for supremacy between these two sciences which we can so often observe in the course of their history.

4. The grand discovery of modern times, already prepared for by the

and of numbers may derive from natural philosophy, to such a degree indeed that, according to St. Thomas, the 'postulates' of mathematics could be proved by the philosophy of nature. 'Sunt enim quaedam propositiones, quae non possunt probari nisi per principia alterius scientiae; et ideo oportet in illa scientia *supponantur*, licet probentur per principia alterius scientiae. Sicut a puncto ad punctum rectam lineam ducere, supponit geometra et probat naturalis; ostendens quod inter quaelibet duo puncta sit linea media.' (St. Thomas, *In Post. Analyt.*, lib. i, cap. 2, lect. 5, n. 7.) If this form of observation is exact it is the rational necessities perceived by the philosopher in his analysis of the continuum detached, by abstraction, from sensible and mobile reality (in other words, the axiomatic analysis of the continuum in so far as it can be built up by imaginative intuition), which form the basis of the postulates of euclidian geometry, *i.e.* which 'discover' the euclidian axiomatic in the notion of a continuum intuitively representable (as, from the idealist point of view, O. Hamelin has tried to do in certain remarkable pages of his *Essai*), and which justify in the same stroke the non-euclidian geometries, and give the mind a complete security as to the compatibility of their axioms, since these geometries, which continue that of Euclid and are contained in it, can always, by means of the addition of supplementary dimensions, be translated into euclidian terms—and since the compatibility of the euclidian axioms, the absence of any contradiction latent in their origin, is certified by the constructability of the euclidian continuum by intuition: *ab actu ad posse valet consecutio*: if the euclidian continuum can be built up in the intuitive imagination and so given fact, it is because its notion conceals no latent incompatibility.

Parisian doctors of the fourteenth century and by da Vinci, realised by Descartes and Galileo, is that of the possibility of a universal science of sensible nature informed, not by metaphysics, but by mathematics: what we might call *physico-mathematical* science. This prodigious invention—though obviously powerless to change the essential order of things of the mind such as those we are endeavouring to consider here—has changed the face of the world, and given rise, as I have tried to point out elsewhere[1] to that terrible misunderstanding which, for three hundred years, has created a quarrel between modern science and the *philosophia perennis*. It has given rise to enormous metaphysical errors, in the degree to which it has been believed that it supplied a veracious philosophy of nature. In itself, from an epistemological point of view, it was an admirable discovery to which, nevertheless, we can easily assign a place in the system of sciences.

It is a *scientia media*, of which the typical examples to the ancients were geometrical optics and astronomy: an intermediary science, halfway between mathematics and empirical natural science, of which the physically real forms the subject-matter in regard to the measurements which it allows us to draw from it, but whose formal object and conceptual procedure remain mathematical: a science which we may call *materially physical* and *formally mathematical*.[2] In such sciences the ruling principle of explication (as Duhem has clearly seen) leaves on one side principles and physical causes in their proper value of intelligibility—which does not prevent, as St. Thomas noted apropos of the Second Book[3] of the *Physics* (as Einstein and Meyerson have very well seen),

[1] Cp. J. Maritain, *Réflexions sur l'intelligence*, chap. vi.

[2] Cp. *ibid.* chap. vi and text which I have there cited from St. Thomas, notably that from *In Boet. de Trinit.*, q. 5, a. 3, ad. 6: 'Quaedam vero sunt media, quae principia mathematica ad res naturales applicant, ut musica et astrologia, quae tamen magis sunt affines mathematicis, quia in earum consideratione id quod physici, est quasi materiale, quod autem mathematici, quasi formale.' See also *infra*, pp. 76–81.

[3] He understands in this way the expression, τὰ φυσικώτερα τῶν μαθημάτων, *Phys.*, ii, 2, 194, a. 7, used by Aristotle apropos of geometrical optics (*perspectiva*), harmony and astronomy. 'Hujusmodi autem scientiae, licet sint mediaei nter scientiam naturalem et mathematicam, tamen dicitur hic a philosopho esse magis naturales quam mathematicae, quia unumquodque denominatur et speciem habet a termino: unde, quia harum scientiarum consideratio terminatur ad materiam naturalem, licet per principia

these sciences from *nevertheless* remaining physical, since they have their end in sensible nature.

Emile Meyerson has forcibly pointed out in opposition to positivism (and also to Duhem) that the thirst for 'ontology', for an explanation by physical causes, can never remain alien to science. But the encounter of

mathematica procedat, magis sunt naturales quam mathematicae.' (*In Phys.*, lib. ii, lect. 3.)

St. Thomas writes elsewhere (*Sum. theol.*, ii-ii, 9, 2, ad. 3): 'Quilibet cognoscitivus habitus formaliter quidem respicit medium per quod aliquid cognoscitur; materialiter autem id, quod per medium cognoscitur; et quid id quod est formale, potius est ideo illae scientiae quae ex principiis mathematicis concludunt circa materiam naturalem, magis cum mathematicis connumerantur, utpote eis similiores, licet quantum ad materiam magis conveniant cum naturali; et propter hoc dicitur in ii Physic. quod sunt magis naturales.' On which Cajetan remarks in his commentary: 'Non dicitur quod scientiae mediae sunt magis mathematicae quam naturales: cum falsum sit absolute loquendo; quia simpliciter sunt scientiae naturales, utpote non abstrahentes a materia sensibili. Omnis enim scientia non abstrahens a materia sensibili, est naturalis, ut patet vi Metaph. Sed dicitur quod connumerantur magis cum mathematicis, utpote eis similiores.'

Physico-mathematical science is thus at once *formally mathematic* (by the principles and *media* of demonstration which it uses) and *more physical* than mathematics by the end or the matter by which it verifies its propositions. These two characters are in no way incompatible and are affirmed simultaneously of the *scientiae mediae*, by both St. Thomas and Cajetan. It is possible that the fuller explanations here given will satisfy the scruples of Rev. Fr. Pierre Hoenen, who ('Maritain's reden te Amsterdam', in *Studien*, May 1927) appears to confound my position with that of Duhem, not observing that for me mathematical-physics is certainly a science of the *physically real*, but which only knows this by transposing it, not *of the physically real as such*. In any case I trust the distinguished professor will find appeasement in making his own Cajetan's conclusion to the commentary which I have already cited (*In II-II*, 9, 1 and 2): 'Verum, quia medium utrumque sapit extremum, et scientiae istae ex parte formae ex mathematica veniunt et pendent, ex parte vero materiae physica sunt, sermones doctorum pie interpretandi sunt, si quando alterum extremum nimis declinant.'

I must admit that it seems as if Fr. Hoenen had read rather rapidly the quotations which he criticises. In *Réflexions sur l'intelligence* I nowhere said that mathematical-physics was a logical monstrosity: what I did say was that a *false* notion of this science, which confused it with natural philosophy, turned it into a logical monstrosity.

In maintaining in his address to the Thomist Congress in Rome (*De valore theoriarum physicarum*, Romae, 1925; cp. also the interesting articles published in the review *Gregorianum*, 1925, 1927 and 1928), that physical theories give us a knowledge *by analogy* of the physically real, without defining to what form of analogy he referred, he himself, it seems to me, runs the risk of either giving rise to serious misunderstandings in regard to the notion of analogy (in fact what is above all meant in philosophy by 'knowledge by analogy'—knowledge by the analogy of rightful proportionality, of which the metaphysician makes use for the knowledge of spiritual things—

the law of causality immanent in our reason and the mathematical conception of nature has resulted in the construction of a theoretical physics of the universe which is more and more withdrawn and geometricised, where fictive causal entities founded on the real (*entia rationis cum fundamento in re*), whose whole office is to serve as a support for mathematical deduction, have risen up to obscure a highly particularised account of empirically determined real causes or conditions. In fact it is

instructs us in a veiled, but not symbolic manner, in a reality not attained to in itself, but remaining in its own entitative order, while physical theories instruct us directly, but in a manner which becomes symbolic at a certain degree of conceptualisation, in physical reality transmuted into mathematical terms, transposed into an order which is not its own); or of sinking into the quest for vain theories of concordance. The perpetual renewals of science (*e.g.* at this moment, the recent ideas on photons, and the new mechanics of Louis de Broglie and Heisenberg) show how wise it is *not* to ask a philosopher to adjudicate on the degrees of truth or falsehood in the physical theories of light or of the atom: all that he needs is to hold true the experimental facts on which these theories are based and to cull from these theories a provisionary *image* of things, destined to buttress his thought, not to shape it.

One point remains true, and it is this that I would have liked to have seen made clear by Fr. Hoenen: the fact that we can see a symmetrical correspondence on either hand of that knowledge, which I shall later call 'dia-noetic', and which attains to its objects in their essence—on one hand, for things above, the knowledge *by analogy* of rightful proportion, which metaphysics makes use of in its ascension to the First Cause—and, for the things below, knowledge by *signs*, which the sciences of phenomena cull from nature, above all that *symbolic* knowledge of the physically real in which physico-mathematical theories result in their highest elaborations from experimental data. I am well aware that this latter form of knowledge belongs, as is sufficiently pointed out by the word 'symbolic', to the logic of analogy taken in the widest sense of the term: but in that case, strictly speaking, it is a question of a metaphorical analogy which mathematics has the privilege of using for its knowledge of the physically real (cp. *infra*, chap. iii, pp. 196-201). One can say with Fr. Hoenen: 'Secundam maximam Cajetani (*De nom. anal.*, cap. 4): *quidquid assimilatur simili ut sic assimilatur etiam illi cui illud tale est simile*, concludendum est: causa quam hypothesis verificata proponit assimilatur causae verae; quod nihil aliud est ac principium analogiae theoriae physicae quod supra delineavimus.' (*De valore. . . .*p. 69.) But the *assimilatio* then in question is either a univocal substitution, in so far as physical theories translate the facts and enable us to attain to observable and measurable structures or causations (co-determinations) which have the value of *entia realia*, or a symbolic or metaphorical one, in so far as physical theory constructs on its own rational beings to assist it in the collection and interpretation of its data by explanatory deduction. This combination, in an almost infinite variety of degrees, of univocal description of experimental reality with symbolic interpretation of that same reality appears to me to be the particular characteristic of physico-mathematic knowledge.

most often the old hypotheses of mechanistic metaphysics that physico-mathematical science (while fundamentally transforming them or introducing into them vast zones of dislocation and irrationality) has been so led to rejuvenate: not as E. Meyerson, who, despite all his apparent rationalism, cannot conceive of the reasoning process except under Eleatic terms, supposes, by reason of the essential exigencies of causal explanation, but because the mechanistic theory is the only causal representation which can manage to survive, ill or well, a general reduction of physics to geometry.

Pierre Duhem himself, as Emile Picard recalled in his lecture to the Académie des Sciences, on 16th December, 1929,[1] considers that 'a physical theory is not an explanation; it is a system of mathematical propositions whose aim is to represent as simply, as completely as possible, a body of experimental laws',[2]—in fact the result is that physics in some of its departments (that of energy, for example, as Duhem conceived it, or to-day of wave-mechanics according to Heisenberg's interpretation, to which Louis de Broglie has also given his support) makes use of purely mathematical symbols, without attempting any *causal explanation* or the construction of those figurative hypotheses whereby the mind can in some fashion take to pieces the mechanism of phenomena. But truly this abstention is because it cannot do otherwise and must make a virtue of necessity. Duhem's mistake was in seeking the type-form of physical theory in these often exceptional cases, which he regarded as true examples. In reality they are borderline instances, where the mathematical transformation of phenomena momentarily occupies the mind in a state of complete isolation, with no underlying physical image: and they so little represent the type-form of physical theory that at the first opportunity the mathematical symbols so employed cease to belong to the domain of pure analytical forms and dissolve into explicative entities. (This is the case even with energy: 'almost all scientists admit to-day that it is not only an abstract conception,' *i.e.* a pure mathematical symbol. An even more glaring case is that of atomic number, which, beginning as a simple ordinal number, has ended as designating the charge of an atomic nucleus and the number of the

[1] *Un coup d'œil sur l'histoire des sciences et des théories physiques*, Paris, 1929.

[2] See in particular Duhem's book on *La Théorie physique*.

electrons gravitating about it.) On the other hand, the causal entities and structural systems constructed by the physicist owe all their consistency to the mathematical symbolism which is, so to speak, incarnate in them. Thus the interpenetration of mathematics and entitative representations appears to be essential to physico-mathematical knowledge.. From which it follows that, in the words of Emile Picard, 'these quarrels of the schools seem very far off and the two points of view are strangely mingled in the work of present-day scholars.' I would rather say that they had become one. Duhem's too rarefied conception moreover annihilated the primary heuristic stimulants without which physics cannot exist. These explanations appeared to be necessary to avoid serious misunderstandings. But let us now return to the main theme.

5. With the physico-mathematical *scientia media*, materially physical and formally mathematical, a science of *phenomena* as such becomes possible. No longer a science of sensible nature which sought to find willy-nilly in phenomena those intelligible connections which are the stuff of philosophy and which only explain phenomena when they have already transcended them; but a science of sensible nature which applies to the detailed study of phenomena as such, as they are co-ordinated in space and time, the formal connections of mathematical relations, and which so approximates, thanks to the science of ideal quantity, to that deductive character to which it aspires and without which it would not be a veracious science. To be at once experimental (by its matter) and deductive (by its form, but still more in regard to the laws of variation of scale which it brings into play) is then the rightful ideal of modern science. Producing as it does both scientific knowledge and a marvellous technical power over nature, but from the point of view of quantity, not that of being; having abandoned the direct search for real causes in order to devote itself to the translation of the measurements of things into a coherent system of equations, we see that physico-mathematical science must be placed in our diagram at an angle between purely empiric science and the philosophy of nature, thus breaking that continuity with which the optimism of the ancients was so pleased.

For the latter, it was the philosophy of nature and metaphysics which, if I may use the phrase, drained off the material of empiric science and infra-scientific experience and tried to approximate it to the level and

the nature of science. This I have represented on the diagram by the track of an arrow pointing towards metaphysics.

For the moderns, it is mathematics which acts in this way. It is necessary therefore to draw an arrow pointing in the exactly contrary direction, whose track represents a break, a sharp, irremediable cut between science and philosophy.

The intersection of these two arrows is the symbol of the epistemological drama of our times.

The endeavour of the ancients resulted, so far as the science of the phenomena of nature was concerned, in a resounding failure, at least with regard to matter and movement. We may say that they stumbled and were pulled up short by physics (in the modern sense of the word).

The endeavour of the moderns has brilliantly succeeded in physics; and to-day we are witness to a crisis of development there which is the prelude to achievements still more brilliant. But what will happen—even while remaining entirely in the domain of the science of phenomena—to those sciences whose object cannot be so easily reduced to mathematics, which cannot be content with an algebraic symbolisation of nature, and where the real continues to be dominant in the mind as a function of the idea of being? It may well be that the modern conception of science will break against biology and experimental psychology (without speaking even of the moral sciences which are more closely akin to philosophy) as that of the ancients broke against physics.

6. I have given here very summary recognition to those organic relations which sustain the mutual relations of the principal categories of science. In putting these categories in a single column, we see them ranged in their hierarchical order. Thus we recover again the classic division between the sciences, in the strict sense of the word, and philosophy.

The word science, in general, in effect embraces two great dominions, that of wisdom, which knows things by first causes and the highest reasons of being, and the domain of science in the narrower sense of the word, which knows things by secondary causes or approximate principles. Metaphysics is a form of wisdom, it is the veracious wisdom of the natural order, of the order which is accessible by reason alone. The philosophy of nature is wisdom under a particular aspect, because it

deals with first principles and prime causes *in a given order*, in the order of corporeal nature. (I would add, in parenthesis, that the study of the ontological bases of mathematics, the philosophy of number and the continuum, returns to the sphere of the philosophy of nature, for mathematical abstraction, not bearing in itself on real being, does not imply wisdom in its own rightful order.)

I have therefore bracketed together these two forms of wisdom, pure and simple wisdom and wisdom under a certain aspect, metaphysics and the philosophy of nature, under the name of PHILOSOPHY.

As to the other sciences: mathematics—the physico-mathematical sciences—the experimental sciences or those historical (paleontology, linguistics, etc.) sciences which have not (yet) received, and which will probably never receive, the dry light of mathematics into their essential constitution, I have grouped them together under the name of SCIENCE in the narrow meaning of the word.

III. SCIENCE AND PHILOSOPHY

Though it is true that the *material object* of philosophy and of science can be the same, *e.g.* the world of bodies—*the formal object*, that which determines the specific nature of intellectual disciplines, is in the two cases essentially different. In the world of bodies the scientist studies the laws of phenomena, linking one observed instance to another, and if he seeks for the structure of matter it is by representing to himself—molecules, ions, atoms, etc.—in what way and according to what laws the ultimate particles (or the mathematically conceived entities which take their place) from which the edifice is constructed, act within the framework of time and space. The philosopher, on the other hand, seeks for *what in fact that matter is* which is so figured, what, as a function of intelligible being, is the nature of corporeal substance (whether it be split up and reconstructed into a spatial or spacio-temporal construction of molecules, ions, atoms, etc., or into protons and electrons associated or unassociated into a series of waves, his problem remains exactly the same).

The one goes from the visible to the visible, from the observable to the observable (*i.e.* observable, at least indirectly—I do not say it is always

imaginatively figurable or representable: for the imagination presents things as they appear in our scale of major dimensions, as possible subjects for a complete and continued observation; and when the scientist enters into a region, *e.g.* the atomic, where even the possibility of a complete and continuous observation of phenomena is out of the question,[1] he so passes from a world of imaginatively representable objects to a world of things without imaginable features. We could say that such a world is indescribable by fault or 'by privation').

The other proceeds from the visible to the invisible, to what is *in itself* outside the bounds of all sensory observation, for the principles which are the aim of the philosopher are pure objects of intellection, not of sensible apprehension or imaginative representation.[2] This is a world naturally indescribable or 'by negation'.

Having totally different formal objects, entirely different principles of explanation and conceptual technique, and in the subject himself requiring fundamentally different intellectual virtues or qualities of discriminating illumination, the proper domains of philosophy and science are not translatable. An explanation of a scientific order can never be displaced or replaced by a philosophic one or *vice versa*. It requires an over-great dose of simplicity to imagine that the recognition of an immaterial soul in man and the study of the glycogenic functions of the liver or the relations between the idea and the image are two explanations which pursue the same lines and that either can be an obstacle to the other.

What is true is that the explanations of science, since they do not bring us into intimate contact with the being of things, and are only explanatory of proximate causes or even simply of that kind of formal cause which is represented by the mathematico-legal system of phenomena (and the entities more or less arbitrarily constructed in support of that system), cannot suffice for the mind, which by necessity, and always, asks questions of a higher order and seeks to enter into regions of intelligibility.

From this point of view we can say that the sciences have a certain dependence on philosophy. The sciences themselves, because they seek for the *raison d'être* and can only proffer it very imperfectly, inspire the mind with philosophical desire, and require the support of a higher

[1] See *infra*, chap. iii, pp. 183-4 and 226-8.

[2] *Ibid.* pp. 179-80.

form of knowledge. Nothing is more curious than to measure the force with which, after the positivism of the nineteenth century, this need is exemplified in all the domains of science and that in the most disorderly fashion, philosophical competence being inevitably lacking with the lack of philosophical technique even in scientists of genius like Henri Poincaré.

The sciences have, however, no dependence whatever on philosophy with regard to their own intrinsic development. They are only dependent *in principle* (not in the sense that they are dependent on philosophy for their principles and their use, but in the sense in which the explication and justification of the latter belong to philosophy). Perhaps it is precisely because scientists have no need of an immediate recourse to philosophy for the exercise of their own rightful activities that they are so given to misunderstanding the nature of this dependence of which I have spoken. But if they were to reflect rather more attentively on the nature of the very activity which they exercise (which would indeed be already a form of philosophising) how could they fail to observe that it involves in itself a complete order of philosophical activity, wrapped up, so to speak, in practical terms?

All employment of the methods of experimental criticism, like the determination of the degree of approximation of the acquired results, constitutes a form of applied or livingly formed logic (*logica utens*), which only becomes pure logic and the object of a speculative art explicitly studied for its own sake (*logica docens*) under the reflective gaze of the logician, but which in itself is nothing other than that logic, a truly philosophical discipline, in practice.

On the other hand, whatever may be the conscious or unconscious metaphysical opinions from which he draws his conception of the world and which he follows out in his life as a human being, every scientist in fact, in the operations of his own science, when thinking as a scientist—we owe a debt of gratitude to M. Meyerson for having so forcibly stressed this point—practically affirms (*in actu exercito*) and with a dogmatism which is the more fearless in the very degree to which it is unconsidered, a number of eminently metaphysical propositions, whether it be a question of the reality of the physical world, of the existence of things as apart from the mind, of stable ontological

nuclei, or of a substantial x at the base of phenomena:[1] not only these, but the very question of the possibility of the apprehension of things in our faculties of knowledge—a difficult thing no doubt and done in a way which demands all sorts of more or less obscurely felt restrictions, but which is also surrounded with a sense of incontestable certitudes—in other words, that of the intelligibility of the world, which, though doubtless in an undefined way and with a sense of imperfect definition, nevertheless in the meanwhile no one hesitates to posit in advance. Or again the question may be that of the values of the principles of the reason, most of all, the principle of causality,[2] in regard to the world of experience, *i.e.* in other terms, the insufficiency of changes to explain themselves by themselves. . . .

[1] 'The habit of calling a spade a spade keeps scientists from numerous vain causes of quarrel. It is fine to listen to their agreement about words and the things they represent. This remarkable accord creates among scientists an atmosphere of confidence, a unison whence they draw a certitude which is none other than a robust faith. There is probably not a chemist who does not confound the reality of sulphate of baryta with the idea which he has of it. I had the curiosity to ask such a question of several of them. To all it appeared exceedingly odd. I could see, by the dubious glances with which they looked at me, that they doubted whether I were not mad to ask such a thing. What happens in actual fact is that a chemist makes the absolute substratum of bodies from their properties, and knows no preoccupation with the highly hypothetical character of this conception.' (G. Urbain, 'Essai de discipline scientifique,' *La Grande Revue*, March 1920.) Formulated as it is in language which suggests entirely different philosophic opinions, this comment by a scientist of unquestioned authority, as M. Meyerson observes (*op. cit.* ii, p. 235), is evidence of all the more value since 'the scientist in question himself professes, in theory, a sufficiently orthodox positivism and evidently finds the whole way of thought, which he describes with so much accuracy, definitely blameworthy'.

[2] My claim is that the scientist affirms *in actu exercito* in the exercise of his own scientific activity, the value of the principle of causality (without waiting for any philosophical reflection on its meaning, its bearing, the various methods of its verification or still less, its critical justification). If he were not practically persuaded that everything which happens has a cause, he would not give himself up to the work of research, he would not even begin it. In the course of its progress along the lines of what I shall later call its empiriological autonomy, science itself may need to refound or transpose the concept of cause, and even perhaps admit, in the picture of the world which it constructs, lacunas which make holes in the field of what for it is 'causality'. (Cp. chap. iii, pp. 182-6 and 231-5.) Here, between the scientific vision of the world and the springs of mental work from which it emanates, there is an analogous disparity to that between the scientific universe perceived by the physicist as a physicist and the familiar universe which he knows as an ordinary man.

Finally, every scientist has a certain idea, often only very partially explicit or even highly confused, but which is practically highly effective and active, of the true nature of his science: an idea which without doubt plays a major part in the intellectual orientation of the great initiators. What, from this point of view, could be more noticeable than the aphorisms on the nature of physics which are so frequently on the lips of M. Einstein? But these considerations of the true nature of such and such a science do not in fact belong to any science, but to philosophy: to a *gnoseology* formed by living.

In short, there is no science without the first principles on which the whole train of our reasonings must be fixed, an infinite regression in this order evidently rendering all demonstration impossible: and every scientist, by the very fact that he applies himself to no matter what form of demonstration, has already given his adherence, very positively however undeclared, to an important number of philosophical propositions. It very evidently follows from this that all these things which live latently and vitally in the mind of the scientist could advantageously be brought to light and looked at face to face as objects of knowledge, in other words, be dealt with by philosophy. Then we should see explicitly the objective links between the sciences and philosophy. Their axioms are determinations of the principles of metaphysics: for example, the mathematical axiom, two masses equal to a third are themselves equal, is a particularisation of the metaphysical axiom: two things identical with a third are themselves identical. It is philosophy which justifies and defends their principles, which determines the first objects towards which they work, and as a result, their nature, their value, their limits as sciences. It is philosophy, for example, not mathematics, which tells us whether irrational numbers and indefinite numbers are real beings or only rational beings, whether the non-euclidian geometries are rational constructions built on euclidian geometry and which leave the latter its privileged position, or if, on the contrary, they constitute a much greater system of which euclidian geometry is only one specimen; whether mathematics and logic are divided or not by immovably drawn frontiers, etc. In a word, it is philosophy which assigns the order which reigns between the sciences: *sapientis est ordinare*.

In all this it does not impinge in any way on the proper procedure

and sphere of action of each of them, for we have just seen how absurd it is to treat a problem of the scientific order as if it were one of philosophy and *vice versa*: but it implies that it is a higher science.

Superior, therefore independent, at least by its own formal constitution: philosophy is, as such, independent with regard to the sciences.

It should be understood: there is no *formal* dependence of philosophy with regard to the sciences. No scientific result, no scientific theory, in short, no science in the exercise of its own proper means, can ever adequately cut the knot of a philosophical problem, for those problems depend both in their origin and their solution on a light which is not in the reach of science.

There is, most certainly, a strong *material* dependence of philosophy on the sciences. To begin with, philosophy is like the culminating point of the hierarchy of knowledge, and as a result comes pedagogically last; and the philosopher, since he judges of the value, the limits and subordinations of the sciences, must evidently know them as they are and the stuff of their proper life; more, scientific data are like illustrations which normally serve the philosopher in the exemplification and embodiment of his ideas; finally and above all, the progress of science, at least in regard to the facts discovered if not the theories, should normally, above all in what is concerned with natural philosophy, renew and enrich the matter offered for philosophical explication. Thus, for example, modern discoveries concerning the organic structure of the cell, in particular the embryo and the sexual elements, artificial parthenogenesis, etc., should give a new precision and a greater quality to the way in which the problem of the eduction of the vegetative soul is posed. The new developments in geometry begun by Lobatchevski and Bolyai equally oblige the philosopher to clear up and re-order his notions concerning quantity.

But such dependence remains material, and the changes which it induces primarily affect the nature of that imagery whose importance is so great in his vocabulary, and the halo of associations which have gathered about the actual didactic terms: to imagine that philosophical doctrines need to be radically transformed to fit in with scientific revolutions is as absurd as to suggest that our souls are vitally affected and altered by a variation in the elements of our dietary.

SOME ELUCIDATIONS ON THE NOTION OF FACT

A question arises here which must be briefly treated: that of the part played by experience and experimental fact with regard to philosophy.

The latter, according to St. Thomas, rests on facts; it must accept the facts, begin by an act of humility before the real already made known by the senses, attained by our physical contact with the universe. And the philosophy of nature, differing in this from metaphysics, has not only its origin but the end where it must verify its conclusions in the experience of the senses: although in a way other than that of the experimental sciences.

What then is a fact? It is a well-founded existential truth: in existence a certain group of conceptual objects is posited beside the thing; and this in itself implies that this existence is face to face with a mind, a spirit which can lay hold on its objects. A fact which interests human observation is not created by the human mind, it is given. But it is given *to someone*; if it is given, it is because it is received, a stone is not given to a stone: a fact is given to a mind. That is to say, the mind discerns and judges it. To wish to make of this a sure and simple transcription of external reality without any discrimination is a deceptive simplification due to the unconscious materialism of the imagination.

Even in the order of the external senses, there is, as St. Thomas said, *a judgment by the senses*; sensible perception is itself induced by and presupposes the bringing into action, instinctively or otherwise, of the internal senses or *ratio particularis*. The discernment of any fact presupposes a judgment either of the senses or of the intellect. On that point the idealists are certainly right. But they are wrong in thinking that the activity of the mind cannot ask or draw from things information which is at once enunciated by and *given to* it; their error is to believe—a gratuitous postulate and in fact quite absurd—that every interpretation, or more exactly every judgment, by our faculties for knowledge is either a deformation or a creation, not a more or less pure and profound assimilating of oneself to the object, a conformation to what it rightly is.

Their other error is a rejection of the primordial values of sensible intuition. It is from this intuition, in one way or another—and even when the fact in question transcends the whole order of the empiric and the sensible—that all existential apprehension originates (it is the same for our experience of our own existence, which is spiritual and non-empiric, but which supposes reflection upon our acts, as for the knowledge of the existence of God, which is established apart from sensible things). In the physical order or in that of the knowledge of bodily nature, it is by the senses, through a discriminating and critical judgment of the intellect, that the facts are given. To distinguish, in that order and in the use made of them in the natural sciences, the category of *fact* from that of *theory*, we should not say that the one belongs to the intellect and the other to the senses, which would be far too summary a view; but that the intervention of the intellect, with its natural or artificial resources, we might even say with its knowing devices and most delicate refinements of theory, remains in the former case ordinated to the discernment and formulation of what is furnished to it by the intuition of the senses,[1] while in the latter, with the same resources, to discovering essences and laws, and their underlying reasons.

Into the complex of things attained by the perception of the senses the activity of the mind so intervenes, not in order to create, but to discern what interests the observation. And in so much as the moment a science is born, the rightful point of view which characterises it emerges at the same time as the first facts on which it is based—whether before advancing into a scientific region and there unearthing new facts the mind has already begun to enter and acquired the habit of such science, or whether before crossing the threshold of some particular scientific region it has already begun to philosophise, already in some measure disengaged the notion of being as such from the principles to which it is attached—in that degree the discernment of which we are speaking will take place at a certain level of abstraction and in the light of certain principles in regard to which the fact holds its value, a value, that is to say,

[1] In the orders superior to those of physics, which will be in question at a later stage, this work of the intellect, characteristic of the 'registration of facts', is ordinated to make clear an existential position which we conceive *by analogy* with that furnished by the intuition of the senses.

of knowledge and truth. We may conclude from this that all facts are not of the same *rank*, that they do not constitute an indistinct crowd without hierarchical arrangement, piled pell-mell in the field of sensible experience for each of the various sciences to come and pick out the particular wares of their desire. Facts in themselves belong to hierarchies of knowledge: there are facts of common sense, scientific facts (*i.e.* facts which occupy the natural sciences), mathematical facts[1] (*e.g.* the (ideal) existence of continuous functions without derivatives), logical facts, philosophical facts.

Materially speaking, one can say from this that philosophy is 'experimental' and founded on facts. This is true in the sense that experience is not for philosophy, as it is for mathematics, entirely pre-scientific, infra-scientific, mathematical science being entirely deductive and axiomatic and apart from imaginative intuition and those notions which experience alone allows abstraction to form and reconstruct. The method of philosophy, on the contrary, is analytico-synthetic; and, just because it deals with real being, rightly capable of existing outside the mind, experimental affirmations form an integral part of philosophic observation as such.

But for philosophy, in contradiction to the natural sciences, this is only the material foundation from which it rises to the consideration of essences and the necessities which they imply, by a formal resolution into the first truths in themselves intelligibly known: it only returns to experience—in natural philosophy to verify deduced conclusions and seek for ever fresh material—in metaphysics to take up new points of departure, new analogical material, not to verify conclusions which belong to an entirely immaterial order. For, formally speaking, metaphysics is in no degree an experimental science, but a form of knowledge far more purely rational than mathematics.

THE STRUCTURES AND METHOD OF THE PRINCIPAL KINDS OF KNOWLEDGE

The foregoing conclusions imply several important consequences in epistemology.

[1]Cp. Pierre Boutroux, *L'Idéal scientifique des mathématiciens*, chap. iv.

Here I can only briefly indicate some of these, most of all in the endeavour to exhibit how rare an instrument of epistemological analysis is offered by the principles of St. Thomas, and to draw attention to one of the characteristic features of his noetic: the order and organic differentiations which it establishes among the sciences, and the care which it takes (unlike many modern systems which exhibit them as all on the same plane) to recognise and respect the structure and particular procedure of each.[1]

Let it be remembered that every science is a response to two questions: first the question *an est*, if a thing exists: second, the question *quid est*, of what nature is it.

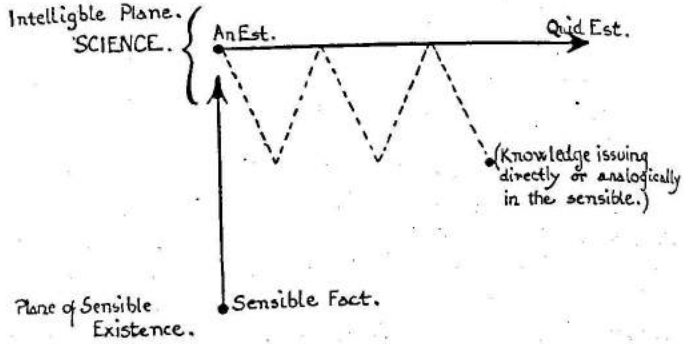
For mathematics, experience has only a pre-scientific function, in the sense that if we had never seen a ball or a stick we could not have formed the notion of a circle or of a straight line; if we had never counted on our fingers the parts of a concrete whole we should never have formed the idea of number. But once in possession of these notions, thanks to the abstracting power of the intellect, they present in themselves objects of thought independent of experience, so independent of experience that we can generalise analogically from them, de-ballasting them of that very intuitive scheme in which they were first made manifest. If mathematical entities could only—when they are capable of existing outside the mind—so exist in matter, they could not exist mathematically: the straight line, the circle, the whole number are realised in sensible things, but lose thereby the conditions of ideal purity which are imposed by the mathematical mode of existence.

In the mathematical order the question AN EST bears on the *ideal* (*possible*

[1]Here I follow the ideas which St. Thomas develops in his commentary on the *Posterior Analytics* (book ii) and on the *De Trinitate* of Boethius (q. 5 and 6). Let me recall here the fundamental text from the latter: 'In qualibet cognitione duo est considerare, scilicet principium, et finem sive terminum. Principium quidem ad apprehensionem pertinet, terminus autem ad judicium, ibi enim cognitio perficitur. Principium igitur cujuslibet nostrae cognitionis est in sensu. . . . Sed terminus cognitionis non semper est uniformiter: quandoque enim est in sensu, quandoque in imaginatione, quandoque in solo intellectu. . . .

'Deduci autem ad aliquid est ad illud terminari: et ideo in divinis neque ad sensum, neque ad imaginationem debemus deduci: in mathematicis autem ad imaginationem, et non ad sensum; in naturalibus autem etiam ad sensum. Et propter hoc peccant qui uniformiter in tribus his speculativae partibus procedere nituntur.'

or *rational*)[1] existence of the entity under consideration; and starting from the notion of this entity once so posited as capable of mathematical existence, the truths which concern it (*quid est*) are deductively established, by means of constructive operations which may apparently play the principal part, but which in fact remain only material: formally



MATHEMATICS.

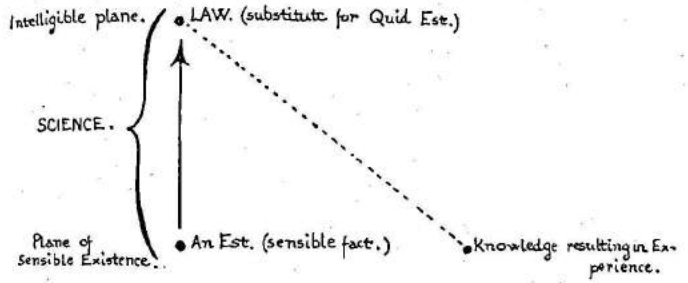
FIG. 2.

it is by virtue of the intelligible connections which proceed from mathematical deduction, whether these connections are themselves guided and determined all the time by constructive operations, or are established and justified once for all by the rules of an architecture of signs where the art so determined has only need to be applied. The ancients held that in mathematics the judgment—by which knowledge is achieved—resulted not in the sensible, but in the imaginable. This should not be understood as meaning that each of the established con-

[1]The sense of the words 'ideal existence' is fixed according to the following division:

real being { actual; possible } rational being } ideal being.

clusions needs to be directly verified by imaginative intuition: but that they need to be verified by it either *directly or analogically, i.e.* according to whether they are constructed by intuition, or whether they belong to a system of notions (as for example non-euclidian or archimedian geometrical entities), itself issuing from a system of constructable notions in the intuition (like the euclidian entities) and which can find in this system an analogical interpretation.[1]



EXPERIMENTAL SCIENCES.

FIG. 3.

In the experimental sciences experience is in itself essential and *entirely rules*. The question AN EST bears directly on the facts experimentally criticised. Science does not arrive at seeing the essence in itself or *dianoetically*[2] as it lies embedded in facts, it only grasps it blindly: not in its constituting signs but in those of *peri-noetic*[3] intellection which it contents itself with in their place (above all the *constancy* of a well-verified relation), and that substitute which is scientific *law*—the judgment, by which knowledge is achieved, issuing in experience itself, or in other words, every newly acquired conclusion needing to be verified by sensible fact.

When it is a question of the physico-mathematical sciences, the deductive theory and the system of notions elaborated by it come face to face with experimental results to find there their verification, although

[1]*Vide infra*, chap iii, p. 201-2. [2]*Vide infra*, chap. iv, p. 248-9.
[3]*Ibid.* p. 251-2.

apt to translate them in a somewhat rigorous fashion by means of an adopted vocabulary; and it is a mathematical *quid est*, not an inductively established law, but an algorithm of the physically real, which is then substituted for the ontological *quid est*.

In the philosophy of nature, sensible fact forms the material part of observation, which thus essentially depends on experience, but it does not constitute the formal medium of demonstration. The question AN EST bears on the *real existence* of a nature which abstraction has been able

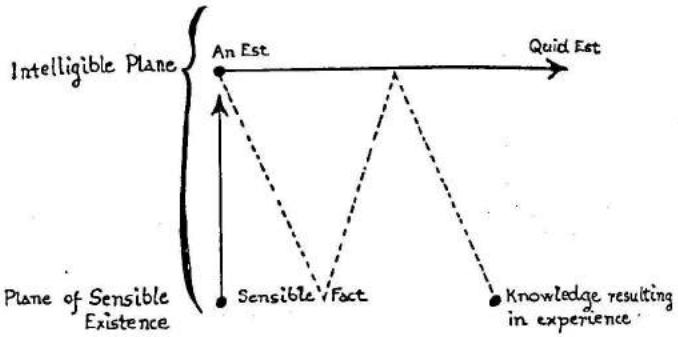


FIG. 4.

to raise to a point where it can be considered in itself, *e.g.* the vegetative soul; and starting from this so posited nature, reason establishes its properties by an inductive-deductive alternation, all the while issuing in experience and verifying by sensible facts the conclusions so obtained.

Finally, in metaphysics sensible fact also forms the material part of knowledge, because we only rise to the invisible from the visible, but it does not formally constitute its medium, *neither are its conclusions verified by it*. The judgment, by which knowledge is achieved, issues in pure intelligibility. For it is not because, like the philosophy of nature, it essentially depends on sensible experience, but because of its transcendence that metaphysics (as mathematics does not do) descends to the world of sensible existence. It also ascends to the world of supra-sensible existence. Thus in natural theology the question AN EST bears on the real

existence of an immaterial object to which knowledge is able to rise by analogy (ananoetic intellection).[1] And from the recognition of such an object, reason, by the triple path of causality, eminence and negation, without verification either from the sensible or the imaginable, since it is a case of the purely immaterial, establishes conclusions concerned with nature (analogically known) and the perfections of the Pure Act.

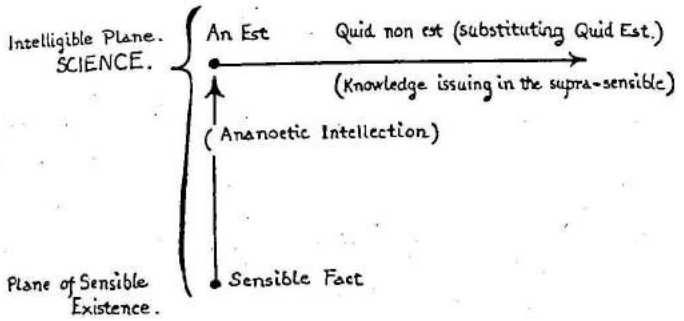


FIG. 5.

THE CONDITIONS PROPER TO PHILOSOPHY. ITS RELATIONS WITH FACTS

Moreover, whether it be a question of natural philosophy or of metaphysics, philosophy, which emerges, as do the positive sciences, from sensible experience and empirical knowledge, but which transcends them in a much more perfect and pure manner,

1. makes use of an experimental material which is proper to it, much more simple, universal, immediate and incontestable than that of the experimental sciences. The facts on which it is based are not facts which are more or less difficult to define—and which, in the degree to which science progresses, become more and more only points of incidence between the real and the constructions (ever more complex and elaborated) previously established by the reason—but facts which are absolutely general and primary.

[1] *Vide infra*, chap. iv, pp. 268-71.

2. These facts are not drawn from 'common experience' (although that is in a sense more certain than scientific experience)[1]; this common experience only enters into philosophy in so far as it takes the place of an as yet undeveloped scientific experience and thus in the same (secondary) manner as the latter. The rightful material of philosophy springs from an experience which is philosophically elucidated, and is therefore much superior to that of common experience, for philosophy judges and criticises this material *in the light of its own perception*, in such a way as to establish it with complete certitude, since being able by right of wisdom to defend its rightful principles, it also defends and (indirectly) justifies the value of sensible perception in itself. From this point of view one could say that the fact that *something exists*, the fact *that multiplicity exists, that change and becoming exist, that knowledge and thought exist, that desire exists*, are all rightly PHILOSOPHICAL FACTS.

With regard to scientific experience, to *scientific facts*, we see that it is possible for them, as I said just now, to bring new material to philosophy and to be annexed by it, since philosophy knows well how to make alien material its own; nevertheless they do not as such constitute its proper material, and must in any case, like the latter, be judged and criticised in the light of philosophical perception before they are fitted for philosophic use.

A scientific fact in itself belongs to the stuff of the natural sciences; and if it is true that what characterises these sciences is the resolution of their instruments of knowledge in the sensory, a scientific fact in itself can only be interesting to that form of explication. In so far as it is only illuminated in the degree to which it was first of all seen and utilised by the scientist, it interests the latter, not the philosopher. It is thus an illusion to believe that any appeal to scientific facts with no higher perception turned upon them can ever nullify a philosophical assertion, such as, for example, hylomorphism. In themselves of course they have nothing to say about it one way or the other. For heaven's sake then let

[1] 'The layman believes that a scientific experiment is distinguished from common observation by a greater degree of certitude; he is mistaken, for any account of a physical experiment lacks that immediate certitude and relatively easily controlled witness of common, non-scientific observation. It is less certain, but surpasses the latter by the number and precision of the details which it makes known to us: there lies its essential and veritable superiority.' (Pierre Duhem, *La Théorie physique*.)

us avoid torturing them to wring from them pretended avowals: neither let us fawn on them! But let us continually ask them straightforward questions, which presuppose that we already possess some information. It is necessary to compare them, and as many of them as possible, to enquire of the scientist for everything concerning their ordinary conditions, their experimental significance and the fashion in which they have been established. All should be treated with respect and we should be on the look-out for the appearance of any new ones. But it is only in relating them to philosophical knowledge which has already been acquired by other means, with philosophical principles, that an intelligible content appropriate to philosophy can be drawn from them, in order to discern and judge the ontological values implied by them, and use can be made of them, either to confirm and establish facts which are rightly philosophic or as a point of departure for philosophic demonstration.

A whole nest of critical problems is revealed by this, which I must content myself with signalising in passing. I have just shown how in a general way we can distinguish in the natural sciences the category of facts from that of theory. But because in the concrete these two categories constantly overlap one another, since science proceeds by a continual encirclement of facts by new theories which again serve for the creation of new theories from the new facts so discerned, it becomes necessary to establish a hierarchy of scientific facts in themselves, from the point of view of their varying values as facts and also to make a division between 'facts' which rightly merit the name and those which in one way or another have usurped it. The facts immediately exposed by scientific observation themselves presuppose a certain number of theoretical and already established propositions (the foremost of which originate from sensible perception) concerning the objects to be measured and the means of measuring, the apparatus which it is necessary to construct to this end. As to the other scientific facts mediately established, they result either from the coincidence of a verifiable datum and a preliminarily constructed system of theory, or from the explication itself when it asserts that it is the only one possible. The need for numerous discriminations is therefore imposed on the philosopher. When modern astronomy established that the earth turned round the sun, or when

modern physics established the existence of atoms, such 'facts', mediate as they are, have nevertheless an incomparably greater value as *data* (higher also in the first case than in the second) than the hypothetical 'fact' of Lorentz's contraction or that of the curvature of space postulated by Einstein's system. How then do we find the principles of discernment? Nowhere else than in the critical analysis of the reasoning process employed in each instance in particular. The more mathematics is reduced in physics to allow of our grasping, thanks to measurement and the calculus, in a physics not so transposed, those causes and conditions whose character as *entia realia* the philosopher has no reason to doubt, the more the result merits the claim of being held as a fact. The more physics is reduced to intervening simply as a discriminatory element in theoretic constructions whose proper value belongs to their mathematical amplitude and coherence, or as a simple foundation for entities which the philosopher has reasons for holding rational, not real, beings, the more the result should be considered as belonging to the order not of facts, but of explanatory images.

If philosophy is in itself independent of the sciences, cannot the latter nevertheless indirectly exhibit the falsity of some philosophical doctrine as a consequence deduced from a given principle which, being recognised as false, exhibits the falsity of the former?

That is true in so far as a philosophical doctrine impinges upon science as such or holds as a necessary consequence a scientific conception or at least a general framework for science whose worthlessness is thus exhibited.

But whatever may be said by certain popular writers (such as those who attribute to the ancients their own casualness in distinguishing intelligibility from topography, either in metaphysics or astronomy) this is not the case when the philosophy of Aristotle is brought back to its authentic principles. On the side of the human subject we must needs recognise that a too great confidence in the intelligibility of things and in the procedure of the reason, in a region which is not rightly that of philosophy, but of experience, and where essences are not discoverable, had its part (and perhaps a preponderating one) in the errors of antique science. From this point of view, and here I am prepared to go all lengths, we are persuaded that, on the one hand, modern science has

done immense service to philosophy in delivering it from the essentially alien burden which had oppressed it for so long, of the necessity for explaining phenomena; and, on the other, if the loss or weakness of the metaphysical spirit is an incalculable misfortune for the general order of intelligence and mortal things, it is also true that the predominance of the metaphysical spirit, unaccompanied by critical rectifications of exceptional vigour, can nullify as though *per accidens* the particular interests of experimental research. And this accident is a costly one, for experimental research and the smallest advance towards the minutest truth of fact are also a work of the spirit and the spirit brooks no impediment.

But on the side of the object there is no necessary link between the mechanics, physics and astronomy of the ancients and the natural philosophy of the scholastic tradition. The whole edifice of the experimental science of the ancients could fall in ruins, and this immense wreck has seemed to hurried minds as if it were the ruin of all the ancients had thought, in reality their metaphysic and their philosophy of nature, in their essential principles, as we are able to disengage these in the thomist synthesis, have been no more affected than the spiritual soul is altered by the dissolution of the body.

If the purity of philosophic and metaphysical knowledge has been so delivered from many alien elements, it is evidently as necessary and desirable, once this purification has been performed, to recover, after the interruption of three centuries of bankruptcy and misunderstanding, its organic relations with the grand totality, the life, actuality and activity, of the sciences. For the position of a soul without a body here on earth is exceedingly uncomfortable, and the prison of the body is a definite good. (As for the modern metaphysical systems, most often in reality they only represent the oppression of metaphysics by the hypostatised ambitions of the science of the sensory world.)

Under what conditions this work of integration, which has already been begun at several points, needs to be pursued to be brought to a good end, the notions brought together in this essay may serve as a certain indication. Those who take part in this quest must be on their guard against both an indolent separatism and a too facile concordance, in order to re-establish the vital connections without offending against the

essential distinctions and hierarchical order of the universe of knowledge.

For this end it seems to me that it is essentially necessary to distinguish clearly between two different cases: the case of physico-mathematical science and the sciences of which it is a type-form, and the case of sciences of the biological and psychological type.

KNOWLEDGE OF THE PHYSICO-MATHEMATICAL TYPE AND PHILOSOPHY

In my opinion it is necessary to abandon, as contrary to the nature of things, the hope of finding any continuity or close connection in regard to the explication of the real, I do not say in regard to the *facts* (in so far as they can be isolated from theory), but the *theories*, the conceptual elaborations of mathematical physics, and the proper texture of philosophical and metaphysical knowledge. The discontinuity is very clear-cut and is due to the very essence of these sciences. Mathematical physics is not a formally physical science: if it is directly physical in regard to the matter whereby it verifies its judgments, if it is orientated towards an end in the physically real and physical causes, it is not in order to grasp their intimate ontological nature. I shall return, in chapter iii, to a further consideration of this conviction, which is as frequently put forward by scientists[1] as by philosophers, but which it is over-easy to misunderstand and of which the full epistemological meaning is a delicate matter to fix. Such as it is, it suffices for out present object.

Physics is based upon ontological reality, it is preoccupied with causes, it is because of a passion for the nature of things that it bestirs itself. But it only envisages this ontological reality, these physical causes, from the angle of mathematics; it only considers them in pursuit of certain analytic translations, in divisions effected by mathematical means. It retains of the real only its measurable bearing, the measurements taken of it by our instruments—and it is thanks to these measurements, which are certainly

[1]'The object of mathematical theories (of physical phenomena) is not to exhibit to us the veritable nature of things: that would be an unreasonable claim. Their unique aim is the co-ordination of the physical laws discovered by experiment, but which without the assistance of mathematics we should not even be able to enunciate. The question whether ether in fact exists is a matter for the metaphysicians; the essential for us is that everything happens as if it did. . . .' (H. Poincaré, *La Science et l'hypothèse*.)

real, that the entities and symbols of mathematical physics have a foundation in reality. But it is in the measurable that it resolves all its concepts, which alone has a meaning for it.[1] And once in possession of its measurements, it essentially lives by weaving between them a web of mathematical relations deductive in form, which constitute its formal object and which doubtless need to be completed by a certain hypothetical reconstruction of the physically real, but from which it is only asked that their ultimate numerical result should coincide with the measurements of things effected by our instruments.

This is no manner of pragmatism. I do not in any sense suggest that in such a science *utilitarian success* substitutes the *truth*, in my eyes a barbarous conception. Like every other science it only exists to be true and the definition of truth—conformity between our judgment and the thing—endures for it as for all the others, but in the following sense: a physico-mathematical theory is called 'true' when the coherent system and the fullest possible range of mathematical symbols and explicatory entities which it is able to organise coincides in all its numerical conclusions with the real measurements effected by us, without it being in the least necessary that any physical reality, a certain nature or ontological law in the world of bodies, should *precisely* correspond with each of the symbols and mathematical entities which are in question.[2] The need for

[1]'. . . The whole of our physical knowledge is based on measures. . . . The physical world consists, so to speak, of measure-groups resting on a shadowy background that lies outside the scope of physics.' (A. E. Eddington, *The Nature of the Physical World*, 1928, p. 152.)

'The whole subject-matter of exact science consists of pointer readings and similar indications. We cannot enter here into the definition of what are to be classed as similar indications. The observation of approximate coincidence of the pointer with a scale-division can be generally extended to include the observation of any kind of coincidence—or, as it is usually expressed in the language of the general relativity theory, an intersection of world-lines. The essential point is that, although we seem to have very definite conceptions of objects in the external world, these conceptions do not enter into exact science and are not in any way confirmed by it. Before exact science can begin to handle the problems they must be replaced by quantities representing the results of physical measurement.' (*Ibid.* pp. 251-3.)

[2]This is a generalised application of the method which the ancients described as consisting in 'saving sensible appearances', and they made clear and explicit first in regard to astronomical theories, later in certain sections of physics. As Pierre Duhem has pointed out in a remarkable passage, aristotelian astronomy with its homocentric

causal physical explanations which remains immanent in the reason of the physicist issues, in the highest syntheses, in the construction of a certain number of rational entities founded on the real and the production of an image (or the shadow of an image) of the world capable of sustaining mathematical deduction. It would therefore be a proof of a very uncritical and truly naïve optimism to hope to make any real continuity between the way in which the theories of mathematical physics

spheres, however irreconcilable, as quickly appeared with the observed facts, is the first application of this method, 'the first of all physical theories. For the first time, in fact, in the construction of this theory, we see geometry starting from a certain number of simple principles which it has received from elsewhere and, conformably to these principles, constructing a system of hypothetical mathematics, retouching, complicating this system to the point where it has saved with sufficient exactitude the appearances described by observers.

'When observation had learned from phenomena that the whole system of homocentric spheres was forever impossible to save, geometric astronomers accepted other principles and, with their novel aid, combined them in new hypotheses; but the method which was followed in the construction of these new astronomical systems did not differ from that which had served for the building up of the system of homocentric spheres.

'There was no delay in extending this method from Astronomy to the other sections of Physics; the author of the *Mechanical Questions*, which was attributed to Aristotle, attempted its application to the equilibrium of solid weights, and Archimedes gave a rational form of rare perfection to the science of equilibrium; this admirable formulation he extended, following as always the same method, to the equilibrium of liquids and of floating bodies.

'Euclid on his side showed how the single hypothesis of the equality between the angle of incidence and the angle of refraction sufficed to save the phenomena presented by concave and convex planes and mirrors.

'Thus, two centuries before our era, Astronomy, the Science of the equilibrium of weights, and a part of Optics had taken on the form of mathematically precise theories, in the desire of satisfying the demands of experimental control; though many parts of Physics have in their turn only taken on this form after long years of groping; but, in doing so, they have only followed the method by which the earlier sciences had already arrived at the conditional of rational theories.

'The attribution of the title of "creator of the method of physical science" has given rise to many quarrels; some would claim it for Galileo, some for Descartes, others for Francis Bacon, who died without having ever even understood this method. In fact, the method of physical science has been defined by Plato and the Pythagoreans of his time with a clearness, a precision which has never been surpassed; it was applied for the first time by Eudoxus when he attempted, by combining the rotations of the homocentric spheres, to save the apparent movement of the stars.' (P. Duhem, *Le Système du monde.*)

The same discussions, moreover, must have taken place among the Greeks and the

and of philosophy—which seeks to grasp ontological principles in the very stuff of their reality—affirm their apprehension of things. It is in this sense, as I have tried to show elsewhere,[1] that we must both pay a tribute of admiration to the conceptions introduced by Einstein in the degree to which they create a powerful physico-mathematic synthesis, and reprove any pretensions which may be made to give them a rightly philosophical significance.

Does this imply the breaking of any organic connections between

mediæval Arabs and Christians, on the significance of the results obtained as in our own day on the theme of 'the value of science'. St. Thomas has clearly indicated the bearing of the method in question in the following passage: 'Ad aliquam rem dupliciter inducitur ratio. Uno modo ad probandum sufficienter aliquam radicem. Alio modo inducitur ratio non quae sufficienter probet radicem, sed quae radici jam positae ostendat congruere consequentes effectus; sicut in astrologia ponitur ratio excentricorum et epicyclorum, ex hoc quod, hac positione facta, possunt salvari apparentia sensibilia circa motus caelestis: non tamen ratio haec est sufficienter probans, quia etiam, forte, alia positione facta salvari possent.' (*Sum. theol.*, i, 32, 1, ad. 2.)

I would add, to avoid all misunderstanding, that σώζειν τὰ φαινόμενα in no sense implies that refusal of the search for causes and an explicatory hypothesis which Duhem attributes for his part to physical theory (see *supra*, p. 55). These are in themselves causal explications and figurable entities which are elaborated by the physical sciences and which are arranged to *save phenomena* and which are *true* (not in the absolute sense in which a metaphysical doctrine is called true), but true in the measure in which they succeed, without assuming a penetration into the essential nature of things. It is therefore a secondary question whether a scientist attributes to a theory the value of a simple mathematical representation or that of a causal explanation, or both at once, or oscillates between the two (as Ptolemy did in astronomy; or as, in our own day, in physics, 'some ask if the electron has not only a purely analytic existence, is only a centre of vibration in a system of waves which are the true reality. For others, it is these waves which have only an analytic existence: for a surrounding field of discontinuity a field of imaginary continuity has been mathematically substituted' (E. Picard, *op. cit.*)): for, in reality, this 'causal' explication in itself remains 'empiriological', and has no rightful or direct 'ontological' significance. (Cp. chap. iii.)

As M. René Poirier has written, from a point of view which otherwise is very different from mine, 'There is no essential difference between the way in which a logical or numerical allegory rationalises the real and that of a structural scheme or figurative hypothesis. . . . The most abstract schemes of statistical energy and of Relativity in general do not proceed from any other attitude of mind, correspond to no other form of comprehension than that which produces the mechanical models of the atom or the solar system; the difference between abstract and intuitive theories is like that between painting and sculpture' (*Essai*).

[1] Cp. *Réflexions sur l'intelligence*, chap. vii.

philosophy and mathematical physics? Certainly not. In the very nature of the order of the explication of things there is a continuity between the philosophy of nature and mathematical physics, if not in the explicatory theories elaborated by the latter, at least in the degree to which, as I said above, science furnishes philosophy with an immense supply of facts, a gain which endures despite the fluctuations of theory. This is the case with the existence of atoms (which have nothing in common with those of Democritus), a probability which to-day has grown next door to certitude: I say the existence of atoms, not, be it noted, the nature and structure attributed to them by science, for these latter are subject to constant alteration and consist in large measure of scientific symbolisation. But if nowadays, for example, the Rutherford-Bohr atom is eclipsed by that of Schrödinger, and has become, in anticipation of further avatars, 'a wave-centre of probability', the existence of the constituent elements of the molecule called 'atoms' (and of their constituent elements, 'protons', 'electrons', 'neutrons', or whatever other names science has endowed them with) seems in no way overthrown, although conceived of in such varying fashion, as though thought out solely in the form of mathematical symbols.

On the other hand, in the epistemological order, in that of theories of knowledge, the organic link between physico-mathematics and metaphysics is closer than ever. In the determination of the nature and true value of physico-mathematical science, the place, the part and the bearing of its explications, metaphysics not only maintains order in the system of our forms of knowledge, but renders to physico-mathematics the essential service of protecting it against otherwise almost inevitable deformations, above all, against the pernicious illusion that it is itself called on to be a philosophy of nature and the belief that things only begin to exist when submitted to the measurement of our instruments. Physico-mathematical explanations are free to make use and good use of dislocations of time and non-euclidian space, for they have the right to progress along the lines of their own development: they do well in doing their own work: the eyes of the spirit are set on their significance and know its limitations.

There is perhaps an element of melancholy in this assertion that the image of the universe, or more exactly the more or less discordant

images and shadow-images in which it appears in the last analysis the explicatory effort of physical theories can only result, cannot be, as was for so long believed, the natural prolongation of the ontological explications supplied by philosophy. Nevertheless for the latter this is an excellent purification. Philosophy must renounce a state of satisfaction with images—whether they be the explanatory but imaginary images of science or the natural image, which is still more baseless for any explanatory use, proffered by common sense. I shall endeavour to show in a later chapter[1] how it is possible, but in another order than that of knowledge in this sense of the term, for philosophy to re-connect with these scientific images and incorporate them in its own field.

KNOWLEDGE OF THE BIOLOGICAL AND PSYCHOLOGICAL TYPE

In the sphere of life and organic wholes the distinction between the point of view of philosophy and that of the experimental sciences remains exceedingly clear; the conceptual vocabulary, the procedure of verification, the laws of the resolution of concepts and the organisation of knowledge being necessarily different one from the other. But in this sphere a certain 'continuity' or solidarity between the specifically rational and specifically experimental sections of knowledge can be established—despite an essential epistemological diversity—in what is concerned with the explanatory theories which are furnished by the sciences and the final explanation given by the philosophy of nature. For, although resolving their concepts in sensible and observable being in the very degree to which it is sensible and observable, experimental biology and psychology do not undertake the construction of a closed universe of mathematically inspired phenomena, and it is natural that the form of deductive explication to which they are attracted should be of a philosophical, and not mathematical, type.

It is not in the least that I wish to deny or lessen *a priori* the part played by physico-chemical explications (which are in themselves orientated towards the integral mathematisation of the real) in biology. If it is true that physico-chemical forces are the *instruments* of superior ontological principles in living matter, it is possible to hold that the field of

[1] See *infra*, chap. iii, pp. 222-4.

these explications can be unceasingly extended, although a halt has to be called before certain specific 'irrationals' which inevitably arise of themselves.[1] But it is also possible to hold that in the measure to which the biologist keeps the sense of reality proper to living things, and demands, in the study of phenomena, a type of explication which does not, in the last analysis, resolve this reality into its constituent elements, in a word, to the degree in which he refers himself to the notion of living *being*, that he will subordinate the so discovered physico-chemical explanations to an 'autonomous' conception of biology, or to the penetration of the detail of phenomena and the grouping of them under more and more general experimental laws—without the pretension thereby of resolving them in that universal mathematical explanatory deduction envisaged by physics (and moreover without quitting the ground of the observable and the measurable)—and will remain based on that ontological structure which is *understood* in the concepts furnished by philosophy.

On the other hand, if they do not put their intelligence in blinkers, the biologist and the psychologist are inevitably led by their very objective to ask meta-phenomenal questions; to which they can certainly endeavour to reply with the aid of their own conceptual equipment, their own means of analysis, so winning, in the most favourable instances, indirect and circuitous solutions, surrounded with inconceivable limitations, which mimic those of philosophy and are at a tangent to them. Thus Driesch[2] has recognised, in the course of remarkable work, that embryonic development depends on a non-spatial *factor E* which maintains the specific type, or again that the actions of animals also depend on a non-spatial factor, thanks to which stimuli coming from without are individualised, and the functioning of the animal mechanism is enriched by its own exercise—a non-spatial factor which he prudently christens *psychoid*.

But it is only in making use of the apparatus of philosophy, in becoming themselves philosophers, that they will be able to give a rightful and adequate solution to those supra-experimental problems which experience itself constrains them to envisage; that they will be able, for one example, to learn the veritable names of a *psychoid* and *factor E*.

[1] See *infra*, chap. iii, pp. 235–40.

[2] Cp. my preface to the French translation of Hans Driesch's *Philosophy of the Organism* (Paris, 1921).

CONCLUSION

We have the right to hold that thomist philosophy rather than any other is in the position to supply the sciences with the metaphysical framework where they can follow out at ease the necessities of their own proper development and which will do them no violence: not only because it is essentially realist and critically justifies the extra-mental reality of things and the value of our faculties of knowledge, which all science implicitly presupposes, but because it guarantees the autonomy, the specific quality of each, and its metaphysical elucidations of the real imply in consequence no necessary systematic deformation despotically imposed upon experience.

In fact the reproach addressed by the misinformed to scholastic philosophy recoils on the modern systems. For it is these systems which derive from systematic prejudices like mechanism or monism, psychophysical parallelism, the cartesian theory of knowledge, universal evolutionism, etc., which necessarily and as such impose on science such exasperating metaphysical fetters.

It is not a question of finding between the aristotelian-thomist philosophy and the sciences that concordance of detail which we have just rejected: but of affirming rather a concord in general, a good understanding, a natural friendship, of which the very liberty of science, the ease with which it spreads its wings, is the best indication. This is explicitly affirmed by several representatives of the natural sciences, while elsewhere a remarkable renaissance of themes proper to the moral philosophy of St. Thomas is visible among the juridical and moral sciences, which I have not had the space to speak of in this essay.

If there is no lack of labourers, if unreasonable prejudices—due most of all, it seems, to a morbid fear of ontological research, and of all philosophy directed towards the knowledge of things (as if a philosophy of being could not also be a philosophy of the spirit)—do not turn them back from the study of the sole philosophy which claims to confront the universality of extra-mental reality without claiming in the same stroke to absorb all knowledge into itself, we may hope to see the dawn of a great new scientific period, which will put an end to the misunderstandings engendered in the field of experimental research by the quarrel

between Aristotle and Descartes, and where the phenomenological sciences will at last achieve their normative organisation, some, especially physics, subject to the attraction of mathematics and following out on those lines the path of their splendid progress, others, especially biology and psychology, subject to the attraction of philosophy, and finding there that organic order of which they have such need, and the conditions of a development which will be not only material, but rightly worthy of the human mind. A general redistribution which comes from the natural growth of phenomenological science, but which also presupposes, that is clear, the supreme regulative power of metaphysical wisdom.

This would be the restitution to the human soul of that divine blessing of intellectual unity, which for three centuries has been broken.

Kant denied to metaphysics the character of a science, because for him experience was both the product and the end of science, which creates it by applying to sensible data those necessities which are purely mental forms; but St. Thomas recognised in metaphysics the supreme science of the natural order, because for him experience is the point of departure for the science, which, reading in sensible data those intelligible necessities which surpass them, can transcend it in following out those necessities and so come to a supra-experimental knowledge which is absolutely certain.

Being is in fact the proper object of the intellect; it is enracinated in all its concepts, it is towards it, in so far as it is absorbed in what is given through the senses, that it is first of all directed.

When the intellect disengages this conceptual object to consider it in itself, in the degree to which it is being, it perceives that it is not exhausted by the sensible realities in which it is at first discovered; it has a supra-experimental value and so also have the principles founded upon it. Thus the mind, if I may say so, 'loops the loop', returning in order to grasp it metaphysically and transcendently to that same *being* which it was given first of all in its primary intellection of the sensible.

And so, because it has in its metaphysical concepts the intellectual perception of objects, such as being and the transcendentals, which can be realised otherwise than in the matter where it perceived them, it can also attain to these objects—without, this time, directly perceiving

them, and as if in the mirror of sensible things—there, where they are realised immaterially, as the facts asserted by the world of experience compel us to infer. The supra-sensible cannot be, at least in the natural order, the object of an experimental science; it is nevertheless the object of a science rightfully so called, the science *par excellence*; for if the universe of being as such, disengaged by the mind when it delivers its objects from all materiality, does not fall under the ken of the senses, on the other hand, intelligible necessities are there seen in such a degree of perfection that the knowledge ordinated in regard to such a world of intelligibility is in itself of the highest certainty, though we indeed may have difficulty in acknowledging it. For we are an ungrateful and mediocre species, who only ask the right to fail to achieve the heights of which we are capable, and who in ourselves, even when the highest gifts have fortified our eyes, have always a preference for the dark.

CHAPTER II

CRITICAL REALISM

I. CRITICAL REALISM

By the name *critical realism* I do not here mean those contemporary philosophical ideas which, notably in America and in Germany, have adopted that title to characterise their position,[1] but rather the aristotelian-thomist conception of knowledge. It strikes me as having a better title to the appellation.

M. Etienne Gilson has raised an interesting and useful controversy on this theme, by maintaining[2] that though thomist realism constitutes a 'methodic' realism rather than anything 'naïve', it can nevertheless only become a 'critical' realism in conceding, at the very moment when it claims to strike them down, to the pretensions of idealism.[3]

Gilson's study is marked by many just and penetrating observations, and it excellently exhibits how vain is the idea of asking from the cartesian *cogito*, however many amendments one proposes in it, any elements of a realist noetic. 'He who begins as an idealist', he writes, 'necessarily ends as one: it is impossible to be an idealist by halves. There is no need to doubt what history teaches by so many examples. "*Cogito, ergo res sunt*" is Cartesianism, that is to say, the exact antithesis of what is considered scholastic realism and the cause of its ruin. No one made a greater

[1] Still less in particular to that theory of the perception of the exterior world sustained not only by Kulpe but also by several neo-scholastics, and opposed with so much reason by J. Gredt (*Unsere Auswelt*, 1921); according to which, sensation is only attained as a subjective end which is objectified in a secondary manner thanks to an inference.

[2] 'Le Réalisme méthodique,' in *Philosophia perennis* (Mélanges Geyer), Regensburg, 1930, vol. ii. L. Noël's reply ('La Méthode du réalisme') will be found in *La Revue néo-scolastique*, Nov. 1931.

[3] E. Gilson, 'Réalisme et méthode' (*Revue des sciences philosophiques et théologiques*, vol. xxi, 1932).

effort than Descartes did to throw a bridge between thought and things, basing himself on the principle of causality; he was indeed the first to make the effort since he had obliged himself so to do by placing the point of departure of knowledge in intuitive thought: it is therefore strictly accurate to say that every scholastic who thinks he is a realist because he accepts this setting of the problem is in reality a Cartesian. . . . The cartesian experiment was a wonderful metaphysical enterprise, marked with the purest genius; we owe much to it, if only for its brilliant proof that every tentative of this kind is doomed in advance to failure; but it is the height of simplicity to begin it again in the hope of obtaining contrary results from those which have always followed, because they are of its essence. . . . One may begin with Descartes, but one will end along that road with Berkeley or Kant. There is an internal necessity in the very essence of metaphysics, and the progress of philosophy precisely consists in an increasingly clear consciousness of its content. . . . No man will ever win from the *cogito* the justification of the realism of St. Thomas.'[1] *Aurea dicta!* Let us give thanks to a philosopher with such a rich historical background for this vigorous witness, in the name of history itself, to the intelligible necessities which, despite all the accidents of material causality, rule the historical development of thought.

The criticism which he suggested from this point of view of idealism is exceedingly pertinent.[2] History attests at once the essential impotence of idealism 'to pass on from criticism to positive construction' and for the preservation of the rightful content of philosophy as distinct from that of a chosen regulative science—and the necessity in which it finds itself of substituting for the real (because it does not start from things, but from thought) rational not real beings 'which are only false coin'.[3]

It is certainly true, on the other hand, that, though fundamentally and consciously 'realists' *in actu exercito*, neither Aristotle nor St. Thomas ever felt the need to qualify themselves as realists in the modern interpretation of the term; for the reason that the error to which it is opposed had not yet arisen in the West. But the realism professed by Thomists to-day is only a passage from the implicit to the explicit. And this transition is itself a form of progress. It is even possible to think that in this, idealism has played a necessary historical part. Precisely because

[1] *Ibid.* pp. 747-8, 751. [2] *Ibid.* pp. 753-4. [3] *Ibid.* p. 754.

the aptitude with which our faculties for knowledge lay hold on the real is a gift of nature, and human thought, by the very reason of its native vigour, deals the more spontaneously with what is in the degree to which it is healthy, it needed, so to speak, the pathogenic ferment of the cartesian *cogito*, and the aberration of the way in which idealism posed the critical problem, to compel the philosophical intelligence to turn seriously to its consideration and to enter consciously into a phase of self-reflection, which in itself, whatever the cost needing to be paid for it, must add to the fuller manifestation of the spirituality of the reason.

If idealism is in itself a tragic experience for thought—which, like all veritable tragedies, ends with the suicide of the protagonist—it also opens —on condition that it itself is entirely turned out—together with a new problematic, new possibilities of depth and penetration which the mind cannot renounce. It is important therefore to avoid here a double-sided danger: one, which consists in accepting, in whatever way and however little, the idealist setting of the critical problem; and here I am in the fullest agreement with M. Gilson; and the other which consists in the refusal of any possibility whatsoever of posing as philosophically soluble the whole critical problem. It is here that I part company with M. Gilson. I believe that it is possible—in fact that it is the particular office of wisdom—to face this problem in a wholly other fashion than that of idealism.

To my mind it is inexact to say that realism only exists by idealism[1] (on that ground no true thesis would exist except by right of the error which it refutes, and a dogmatic definition would depend on the error which it opposes), and that realism, in order to be critical, must 'borrow' from idealism 'the posing of the problem'. Nor is it sufficient to point out that realism has succeeded at the point where idealism fails, or to demonstrate the insufficiency of the latter in constructing a viable philosophical system.[2] Without doubt that is an indirect sign whose value is far from negligible. But the point which it is necessary to bring the mind to take full cognisance of is the absolute impossibility in itself and *as such* of idealism. More, there is not the slightest reason for

[1]E. Gilson, 'Réalisme et méthode' (*Revue des sciences philosophiques et théologiques*, vol. xxi, 1932), p. 751.

[2]*Ibid.* p. 753.

abandoning into the hands of the idealists the whole use and possession of the word 'critical' and all it signifies. 'To criticise in the exact sense of the word is *to judge*, in conformity with the exigencies of the object under examination.'[1] And how can judgment and the control of the self by the self be held alien to the one philosophy in which the mind is characterised by its capacity for a complete return upon itself? Truly, as I have already claimed in an earlier book[2] and as J. de Tonquédec has forcibly pointed out,[3] the primary reproach with which we can face critical idealism is that it is and has been insufficiently critical.

The critical problem is not: 'How is it possible to pass from *percipi* to *esse*? Thought being itself the sole object attained with indubitable certainty, is it possible to demonstrate that it attains also to things, to a real which is its measure?' It is this: 'What value, in the various degrees of the elaboration of knowing, must we recognise in *percipere* and *judicare*? Thought giving itself at the first shot and as if with complete assurance to things and being given its measure by an *esse* independent of it, how is it possible so to judge, how, under what conditions and what measure is it really thus in the beginning and in the various degrees of human knowledge?' It is absurd to demand from philosophical thought that it should begin, before rightly knowing anything, by giving proof that it is able to know (which it can only know by knowing); it is absurd to suppose first of all that what cannot be judged as true by thought may, by the action of some malign genius, not be true, in order to demand as a result that this same thought should demonstrate that in fact it is not so; or to admit that thought can only attain to phenomenal-objects and then ask that it should prove that these objects are extramental realities.[4] Such things are those *stultae questiones* which St. Thomas, following St. Paul, counsels us to shun.[5]

[1]R. Garrigou-Lagrange, 'Le Réalisme thomiste et le mystère de la connaissance,' *Revue de philosophie*, Jan.-Feb. and Mar.-Apr., 1931. (This article has been reprinted in *Le réalisme du principe de finalité*, Paris, 1932.)

[2]Cp. *Réflexions sur l'intelligence*, chaps. i and ii.

[3]J. de Tonquédec, *La Critique de la connaissance*, pp. 21-2.

[4]Cp. *Réflexions sur l'intelligence*, p. 41.

[5]'Stultae questiones de vita', Tit. iii, 9: St. Thomas, lesson ii, '. . . . Item quando manifestum proponitur ut dubium, sc. quaecumque debet aliquis per se tenere in scientia.'

But when thought has begun to operate, to know and to philosophise, to acquire the certitudes of science and of wisdom concerning things and the soul, and their first cause, it has need to turn back upon itself and on these acquisitions, and apply itself to the knowing of knowledge, to judge concerning it and to verify it (in order to advance again, and again to circle back upon itself . . .).This is the task of metaphysical wisdom[1] which, as the highest natural point of spirituality among the sciences, has the power to go back over the principles of these latter and over its own, in order to justify (if not by direct demonstration—for it is an *apaedeusia, id est ineruditio*[2] to wish to demonstrate everything—at least by a *reductio ad absurdum*) and so fulfil that self-return which is proper to the spirit.

In a sense it is ungrateful and dangerous work (the danger is sufficiently obvious), as is all rescension and verification, all the registration of reflex valuation, a work which goes against nature, but which is indispensable, for the intellect even more than the hand needs to know how to control its tools and that instrument which is itself. It makes a particular call on the sobriety and humility of veracious science and on that respect for the object, which is in this case the mystery proper to knowledge. Thus humbly, by the impossibility of their contraries, the fundamental truths and particularly the general validity of knowledge and its first principles are confirmed: then follows the principal business, where research can advance and exhaust itself endlessly: which consists on the one side in the analysis and description—with full respect for its integrity—of the objective content of knowledge in its diverse phases[3] and of the witness which it gives to itself; on the other side, of the endeavour to penetrate metaphysically into its nature and its causes, and to make it in the rightful sense of the word, know itself:

[1]'Considerandum est in scientiis philosophicis, quod inferiores scientiae non probant sua principia, nec contra negantem principia disputant, sed hoc relinquunt superiori scientiae; suprema vero inter eas, scilicet metaphysica, disputat contra negantem sua principia, si adversarius aliquid concedit; si autem nihil potest cum eo disputare, potest tamen solvere rationis ipsius.' (St. Thomas, *Sum. theol.*, i, 1, 8.) Cp. R. Garrigou-Lagrange, *art. cit.*

[2]St. Thomas, *In Metaph.*, book iv, lect. 6.

[3]It is here without doubt that something will remain, when it has been distilled by time and reduced to more modest proportions, of the phenomenological method.

after which it is possible to proceed to the detail of instances and discrimination of gnoseological values and what in the act of knowing depends on the real and what on the constructive activity of the mind (thus the treatise on the Divine Names in the *Summa* is a critique of theological knowledge; and thus again all search for the true significance of physical theory is an attempt at a critique of physico-mathematical knowledge), like, for instance, the discovery of the laws of that transcendental theme which is at various times under discussion in the present book.

The mind throughout has a veritable understanding of the object which it proposes to itself and *judges* of it in accord with the intrinsic necessities proper to knowledge; indeed, in the strictest sense of the word, it is a critique of knowledge which will have been instituted. But its work will always and essentially remain a taking cognisance of, a return on another activity which is the knowledge of things, a purely reflective activity. When this condition is fully understood the principal danger drops away. Such a critique of knowledge will have been subject to no idealist contagion. For it is in effect essential to all idealism to mix a constructive desire with all reflective activity (however unacknowledged it may be, however dissimulated under the aspect of a pure methodical austerity)—at least the desire to make the whole nature of philosophy depend on this preparatory self-reflection, if not to make it wholly consist of it. As soon as one acknowledges that the work of a critique is purely and exclusively reflex, secondary (not only in order of time, but of nature) and therefore cannot separate itself for an instant from the knowledge of the real without having recourse to an illusory self-devouring, one is securely innoculated against cartesian fever.

SCIO ALIQUID ESSE

If the foregoing remarks are correct, it follows that a thomist criticism of knowledge will differ from the beginning and by reason of the very method of its procedure, from that of any type of idealism, and particularly by these three points:

1. It is in no sense the pure *cogito* shut in on itself which makes its

point of departure. Criticism, as a work of philosophy, implies the act of consciousness whereby the mind goes philosophically back over its preliminary work of knowing; and this is not the act of consciousness which is in point of fact and chronologically first (to what point in that case of infant experience would it be necessary to return?) but that *act of consciousness* which is verified by the philosopher as being *by right and logically first*, when he lays bare those most primary roots of knowledge which constitute his point of departure. How is this exactly determined? In my opinion three primordial axioms, which each imply the others, are included in this fundamental act of consciousness and impose themselves on any philosophic analysis: the incontrovertible evidence of the principle of identity, that primary fact to which we are led by the resolution of the knowledge which has already been acquired[1] and in which we find the very first (*i.e.* in the order of reason) living connection between the mind and things; the general truthfulness of our powers of knowledge, which is like the first if highly indeterminate witness which the intellect gives to itself; the notion of truth, whose elucidation presents the primary problem which criticism must solve. Thus if we wish to formulate directly that experience which forms the point of departure for all criticism, it must run not, *I think*, but—I *am*

[1]'Hujusmodi autem principia naturaliter cognoscuntur, et error qui circa hujusmodi principia accideret, ex corruptione naturae proveniret. Unde non posset homo mutari de vera acceptione principiorum in falsam, vel e converso, nisi per mutationem naturae.' *Sum. Contra Gent.*, iv, 95.

Cp. R. Garrigou-Lagrange, *op. cit.* 'This primordial evidence belongs to the *first intellectual apprehension* of being or of the real and to the *necessary and universal judgment* which immediately follows it; these direct acts are necessarily anterior to any reflection upon them. Then this primary and indestructible evidence is confirmed by the intellect's reflection on its own act, on the nature of that act and its own nature, of which it sees the *essential finality*, as it sees the finality of the eye or of the ear. And by this the intellect sees that the idea of being, impressed on it and subsequently expressed by it, is as essentially relative to *extra-mental being*, whether actual or possible, wholly different from *being only existing in the reason*....' (*Ibid.*)

'It is untrue that we are first conscious of our certitudes as "purely subjective" states, from which we subsequently conclude (no one has ever explained by what right) the existence of reality distinct from our knowledge, in "objective" truth. No, *immediate evidence gives us the object*; if it did not, no reflection on it—it is only too evident—could discover it among its acquisitions.' (J. de Tonquédec, *op. cit.*)

'The real is given us straight away in the activity of knowing.' (L. Noël, *art. cit.*)

conscious of knowing—I am conscious of knowing at least one thing, that that which is, is.

The *cogito ergo sum* is ambiguous: it is proffered at the same time as the point of departure for the whole of philosophy and for the critique. If we were in search of an equally ambiguous formula, to serve both these aims, we could say: '*scio aliquid esse* (*seu esse posse*)', but it would be necessary at once to resolve it into the two significations which it embraces and which would need to be differentiated, for the one is concerned with direct knowledge and the first movement of the mind, the other with reflex knowledge and the mind's secondary motion. When I say, 'I know that some thing is (or may be)', I can have the intention of affirming simply that *some thing is* (or may be), *aliquid est*, an enunciation in this case concerned with the first movement of the mind, and thereby related to *the starting-point of all philosophy*. The concrete experience which it translates includes besides all the complexity of my cognitive activities, for my intelligence there lays hold of intelligible being, on which it bears directly, and which has been perceived by it in exactly so far as the surrounding possibility of eternal exigencies forms the object of its whole first purely intellectual certitude (principle of identity), but which it grasps in fact in turning back on some singular object given to it by the senses and from which it has caused it to arise; and in going back also, although entirely implicitly and by the single fact of judgment, on its own act of knowledge and its relation to the thing; on the self which knows and whose existence in act—for my me the most indubitable of all such existence—is so made known to me—but as though in its germ (*in actu primo*) and not yet effectively—each time that I know.[1]

If I say after this: 'I know that some thing is (or may be)', having taken explicit cognisance only of what was included in direct knowledge and meaning to say that *I know* that some thing is or may be, *ego cognosco aliquid esse*, my statement is then concerned with the second motion of the mind, refers to the point of departure of a critique.

The position so taken up is this: Since the intellect deals first of all neither with itself nor with myself, but with *being*, the very first evidence (I say first, not in the order of time, where what in itself is

[1]Cp. *infra*, pp. 108 (note 1) and 124 (note 1).

primary is only implicit, but in nature), the *evidence which in itself is first* for the intellect is that of the principle of identity, 'discovered' in the intellectual apprehension of being or of the real.

I have said that the real in question is not necessarily in the actual (existential) order, although it may be as incarnate in the example of some sensible existence that the intellect first lays hold on the principle of identity. In itself this principle bears on the whole extension of being and primarily on the order of essences, on the *possible reality*.[1] But at the same time in the intelligible order itself a certain *actual reality* is given to the intellect in this first act of perception and judgment, this time from the side of the subject, *i.e.* the existence of the thinking subject itself, for all that it is implicitly and pre-consciously and by an initial act[2] and not yet as an express object of knowledge.

Thus the intellect here embraces in its own sphere at one and the same time—the possible real: the object ('all being . . .') set before the mind and attained by it, and signified in the enunciation of the principle of identity[3]—and the actual real: the reality of the thinking subject, not yet attained in ultimate act (*in actu secundo*). *Intelligible being* and the *self* are given it at once and together, but *being* is in the foreground and, as it were, on the centre of the stage, and the *self* in the background or in the wings. It is only with the second movement of the mind, in that reflex act which serves as a starting-point for the critique of knowledge, that it comes into the foreground.

2. An authentic criticism of knowledge does not in the least imply a

[1] See *infra*, pp. 111-12 and 123-4.

[2] On the distinction between the initial act (*actus primus*) and the final act (*actus secundus seu ultimus*) in the order of knowledge see *infra*, p. 141. When the object of intellection is a thing other than myself it is (directly) known in initial act by the fact of the actuation of the intellect by the *species impressa*, and in final act (*i.e.* purely and simply) by the act of intellection itself and in the *species expressa* or mental work. When it is the act of intelligence or the intelligence itself or the existence of the self, it is known (reflexively) in initial act by the very fact that the intellect is itself a direct act of knowledge of a thing, and by that very fact intelligible in act to itself, and it is known in final act (effectively known) by the act of reflex intellection and in a reflex concept. Cp. *infra*, p. 108 (note 1) and p. 145 (note 2).

[3] 'All being is what it is.'

single moment of real universal doubt.[1] Such a moment in effect includes *in actu exercito* the negation of what it is assumed one as yet knows nothing of (I mean, the essential ordination of the intellect to being), and creates a vicious circle.[2] As I have indicated elsewhere,[3] the *universalis dubitatio de veritate* of which St. Thomas, following Aristotle,[4]

[1] 'In fact the evidence takes us by the throat and leaves us no time to defend ourselves; it leaps to our eyes, not like a blind force, but like an irresistible light. The moment the mind decides to reflect, it is subject to this shock; not a moment is given it for deliberation, its reflection instantly comes across evidence which it cannot dispute, which it has not to 'justify', but only to observe and record. There is not, nor can there be, at the beginning of the critique of knowledge, any instant's pause, a second of uncertainty, abstention or ignorance, of any real doubt.' (J. de Tonquédec, *op. cit.*)

'This is what Descartes, the founder of modern idealism, did not see when he said that God, if he had so wished, could have created square circles or hills without valleys. Descartes did not comprehend that he was committing an unforgivable sin as grave as that which is called in the spiritual order the sin against the Holy Ghost or against the light of liberation. From the dawn of our intellectual life we have an absolute certainty that neither God, if he exists, however powerful he may be, nor any malign genius, however perverse and deceiving, could make a square circle, for this is not only *inconceivable by us*, but *really in itself impossible*.' (R. Garrigou-Lagrange, *art. cit.*)

[2] And this is not the only one. 'It is impossible to deliberately put in doubt the value of all certitude without expressly referring to an absolute and incontestable ideal of certitude, to a notion already acquired and held as assured of certitude, to a rigorous principle which will dominate all further discussion: let it be quite clear, viable, scientific certitude—which carries as its correlative, objective truth—carries such characteristics, implies such conditions. Here for reflection, at least, is something which is not in the least dubious! There is a *considered, even philosophic*, certitude, moreover one that is easily recognisable, which must be rescued from universal doubt! But it implies all the elements of critical philosophy: the notions of truth, of reality, of objectivity, etc.; critical philosophy has therefore been in action before the point assigned for it to come into action.' (Cp. Du Roussaux, 'Le Néo-dogmatisme,' *Revue néo-scolastique*, Nov. 1911.)

'It is perfectly legitimate to make an inventory and a critical revision of human knowledge. It is indeed what has been attempted in the present book. But in this enterprise there is no place for universal doubt. "The reduction of thought to a bare potentiality which knows nothing about nothing is an impossibility, even for the duration of a flash of lightning. . . . Every attempt at universal doubt is still-born, dead in its essence, void of reality or possibility. The interlocutory question is a vain interrogation; it is answered by the asking." (Du Roussaux, *op. cit.*).' (J. de Tonquédec, *op. cit.*)

[3] *Réflexions sur l'intelligence*, p. 42.

[4] Aristotle, *Metaph.*, B. c. 1. (St. Thomas, book iii, lect. 1.) J. de Tonquédec has shown the true meaning of this expression at the concluding chapter of his book, *op. cit.*, pp. 436-441.

speaks, that putting in question, or universal *aporia* which is the privilege of metaphysics, that *videtur quod non* which is the beginning of all scientific research and which stops at nothing, is not in any slightest degree a living or *exercised* doubt—no more than it is the phenomenological ἐποχή[1]—it is not a living ἐποχή but one put forward as a hypothesis to be examined, a conceived or *represented* doubt (and by this much more rigorous and much more sincere than the cartesian doubt, for it involves no ruse, no arbitrary forcing from the side of the will, no pseudo-drama); and the end which the mind arrives at as a result of this universal problematisation is precisely the clear and deliberate consciousness of both the absolute impossibility of realising a universal doubt (or a 'putting in parentheses' of all certitude concerning the being of things), and of the knowledge which it already possessed, rooted in the exercise of its basic activity, although unformulated, from the very start, of its essential ordering for the apprehension of things: for in every judgment the intellect tacitly and virtually knows itself, *in cujus natura est ut rebus conformetur*.[2] The intellect lives realistically before it recognises the name of realism.

3. Finally, an authentic critique of knowledge, comprehending that it is absurd to go back on its traces at the first step, does not give itself out as the preliminary condition of all philosophy.[3] The conception of 'philosophical radicalism'[4] formed by Cartesians and neo-Cartesians appears from this point of view as an almost perfect type of presumption in the field of human knowledge. The critique of knowledge presupposes a long-continued effort to know—knowledge which is not only spontaneous, but also scientific—not only scientific (in the modern sense of the word), but philosophic and psychological, logical and metaphysical.[5] It is itself a part of metaphysical knowledge, the

[1] On this ἐποχή, see *infra*, pp. 123-4.

[2] St. Thomas, *De Veritate*, i, 9; cp. *infra*, p. 108 (note 1).

[3] 'What is necessary is to free ourselves from the beginning from the obsession of the idea that epistemology is the essential preliminary of philosophy' (E. Gilson, *art. cit.*). On this point I share the fullest agreement with M. Gilson.

[4] Cp. E. Husserl, *Méditations cartésiennes*.

[5] 'According to the thought of Aristotle and St. Thomas, when rightly understood, the critique of knowledge should not come at the beginning of metaphysics (or, if one wishes it so, at the end, by way of reflection), but after natural philosophy and after psychology. For in order to criticise the value of knowledge it is necessary first to know psychologically what it is, to know how to distinguish the formal object of the intellect (being and the reasons of being of things) and the formal object of the senses (sensible phenomena).' R. Garrigou-Lagrange, *art cit.*, cp. *Revue thomiste*, Jan. 1924: *Dans quel ordre proposer les sciences philosophiques*.

L. Noël (*Notes d'epistémologie thomiste*) supports this thesis, while pointing out, as is very true, that the critique also serves in its turn the progress of the philosophical sciences. Here, as in all organic growth, *causae ad invicem sunt causae*.

supreme wisdom of the natural order. And although in the interests of exterior order in a written treatise (where one must behave, alas, as if knowledge were achieved and fulfilled), it is convenient to place the critique at the beginning of metaphysics, like a sort of introductory apologetic—in reality, criticism, ontology and natural theology all grow together, even more closely interconnected than the moral virtues, since they are integrated into one and the same specific whole. 'Instead of being a pre-condition of ontology, epistemology ought to grow in and with it, sustaining it amd being sustained by it, being at once explanatory and explained, mutually supporting elements of one true philosophy.'[1] The critique of knowledge or epistemology has no existence as a discipline distinct from metaphysics. To give it a separate existence is to interpose a third term between realism and idealism, between yes and no, which is indeed the pretension of the moderns, with their unthinkable notion of a 'pure phenomenon',[2] which voids the very concept of being of any being, that most general of all our concepts.

It is in this way by the very setting-up of the problem and from the outset, that a thomist critique of knowledge is distinguished from all the pseudo-critiques of idealism.[3]

[1] E. Gilson, *art. cit.*

[2] There is, of course, a perfectly legitimate notion of phenomena, but which is not *separated* from that of the 'thing in itself'. It is the sensible appearance of the thing existing in itself.

[3] More, in order to rightly call oneself a Thomist, it is necessary to maintain that what is 'first of all known by the human intellect' is the being of sensible things, the proper object of our mind, and that there is a primary intellectual apprehension which can be called a 'view' (cp. M. D. Roland-Gosselin, 'Peut-on parler d'intuition intellectuelle dans la philosophie thomiste?' *Philosophia Perennis*, vol. i, p. 730) or a 'perception', or an 'abstractive intuition'. (Cp. J. Maritain, *Réflexions sur l'intelligence*, Annexe ii, and *Philosophie Bergsonienne*, also L. Noël, *op. cit.*) The particular word is unimportant,

Will M. Gilson grant after this explanation that his objections to the possibility of a thomist critique of knowledge are not insuperable, and that the idea of *critical realism* is not self-contradictory like that of a square circle?[1]

In any case it must be obvious why I hold that thomist realism is not only not naïve (if by that is meant the absence of scrupulous scientific accuracy and the thirst for verification; for the word can also imply the naturalness of the procedure, a recognition of the primacy of nature over reflection), but that it is also 'conscious, considered and deliberate' or 'methodical'[2]; still more, that it is truly and rightly critical, indeed the only gnoseological doctrine which rightly merits the name.

These comments on the notion of critical realism are only a perliminary. It is necessary now to touch on some of the questions which are central to the critique itself. In the endeavour to posit any just idea of speculative philosophy and of the two typically distinct degrees of knowledge

what is essential is to recognise that the object is immediately attained (*v. infra*, p. 149), and that our mind does not only 'conceive' of being, as some neo-scholastics (Zamboni for example) have suggested, but also in conceiving it, 'perceives'. It is also necessary to maintain that the *species intelligibilis* is *quo* and not *quod* (cp. p. 144-6); and that the knower divines the other as other as much in the 'first' or initial act (by the *species impressa*) as in the final or 'second' (by the cognitive act itself). If these points are not maintained, there is a break between the critique of knowledge which has been set up and the principles of Aristotle and St. Thomas.

[1]E. Gilson, *art. cit.* Actually it is the conception which certain neo-scholastics have set up of realism which M. Gilson has had in his mind, but I should myself hold that if his objections run directly counter to such positions as that of Jeannière (whom he does not mention) or of S. Picard, or still more those of the phenomenologists, his discord with L. Noël is less concerned with doctrine than method; and it is possible that Mgr. Noël would himself agree that the rôle assigned to the *cogito* in his *Notes d'epistémologie thomiste* (particularly on p. 88) is in fact secondary in regard to what is essential to his mind. This latter must rather be sought in the forcible criticism which he directs against Picard and Zamboni. I rejoice to observe that fundamentally, *e.g.* in a point as important as that of the *immediacy* of intellectual perception and those put forward on p. 97, n. 3, there is an essential agreement between such writers as the lamented Fr. Gemy, R. Garrigou-Lagrange, J. de Tonquédec, E. Peillaube, L. Noël, A. Masnovo, M. Cordovani, R. Kremer, and E. Gilson; the differences which subsist between them being those divergences which circle a fundamental unity, and which attest the possibility of collective work really causing a positive advance in the treatment of philosophical questions.

[2]E. Gilson, *ibid.*

which it implies—the philosophy of nature and metaphysics—it is in effect necessary to treat first of all of noetics, and to establish a certain number of propositions concerned with the much more general problem of the relation between thought and reality. I shall begin then with a sketch of the solution which, I believe, can be brought to bear on these problems by the principles of the critical realism of Aristotle and St. Thomas. This exposition will perchance make it easier to confront thomist thought and those diverse tendencies which have been grouped in England and America under the title of Neo-realism and which in Germany have been christened Phenomenological Philosophy. They are tendencies which seem to me to possess great interest and which I hold possessed of a high degree of intellectual stimulation, but which seem perhaps a little too much under the compulsion of the need to re-act against dominant prejudices and are thus too much and too gratuitously *a priori* and thereby too indifferent to the real depths of metaphysics. I shall only offer on these themes indications and suggestions in passing, for my plan is not to propound a thorough examination of such tendencies, but rather to treat of the degrees of knowledge, the philosophy of nature and metaphysics, and so to fix first of all the gnoseological propositions which are requisite for that end.

II. REALISM AND COMMONSENSE

Nowadays, when the world suffers so much from the mind's self-division, when commonsense has had to put up with so many insults, a realist philosophy usually begins by some attempt to rehabilitate commonsense in one fashion or another and to reopen connection with it. It is an excellent preoccupation, for it teaches philosophy a certain measure of humility, it brings it back into line with nature, and it tends to re-establish intellectual unity at the most fundamental and modestly human point, that point where the thought of the man in the street unites with that of the philosopher. But it is also dangerous, for commonsense is nothing homogeneous and because a large part of scientific progress, above all in its modern expression, runs exactly contrary to it.

If one takes commonsense in the purest sense of the word, meaning thereby that common awareness of truths known as such and the

principles of reason (*habitus principiorum*), that metaphysic which is unformulated, but rich in the possession of certain absolutely fundamental certitudes for human life, which reason by the aid of experience draws from those principles, then, for Thomists, it must be said there is indeed a solidarity between commonsense and philosophy, though at the same time a clearly drawn distinction; for philosophy is a form of knowledge where the fundamental certitudes of commonsense are rediscovered, but as they are formulated by critical reasoning and in a scientific state, and which endlessly extends these certitudes by means of new discoveries and new demonstrations, and which is based not only on commonsense, but on the evident necessity of those principles which the intellect knows by intuition.[1] St. Thomas's position is thus, while maintaining both forcibly and respectfully the coherence between commonsense and philosophy, very different from that of Reid and much more critical.

Simple-mindedness and the superstitious fear of being so are, we may observe in parenthesis, the two enemies of any sane critique. Philosophy in so far as it is wisdom needs to verify its organs and its instruments in the degree to which it advances, and can take nothing from either nature or culture without examination and judgment. But to pretend to 'justify oneself from the beginning'[2] and to take nothing from nature, to make the course of the world consist in the fact of this

[1]Cp. R. Garrigou-Lagrange, 'La Philosophie de l'être et les formules dogmatiques', *Le Sens commun*, Paris, third edition.

[2]E. Husserl, *op. cit.* There is a form of singularly naïve credulity with regard to the possibilities of philosophy in thinking that the latter should constitute itself first of all by a 'radical' act of self-cognition and build itself up progressively on the 'fundamental basis' of a 'full, entire and universal act of self-cognition'. The human mind will never achieve this act of self-cognition. And, moreover, consciousness of self presupposes a self and that in all the stages of knowledge: in the highest degree (metaphysics) as in the lower (the particular sciences), there is a self-return, a critique (here partial and limited, there universal and radical) which presupposes direct knowledge. If philosophy should effectively fill the human mind with a more and more profound self-cognition, it is first of all on condition of being itself constituted and progressively built up exactly as knowledge of being, thus permitting the better penetration of itself by thought (by a reflex process which, thanks to the deviation of idealism, has for two centuries resulted in a corrosive and destructive action with regard to that very knowledge of being on which it is a return).

self-verification, is to shut it up in a state of pure artificiality which belongs to that worst form of simple-headedness, that of the professor. We might well ask of those philosophers who are at pains to 'put an end to all this simplicity' how they managed to get born: they will find it equally hard to get born into wisdom (and so into criticism). Let it be added that, in any case, simple-headed simplicity is better than elaborated simplicity; it at least is in line with nature and curable. In fact, in the course of the history of thought, it is simple-mindedness which by reflecting on itself little by little becomes critical. And such critical progress is destined to endure forever. A Socrates or a Plato, an Aristotle or a St. Augustine by no means ignored the critical problem; the Fourth Book (*gamma*) of the *Metaphysics* is pregnant with a critique without the name[1]; there is a deeper criticism in Albertus Magnus, in St. Thomas or Cajetan, than in Kant. Nevertheless they never dreamed of making a special body of doctrine of the reflective and critical section of metaphysics, so leaving vast regions of knowledge lying as it were fallow; and one must add that in their time, as I pointed out above, there was a much less explicit and defined separation of the critical problems and their corresponding technique. It remains for the Thomists of today, of this 'reflective age', to carry this technique to a point worthy of the thought of their masters. The apparatus of observation which should be applied to primary notions and first principles will always require perfecting: we cannot have done with pre-critical 'naïveté' once and for all. Knowledge precedes reflection, as nature precedes knowledge. Critical reflection must increase with each increase of natural knowledge.

I said that general commonsense was not at all homogeneous. In fact it is made up not only of those intellectual elements of which I spoke, but also of a mass of imagery, according to which, for instance, the sun moves round the earth, height and depth are absolute determinations of space, the antipodes live upside down, etc. It is absolutely necessary to discriminate between commonsense and this imagery: and it is only on condition of their deliverance from the latter that science and philosophy can advance.

[1]Cp. R. Garrigou-Lagrange, ' Le réalisme thomiste et le mystère de la connaissance', *Rev. de Phil.*, Jan.-Feb., Mar.-April, 1931; and *op. cit.*

Finally, it is necessary to keep in mind one of those fundamental apothegms which St. Thomas is never tired of repeating, that the human mind belongs to the lowest stage of the scale of minds. By reason of this, the word *natural* has, when in relation to man, two entirely opposite meanings. Commonsense, in so far as it is 'natural', *i.e.* in conformity with the essential inclinations of the mind, is naturally in the right, agile and intuitive, and goes from being towards God by a sort of spiritual phototropism: and it is in this sense that philosophy is its continuation. On the other hand, when the word 'natural' is taken in the second and wholly different sense, and means 'exposed to all the ordinary perils menacing our intelligence', commonsense has a certain natural propensity for stupidity, for materialism, for the incomprehension of what is living and spiritual; and in this sense philosophy is constantly obliged to correct it.

Thus it is easy to see why the history of thought, at least in so far as it is a progress, is made up of a series of scandals for commonsense, each of which is followed by a higher reintegration and reconquest, a victory for commonsense. Each of our paces on this earth is in itself the beginnings of a fall and its recovery.

THE TRUTH

One of these primary scandals for commonsense is that concerned with the relation between things and thought, and the very notion of the truth. 'What I think is what is,' thinks commonsense (and it is not in the wrong), but at once this affirmation is materialised, sinks into a facile representation, and we begin to imagine that thought is some sort of copy or tracing of the thing, in all ways coincident with it, so that all the conditions of the one are also those of the other.

Reflection is not slow in evoking certain bitter disillusionments. If thought or knowledge is a copy, a tracing of things, if all the conditions of the one are also those of the other, how is it possible to err? It would be absurd to imagine error as the tracing of something which is not. And how, by means of a multiple thought such as the idea of 'living being' joined to the idea of 'capable of sensation' and that of 'capable of intelligence', can we know a thing one and undivided in itself as is what

we call 'man'? How by universal ideas can we know what in its own existence is singular, by theorems of the rectangle the geometric properties of this table? And how can we look at this bindweed or this apple without ourselves participating in the sensations of their vegetable existence?

We are thus constrained to make a certain divorce between things and thought, to recognise that the conditions of the one cannot be those of the other. The way in which things live in our thought in order to be known is not the same as the way in which they live in themselves.

(The mind thus, as soon as it begins to reflect on itself, perceives that there is an *inwardness* of thought, a universe apart from, however open to, things. It is above all necessary to be on guard against the reduction of mental things to spatial imagination,[1] but it is vain to try to overleap the limits of human language; the expressions 'in thought' and 'outside thought' have no more spatial significance than the word spirit, which originally meant breath, or the word God, which originally meant light. In the same way, when we speak of creatures which exist 'apart from God' the use of space is entirely metaphorical. Here it simply signifies that sometimes the thing exists—actually or possibly—for itself in the universe which we see, and, more generally, in the order of simple position or existential effectuation, and sometimes not for itself, nor in this universe, nor in space, nor in the order of the simple *positio extra nihil*, but under quite other conditions which are those of thought, and as a beginning or end of the act of thought; in this case we say: it exists in thought.[2] To draw any argument from the metaphorically material or spatial sense evoked by this 'in' and the 'outside' which cor-

[1] L. Noël has rightly pointed out, apropos of this, that the idealist formula 'what is beyond thought is unthinkable' belongs in fact to exactly this spatial form of imagination, or simply signifies that thought cannot achieve an end without its being, by that simple fact, thought of, 'a sufficiently useless truism'. (*Op. cit.*)

[2] Cp. St. Thomas, *Sum. theol.*, i, 59, 2: i-ii, 86, 1, ad. 2; *Sum. Contra Gent.*, iv, 11, sect. 3: *In IV Sent.*, dist. 49, q. 1, a. 1, sol. 2.

If, on the other hand, we take the word *in* in, I do not say a spatial sense, but even only that of entitative inherence in the subject, then St. Thomas warns us that knowledge considered not as *accidental* to the knower (conditioned by the entitative order implied by all created knowledge), but as a relation to the known and in the pure line of knowledge, is not in the soul as in a subject, in the entitative sense of the word 'in' (because it is outside any entitative order). 'Secundum quod comparatur ad cognoscentem, notitia . . . inest cognoscenti sicut accidens in subjecto, et sic non excedit subjectum,

responds to it is the banal sophism of idealism. But to interdict, under the pretext that the mind is neither a courtyard nor a cupboard, the use of such expressions as 'in the consciousness' and 'outside consciousness'[1] would be to take exception at the outset to that inwardness which is proper to the mind and condemn oneself to describing knowledge with the mind left out, in other words, the interdiction of any penetration into what is knowledge. This comment having been here made once and for all, we can pursue our proper object without tripping over words and without fear of using language which, like all metaphysical terms, only refers to space metaphorically).

Things have two different forms of *esse*, two differing planes of existence: their rightful existence by which they act and hold themselves apart from nothingness, and the existence which they take on in the apprehension of the soul, so as to be known. In order to enter into the sense of sight the bindweed and the apple have to leave off that matter by which they subsist; in order to enter into the intelligence and the reason, they lay by their individuality. In the inward world of our intelligence there are a multitude of distinct aspects or concepts of things which in the world of nature exist in an undivided state, and which lead in one world a life wholly different from that of the other.

quia nunquam invenitur inesse, alicui nisi menti. . . . Secundum quod comparatur ad cognoscibile . . . sic non habet quod insit, sed quod aliud sit. Illud autem quod ad aliquid dicitur, non habet rationem accidentis ex hoc quod est ad aliquid, sed solum ex hoc quod inest. . . . Et propter hoc notitia secundum considerationem istam non est in anima sicut in subjecto; et secundum hanc comparationem excedit mentem in quantum alia a mente per notitiam cognoscuntur. . . . Et secundum hoc etiam est quaedam aequalitas notitiae ad mentem, inquantum se extendit ad omnia ad quae potest se extendere mens.' (*Quodlib.*, vii, a. 4). Which does not prevent things known being in the soul in the not entitative but *intentional* sense indicated in the text.

[1]Cp. G. Gurvitch, *Les Tendances actuelles de la philosophie allemande*, Paris, 1930 (apropos of E. Husserl). What in Husserl's observations is exceedingly true is that the object is not *as such* either in or outside the mind. But it is precisely for this reason that it can exist *both* in and outside the mind. Exactly as Husserl himself cannot expound his ideas without saying at every turn that the object or *cognitum* is 'immanent in the consciousness' (E. Husserl, *op. cit.*), is constituted 'in the depth of the *ego*', that it exists 'in us, in me', 'the meditating ego in me', etc. etc. Besides, it might be pointed out, if the spatial metaphor denoted by all the roots of our human tongues is not a crying fault when one says '*in* thought', it cannot be any worse a crime to say correspondingly '*outside* thought'.

In one the lion devours the antelope, in the other he achieves by means of the copula the predicate, carnivorous. And the possibility of error simply arises from the disparity between these two worlds. All of which shows that thought is not a copy of the thing corresponding materially with its model: there is an abyss between the conditions and mode of thought and the condition and mode of things.

But it also signifies that there is between the thing and the thought, thought that is in act, an incomparably deeper unity than that between a model and its copy. For if things were modified or in some way changed, I do not say in their conditions, their *manner of existence*, but in their rightful constituents, in *what* they are, by sensation or intellection, there could be neither truth nor knowledge, and the theoretician of knowledge could not even begin to lift a finger in explanation, for in that case he would have only two, equally impossible resources: either to say knowledge implies a relation with things but one which deforms them and so they can never be known; or that knowledge implies no relation with things, and that it is an expansion of absolute thought which has only itself for object, a position incompatible with the fact of error and that of negative ideas, and which moreover appears *self-refuting*,[1] since one can only affirm that knowledge itself is this or that in holding it distinct from the act by which one thinks. It has been very well demonstrated in England and in America[2] that the principle according to which every relation must modify or alter its term is a pure postulate, for which no proof has ever been forthcoming, and is incumbent only on idealism; and all efforts to demonstrate it only lead to the declaration that a thing cannot be known without being known, a proposition of which the world was in no particular doubt.

The relation of knowledge is precisely a relation which does *not deform*, which neither alters nor modifies its objective. The scholastics used to say that the relation of the knowing mind to the thing known is a real one (it brings something new into the soul), but that of the thing known to the knowing mind is a relation of reason, which in no way affects or modifies the thing known. The mind's power to transfer

[1]In English in the original. (*Translator's Note.*)

[2]Cp. René Kremer, *Le Néo-réalisme américain*, Alcan, 1920; *La Théorie de la connaissance chez les néo-réalistes anglais*, Vrin, 1928.

things into an immaterial and universal condition, its division of them into diverse aspects, the way it shifts and manipulates them, separating, uniting, comparing them with what is outside itself, all these operations are the conditions of their existence in it and preparatory to knowledge; they do not constitute *the act* of knowing itself and leave intact what the thing in itself is. In the working of this great logical factory there is one secret, mysterious and sacred substance which no treatment can alter—the *essence* or nature, the ontological inwardness of the thing made present to the mind by the idea.

This distinction between the mode of existence of the thing and the thing in itself or its nature is capital in the theory of knowledge. And this exigence, which is immanent in knowledge, to leave intact and unaltered the thing known, in so far as it is known, is so potent that it does not admit that in the act of knowing the thing and the thought should make two: for then there would be some difference between the thought and the thing; the thing, by the fact that it was thought, would not be purely what it is. In the act of knowledge the thing (in the exact measure to which it is known) and the thought are not only united, they are strictly *one*: in Aristotle's words, the intelligence in act is the intelligible in act. This is why I just said that the notion of knowledge as a copy or tracing is altogether deficient, not only by the disparity between the conditions of thought and those of things, but also because of the unity between the thing and the thought.

Thus we see in what sense it is necessary to comprehend the definition of truth which St. Thomas made classic: *adaequatio rei et intellectus*, adequation or conformity between the intelligence and the thing.[1] This conformity has nothing to do with any copy or material tracing. Our knowledge comes originally from the senses, all our words, as we were reminded but a moment ago, are drawn from the sphere of the visible and the tangible: the words adequation and conformity are no exception; but their significance here must be taken with no trace of the

[1]Cp. *Réflexions sur l'intelligence*, p. 24; J. de Tonquédec, *op. cit.* According to the researches of P. Muckle, this celebrated definition does not come from Isaac Israeli, the Jewish doctor and philosopher, who lived in Egypt between 845 and 940, to whose *Definitionibus* St. Thomas attributes it. Transmitted by some compiler or other, it must be regarded as being much older and was in any case prepared for by Aristotle.

visible or the tangible. It is a question of a certain corespondence[1] altogether unique in its own kind between the way in which thought declares itself on a thing and posits it in existence in its own inward act of judgment, and the way in which the thing exists: a correspondence which is an identity, not with regard to the mode of existence in the thing and in the mind, but to that of the thing taken in its pure value as an intelligible object, and which is in one case brought about (or can be brought about) outside the mind, in the other is lived in the mind by the mind as brought about (or might be) outside the mind. For judgment is like an imitation of the creative act by one incapable of creating; it brings the content of the mind into existence outside the mind, not by creation *ad extra*, but by affirmation *ad intra*.[2]

'Truth', says St. Thomas,[3] 'is that conformity of the mind with being, whereby it calls being that which is and not being that which is not.' This conformity is established by the being imprisoned in the thing and affirmed by the mind. When the act of the mind, by reason of which things outside it are referred to existence in a certain determined manner, accords with the way in which things present themselves in (actual

[1]'Secundum proportionalitatem', says St. Thomas (*IV Sent.*, d. 49, q. 2, a. 1, ad. 7).

[2]On the nature of the judgment, see *infra*, pp. 117-20.

[3]*Contra Gent.* i, 59; cp. *In Met.*, iv, 1, 8, n. 651; *In Perih.*, i, 1, 3, n. 7; 1, 13, n. 12. It is notable that this notion of the truth, which is only the explication of what, from the first instant of critical reflection and self-awareness, the mind intuitively perceives that it sees, in fact imposes itself even on those who in theory reject it. Not only does idealism break at the outset against the fact of error, which is nothing but a scandal or an impossibility from the moment that knowledge is thought of as self-engendered, self-posited and self-attained, but also those who, even while they claim to have surpassed ordinary idealism, continue to recoil from the 'thing' posited as such outside thought, in fact only make use of the idea of truth by reconstituting after the event and artificially some equivalent for the *adaequatio rei et intellectus*, which in reality necessarily presupposes that original notion. It is thus that in the new 'transcendental idealism' of E. Husserl—and it is the same for the wholly different idealism of L. Brunschvieg—the *verified* takes the place of the *true* (what is true is that which is presented by a 'synthesis of verifying confirmations', *op. cit.* p. 51; cp. pp. 76, 88, 106, 109): as if 'to verify' were something other than 'to recognise as true', for to define the truth by verification is a non-sense. Similarly Husserl, at the instance of Descartes, takes obviousness as a characteristic of the object of thought (*cogitatum*) taken as separated from the thing, instead of coming from the thing itself (*ens intelligible*) as it is objectified in the mind as the object of judgment.

or possible) existence—or in more exact terms, when the identification operated by the mind between the two terms of a proposition corresponds to an identity in the thing, then the mind is true.[1] And whether

[1]It is a well-known thomist thesis that the intelligence is only possessed of truth, only *says* true or false, in the judgment. A commentary on the passages where St. Thomas treats this question, in particular on the classic passage of the *De Veritate*, 1, 9—*Veritas est in intellectu et in sensu, licet non eodem modo. In intellectu enim est sicut consequens actum intellectus et sicut cognita per intellectum; consequitur namque intellectus operationem, secundum quod judicium intellectus est de re secundum quod est: cognoscitur autem ab intellectu secundum quod intellectus reflectitur supra actum suum, non solum secundum cognoscit actum suum, sed secundum quod cognoscit proportionem ejus ad rem: quod quidem cognosci non potest nisi cognita natura ipsius actus; quae cognosci non potest, nisi cognoscatur natura principii activi, quod est ipse intellectus, in cujus natura est ut rebus conformetur; unde secundum hoc cognoscit veritatem intellectus quod supra seipsum reflectitur*'—will be found in L. Noël (*op. cit.* chap. v), and J. de Tonquédec (*op. cit.* chap. vi). Cp. also M.-D. Roland-Gosselin, 'Sur la théorie thomiste de la vérité, *Rev. des sciences phil. et théol.*, April 1921, and R. Garrigou-Lagrange, *art. cit.*

Here I should like to recall and particularise certain points which seem to me specially important. Conformity to the real ('logically true') is the 'ontological truth' itself for the senses and the intelligence in act. All true knowledge is a knowing of the truth. Simple apprehension is only true in this sense. But truth is only possessed as such when it is itself *known*, and it is only known by the judgment where the mind, in giving its assent to the mental presentation which has been constructed for this end, pronounces on a thing and declares that it is so, *ita est*. 'Quando judicat rem ita se habere, sicut est forma quam de re apprehendit, tunc primo cognoscit et dicit verum. Et hoc facit componendo et dividendo. Nam in omni propositione aliquam formam significatam per praedicatum, vel applicat alicui rei significatae per subjectum, vel removet ab ea.' (*Sum. theol.*, i, 16, 2. Cp. *De Veritate*, i, 3.)

By the simple fact that the mind so pronounces on what is, there is here a reflection *in actu exercito* by the mind on itself and on its proper conformity with the thing ('super ipsam similitudinem reflectitur, cognoscendo et dijudicando ipsam', *In Met.*, book iv, lect. 4). This reflection is not yet a logical or critical reflection (cp. Ferrariensis, *In Contra Gent.*, i, 59), where the mind knows *in actu signato* its act and its concept by a new act and a new (reflex) concept, it is only a 'taking in hand' of itself by the mind, *which is none other than the act of judging itself*, in such a way that Cajetan can define the judgment *illa cognitio quae sui ipsius conformitatem cum re cognoscit* (*In I*, 16, 2). This is very clearly pointed out by St. Thomas himself in the precious elucidations of the commentary *In Periherm.*, book i, lect. 3, n. 9: 'Cognoscere autem praedictam habitudinem (conformitatis suae ad rem) nihil est aliud quam judicare ita esse in re vel non esse; quod est componere et dividere; et ideo intellectus non cognoscit veritatem, nisi componendo vel dividendo per suum judicium.'

And by this there are already known in the primary act (cp. *infra*, p. 117, note 3) the nature (*i.e.* the finality, *i.e.* its conformity with the being of things) of the act and that of the potency or faculty from which it emanates (*De Veritate*, i, 9), which are

it be so or not, we have no other means in each case of knowing than the resolution of our thought into the immediate assertion of sensible experience and the first principles of the intelligence, where our knowledge, being intuitively and immediately ruled by what is, cannot be false.

But what is important for the moment in these remarks is to keep hold of the fact that truth is grasped in relation to the (actual or possible)

known in the second act by express reflection, as the nature of the *habitus* (*ibid.* 10, 9) from which the act proceeds, and the very existence of the soul (*ibid.* 10, 8).

The two following points should be carefully observed. 1. If the *nature* of the act, of the *habitus* and the potency is so known, at the same time as their existence, by express reflection and immediate experience, it is precisely and uniquely in so far as the act is specified by the object and the degree to which the *habitus* and the potency (*ibid.* i, 9: 10, 9) are principles more or less proximate to the act and essentially ordinated to it. (This is a question of an experience of my act, my *habitus*, my intellect, of my mind, in their concrete singularity.) Vide *De Veritate*, 10, 9.

2. My soul, on the contrary is not made known to me by this concrete experience and express reflection, either in regard to its *existence* or its nature, because it is not a proximate and operating principle, but only the radical and substantial one of these operations, and because its essence is not specified by them. (*Ibid.*)

One could add that this implicit and living, not yet express, reflection, by which, before any logical or critical reflection, the mind in the judgment knows *in actu exercito* that it is true, or in conformity with reality—that it is by it also (more than by the simple apprehension of the objects of concepts, where nevertheless already it becomes intelligible in act to itself) that it knows in embryo, pre-consciously, before all introspective reflection, the existence of the thinking self, which only becomes the object of effective knowledge (in a second act) with express reflection. Thus it is in *judging* of things that we have at once an implicit experience of the truth of the mind, and the still hidden or pre-conscious germ, the *initium* of the experience of ourselves. This is why in any reading of the passage (*De Veritate*, 10, 8) where St. Thomas explains how each has actual knowledge of the existence of the soul by (express) reflection on its operations, in particular on its acts of intellection, he implies, I am convinced, by the latter not only simple apprehension, but also and most of all the *judgment*, the act of intellection in achievement. Here is this capital text: 'Quantum ad actualem cognitionem, qua aliquis considerat se in actu animam habere, sic dico, quod anima cognoscitur per actos suos. In hoc enim aliquis percipit se animam habere, et vivere, et esse, quod percipit se sentire et intelligere, et alia hujusmodi vitae opera exercere; unde dicit Philosophus in *IX Ethic.* (cap. 9): *Sentimus autem quoniam sentimus; et intelligimus quoniam intelligimus; et quia hoc sentimus, intelligimus quoniam sumus.* Nullus autem percipit se intelligere nisi ex hoc quod aliquid intelligit: quia prius est intelligere aliquid quam intelligere se intelligere; et ideo pervenit anima ad actualiter percipiendum se esse per illud, quod intelligit, vel sentit.'

existence contained by the thing: *verum sequitur* ESSE *rerum*.[1] And a new problem at once confronts us.

THING AND OBJECT

If the preceding analysis is correct, we see that the same thing can be found at one and the same time in the world of nature, where it exists, and, when it is known, in the world of the soul or of thought; and it is necessary for us to distinguish the thing as thing, existing or able to exist by itself, and the thing as object,[2] set before the faculty of knowledge and made present to it. The *objects* as such of our intelligence are abstracted from actual existence and only hold in themselves a *possible* existence; on the contrary, the objects as such of our senses denote an existence *in act* and grasped *ut exercita*, held in the present if it is question of the objects of external sense, without the determinations of time[3] (or in uncertain time) for those of the imagination, belonging to the past in the case of the objects of memory. The tragedy of modern noetics began when the scholastics of the decadence, and Descartes following them, separated the *object* and the *thing*; the thing thus becoming doubly problematic in its concealment behind the object. What

[1] St. Thomas, *De Veritate*, i, 1, 3, *sed contra*. Cp. *In I Sent.*, d. 19, q. 5, a. 1, also *In Boet. de Trin.*, q. 5, a. 3.

[2] The word 'object' is taken here in the strictest scholastic sense (formal object). It is superfluous to add that in current modern language it has a very different meaning, the opposition between *objective* and *subjective* having finally achieved the transference to the object of all the values proper to the 'thing' or 'the real'. To-day, English neo-realist philosophy and German phenomenology have given back to the word *object* some of its authentic meaning.

As to the word, *thing*, it is taken here in the widest possible sense. If first of all it is taken as meaning 'the sensible and visible thing' which is naturally found by our intelligence (for its ideas all originate in the senses) as the simplest paradigm of reality, it also applies to all reality, of whatsoever kind, spiritual or corporeal, to all actually or possibly posited or able to be posited data existing in independence of the mind.

[3] It is because the existence in act denoted by them is not determined as to time that the objects presented by the imagination are either so integrated into sensation that they merely complete it and thus become one with the object perceived, or are entirely displaced by sensation and the flux of the present and relegated to the unreal. When this reduction does not take place, they may themselves be taken for real objects, or at least mingle in an illusory interpretation (cp. P. Quercy, *Etudes sur l'hallucination*, Paris, 1930). Inversely, when the sense of the present is weakened as the result of a defect in the synthetic activity of the consciousness, it is sensation which takes on an unreal aspect.

then is the value in this notion of a *thing* of which we have made use up to now in this analysis? This question is all the more important in that it is there that the most notable contemporary attempts, in England and Germany, to overcome the dangers of idealism have alike broken down.

The moderns, generally speaking, take the *object* as pure object, detached in itself from any *thing* where it could exist, *i.e.*, from existence independent of my *cogito*, posited in itself before my act of thought and independent of it: existence which one may call in this sense extra-mental, without this 'externality' having the least spatial implication, or which could also be called pre-mental, *i.e.* previous to the knowledge which we have of it, or again, metalogical, not in the sense that to know it it is necessary to repudiate logic or to make use of another logic than logic, but in the sense by which it does not belong to the sphere of logic or of the rightful constituents of the life of the reason, to the sphere of *the known as known*, but is 'beyond' that sphere. It is essential to add that in speaking of extra-mental existence I am not only thinking of actual existence but also and first of all of possible existence, for our intellect, in the simple act of apprehension, abstracts from existence in act, and in its judgments does not only judge of what exists, but also of what might or might not exist, and of the rightful necessities inherent in essences, so that it is first of all with regard to the *possibly real*[1] that it 'justifies itself', or better, confirms itself or makes explicit to itself

[1] Cp. R. Garrigou-Lagrange, *art. cit.*; *Dieu, son existence et sa nature*, 5th edit. 'Essentiae rerum antequam existant sunt *entia realia, ut ens reale distinguitur contra fictitium*, non tamen ut distinguitur contra non existens in actu, secundum distinctionem Cajetani in I. de Entia et Essentia, c. iv, q. 6.' Bannez, *In Sum. theol.*, i, 10, 3.

I have already noted that the irrefragable certainty of the principle of identity (p. 93) which is the first law of metalogical being before that of logic, is included in the first motion of the intellect's self-consciousness. In fact it is in an *actual* (and contingent) existence grasped by it *thanks to the senses* (cp. Cajetan, *In II Anal.*, ii, 13) that the intellect perceives, *by virtue of its proper activity*, this *necessary* law of all *possible* being. From this point of view, and granting that we sharply discriminate between the problem of the existence of the external world, which belongs to the critique of sensation, and that of purely possible extra-mental being, which belongs to the critique of intellectual knowledge, one can say with L. Noël (*Rev. néo-scol.*, Nov. 1931): 'La donnée réelle c'est la donnée sensible,' which is in fact and in the concrete at the same time intelligible. In the concrete complex of our cognitive operations, the senses and the intellect work together; our *direct knowledge* starts from sensory perception interpenetrated with an intellection not yet explicitly conscious of itself. But for *critical reflection* it is necessary

reflectively the value of intellectual knowledge, whence the critique of knowledge must primarily proceed. It is because of their misunderstanding of this fundamental point, because they confound the possibly real with rational being and only recognise the actual as real, that the noetics of so many modern writers go astray from the outset.

Then, the object being taken as pure object separated from all that is extra-mental or metalogical—even if it is recognised that the objects of the senses and of the intellect, having as such their rightful and irreducible value, their constitution, consistency or intrinsic resistance, are not subjective modifications or products of thought, but typical structures given by intuition, the question presents itself of knowing how to explain the stable connections and internal regularities exhibited by these pure objects: and the idea that they are distributed in discontinuous groups because they are aspects (rightly it would be better to say 'inspects') or elements of cognisability of certain ontological nuclei called *things*, capable of extra-mental existence. The idea that the law of connection between the different images which our eyes perceive in looking at this table from various points of view is explained by the existence of a *thing* which is precisely this table, appears simply as one explanatory hypothesis among a crowd of others, equally possible. Some, indeed, hold with Bertrand Russell and A. H. Whitehead that by the principle of economy (Occam's razor) it is better to pass by this hypothesis, which results, rightly speaking, in a form of Leibnitzianism heroically pushed to the absolute, in the passing over of all subjective or material causality and the reduction of reality to a cloud of predicates without subjects flying about in unbounded air and which we endeavour to connect up with each other by purely formal laws. Others, like E. Husserl, endeavour to re-absorb the thing in itself and its existentiality into transcendental subjectivity, one of whose functions will be to set it up within itself: which is only another way of suppressing the thing in any authentic sense of the word, the thing which is extramental and metalogical.

to consider the primary datum in itself (as detached by psychological and logical analysis) apart from intellectual perception *as such*, and this is why I said (cp. p. 95) with R. Garrigou-Lagrange, that the consciousness of the unbreakable certitude of the principle of identity as the law of all *possible* being makes a part of that first (philosophical) act of consciousness which is the point of departure for the critique.

It must be said that this is fundamentally erroneous: philosophical reflection has neither to reconstitute the *thing* apart from the *object* as a necessary hypothesis, nor to suppress the *thing* as a superfluous hypothesis, which is a contradiction in itself, but to affirm the fact that the *thing* is given with and by the object, and indeed that it is absurd to wish to separate them. On this point a truly critical critique of knowledge, one which is entirely faithful to the immediate stuff of reflective intuition, is in accord with commonsense in its apologia for the *thing*. In thomist language, the *thing* is the 'material object' of the senses and the intellect, while what I have here called the *object* (*i.e.* on one hand, colouring, sonority, cold, heat, etc., and on the other, the intelligible *quid*) is its 'formal object': both the material and the formal object being attained at once and indivisibly by the same perception.

If the word *thing* appears suspect as belonging already to common speech, nothing prevents our adoption of a vocabulary more in conformity with the habits of modern science, in other words, more artificial and more didactic, but which also shows a greater desire to guard against the uncritical preconceptions of common acceptance. I shall therefore say, bowing down in my turn before the jargon of pedantry, that as the object is correlative to a knowing subject, to an ontological 'for itself' to which it corresponds, which by reflection on its acts of thought perceives immediately, not, as Descartes thought, its rightful essence, but the fact of its rightful existence, and which we may call the *cis-objective subject*, it is also, not correlative to, but inseparable from (because it is itself) an ontological 'for itself' which precisely takes on the name of the object in so far as it is present to thought, and which we may call the *objectiviable* or *transobjective subject*, not certainly in as much as it is hidden behind the object, but, on the contrary, in the degree to which it is itself grasped as object, and that it nevertheless constitutes an irreducible in which the possibility of new objects to be grasped remains always open (for it can give rise to an indefinite sequence of necessary and contingent truths).[1] The transobjective is not

[1] I should like to quote here the very just comments of J. de Tonquédec on a frequent sophism, which Fonsegrive has expressed in a characteristic formula. Fonsegrive has written: 'The concept of an object which should be at the same time in itself and an object of knowledge is clearly contradictory. . . . For to say object of knowledge is the

an unfigurable field of the unknown, which withdraws in the degree to which new objects are grasped, but that of known subjects indefinitely knowable as objects. Cis-objective or transobjective, the subject is never attained purely as such; but it is precisely this which is attained as object;[1] the process of knowledge consists in making it into an object.

That it is so, every act of (intellectually conscious) knowing tells us, so that if we admit that the mind really attains an *object* valid in itself with which it can deal, we must also admit, and in the same degree, that it attains a (possible or actual) *thing*, a transobjective subject which is one with this object (or which is the ground or occasion of it, if the latter is a rational not real being). Being in effect (the being contained in sensible things) is the first object attained by our intelligence.[2] And what is meant by this name of being, if not *what exists or can exist*; and what is first and immediately presented by this to the intellect, except that it exists or can exist in itself or outside the mind? It is sufficient for each one of us to think for himself to experience for ourself the absolute impossibility of the intellect's thinking of the principle of identity without positing (at least possible) extramental being, of which this first of all axioms expresses the bearing. A primary object which is extramental intelligible being without which nothing is intelligible,[3] there is the inescapable datum of fact which imposes itself on the intel-

same as to say known. . . . But it is entirely evident that the known, in as much as it is known, is not in itself in the degree to which it is known.' (*Essais sur la connaissance*, p. 186). J. de Tonquédec rightly replies: 'This entirely formal argument proves only one thing: that the fact of being is itself different from that of being known. But that the one *is not* the other does not result in the *exclusion of* the one by the other. The concepts are different, but it is not 'entirely evident' that they cannot be realised together in the same being. By this same pitting against one another of abstractions one could quite as well prove that 'the concept' of a moon at once round and shining 'is clearly contradictory' because the moon is not round in *so much* as it is shining.' (J. de Tonquédec, *op. cit.*) The known as known defines the sphere of logic; the known, or rather the knowable, as extramental being defines the sphere of the real.

[1]According as it attains itself by reflection on its own acts as in the case of men, or on, primarily and above all, another object, as is the case with angels, the cis-objective subject is also the transobjective.

[2]Cp. Cajetan, *In de ente et essentia*, q.1.

[3]Cp. R. Garrigou-Lagrange, *art. cit.*

lect in the very core of that reflection in which it takes cognisance of its movement towards its object. This apprehension of being is absolutely primary and is implied in all our other intellectual apprehensions. Hence an object incapable of existing (a rational, not real being) can well be conceived, but on condition of its being referred to being, or to objects capable of existing, *i.e.* transobjective (possible) subjects which the mind makes into objects, and at the instance of which this object is conceived, and without which it could not be built up by the intellect. If the notion of being can be extended to what neither exists nor can exist except in the mind it is by an afterthought and on further consideration, by a secondary improper use of this primary notion, which makes it signify—conceived as it is in the way of being—exactly that which is not.

Advancing further in this corrective analysis of the immediate content of knowledge it can be said that, in the very order of sensitive knowledge, the content of a sensory perception is not only some sensible quality or some stimulation, but rather—in so far as what belongs to a non-intellectual plane of knowledge can be described in intellectual terms—*some thing* impinges on us as an extensive field of determined sensory-affective awareness, and so excites our motor-functions. The behaviour of animals can only be explained if, even at the lowest stages, the stimuli received are not only individualised in the subject in an act of sensation,[1] but are still more individualised on the side of the object, in *something* at once sensory and stimulating perceived by the animal. Ascending the zoological scale, we see this something—which as known by sensation itself is something purely indeterminate underlying sensory perception—become determined, solidified, and distinguishing itself more and more through the synergy of all the external and internal senses and by the effect, it may be of hereditary instinctive estimations, it may be of individual experience. A dog does not only know visual, audible, etc., variables associated in a certain way, he knows his master —without the power of saying so to himself or of knowing why; he has on the sensitive plane, thanks to innumerable associations of similarity, something analogous to the knowledge—this time given by the intellect—which we have of this *thing*, that transobjective subject which we

[1]Cp. Hans Driesch, *Die 'Seele' als elementarer Naturfactor*, Leipzig, 1903.

call his master.[1] And if the sheep flies from the wolf, it is not, as St. Thomas said, that the coloured *object* thus perceived has wounded its retina, but that it sees in it 'its natural enemy'.

All of which presupposes that from the first the external senses have communicated to the animal not only their 'proper sensibility' and at the same time the 'general sensibilities' such as extension, but also, in a wholly implicit and potential state—indiscernible by the senses themselves—a *thing* of which the proper *object* of the senses is an aspect. The ancients, assigning a reason for this fact, explained that the perceptive act of the external senses issues in the thing itself or ends with the thing itself, *terminatur ad rem*, and that in the very degree to which the thing exists outside the knower, *i.e.* in the degree to which it exercises *hic et nunc* an effective action on the sensory organs of the knower. And it is with regard to the thing so attained that they spoke of a *judicium sensus*, by which the senses at once adhere to the object perceived as an existing reality,[2] and which is capable of deceiving us, when affected by the thing otherwise than as it is.[3]

Existence is not a sensible object *per se* but, though the senses are incapable of showing or 'discovering' existence as such, what the intellect discovers (thanks precisely to the perception of the senses) and what it calls to itself existence—existence not only possible, but in act—is nevertheless attained by it from the fact, being rooted in its object. The analysis of consciousness attests this irrefutably: it is on what is given by the external senses (long before the reflex data of any possible *cogito*) that

[1]On animal knowledge and on the difference between grasping a conceptual object in itself (which is proper to the intellect) and that sensory complex in which this object is realised, see the important comments by Roland Dalbiez in the 4th *Cahier de philosophie de la nature*, Paris, 1930.

[2]Cp. St. Thomas, *In III Sent.*, dist. 23, q. 2, a. 2, sol. 1. 'Intellectus noster determinatur ad assentiendum ex praesentia intelligibilis . . . et hoc quidem contingit in his quae statim . . . intelligibilia fiunt, sicut sunt prima principia; et similiter determinatur *judicium sensitivae partis ex hoc quod sensibile subjacet sensibus*.' See also the text from *De Potentia*, quoted on p. 143 (note).

[3]Thus the tongue of a fever patient, covered with a bitter coating, finds sweet drinks sour. 'Per hoc quod sensus ita nuntiant sicut afficiuntur, sequitur quod non decipiamur in judicio quo judicamus nos sentire aliquid. Sed ex eo quod sensus aliter afficitur interdum quam res sit, sequitur quod nuntiet nobis aliquando rem aliter quam sit. Et ex hoc fallimur per sensum circa rem, non circa ipsum sentire.' (*Sum. theol.*, i, 17, 2, ad. 1. See the very excellent commentary on this text by J. de Tonquédec, *op. cit.*)

consciousness ineluctably relies when in search of the original type corresponding to the notion of actual existence, which is undiscoverable apart from the prime origin and significance of this notion. It is under the compulsion of the evidence of the intuitions of the senses that the mind is led to make its primary judgments on existence. As to the animal, if it lacks this notion, the relaxation of its motor-functions by sensation, the thrill of desire or of aversion which makes it run to or fly the object so sensibly perceived, at least gives to it its practical equivalent, and alike attests the value of the existential certitude (not known as such) with which the action of the senses is impregnated.

If the existence in act of a thing actually acting is thus implied by sensation, the at least possible existence of a possible thing, of a possible transobjective subject, is equally implied by intellectual knowledge. On the one hand, in effect, every predicate signifies not only such intelligible determination, but *that which had* such determination; the simplest intellectual apprehension, in perceiving what I call 'triangular' or 'conic' or 'musician' or 'philosopher', perceives some (possible) *thing* which is given to it as an *object* under the formal aspects in question. On the other hand, intellectual knowledge is above all achieved in judgment, and what is a judgment if not the act by which the mind declares the identity between a predicate and a subject *in the thing* or outside the mind which differ *in the notion*, or in their intramental existence? For all veritable judgment identifies two terms notionally different, *sunt idem re seu subjecto, diversa ratione*:[1] the notion of 'the whole' is formally other than the notion 'greater than the part', the notion 'Mr. Bernard Shaw' is formally other than that of 'dramatic author'; and nevertheless when I judge that 'Mr. Bernard Shaw is a dramatic author', or that 'the whole is greater than the part', I posit in actual existence a thing or object of thought, 'Bernard Shaw' and an object of thought 'dramatic author' as identical, and that the possible existence of a thing or object of thought 'whole' and the object of thought 'greater than a part' are identical. I accomplish, in the depth of my thought, with my *noemata* an operation which only makes sense because it relates to the way in which (at least in possibility) they exist outside my thought. The proper func-

[1]St. Thomas, *In I Sent.*, dist. 4, q. 2, a. 1; *Sum. theol.*, i, 13, 12. Cp. *Sum. theol.*, iii, 16, 1, et ad. 1; *Contra Gent.*, i, 36: John of St. Thomas, *Curs. Phil.* log. ii, P. q. 5, a. 2.

tion of the judgment is thus to make the mind progress from the plane of simple essence, or of the simple *object* significant for thought, to that of the *thing* or subject containing (actually or possibly) existence, and of which the thought-objects predicate and subject are the intelligible aspects.[1] If we do not admit that the objects of thought are aspects ('inspects') of actual or possible *things*; that each of them contains, if I may put it so, an ontological or metalogical charge, the rightful function of the judgment becomes unintelligible. The analysis of intellectual knowledge thus gives us the same fundamental evidence in favour of the *thing* or transobjective subject as that of sensitive knowledge.

In another sense than Lask's one can say with him that every judgment supposes an 'unbroken harmony' (on the side of the thing) and—worked by the judgment itself—'a reconciliation after conflict'.[2] The 'embrace' preceding that 'condition of tearing apart' which it is the function of the judgment to 'conquer', is in the thing, in the given transobjective subject.[3] The judgment restores to the transobjective

[1] The notion of the judgment has been in obscurity since Descartes. The Cartesian theory definitely results in making the judgment consist in an act of the will consenting to a *quod* immediately attained by the mind (in idea) as an object conforming to its double (the real *quod* so ideated). One would have to turn a Cartesian despite oneself to see in the judgment (as the tendency of certain contemporary scholastics seems to allow) a comparison between the mental word and the object of thought, and an affirmation of this conformity. On the contrary, what is declared to be is that *object* (predicate) attained in the mental word. The text already cited on p. 108 from the *Commentary on the Metaphysics* does not mean that in the judgment the mind only decides that the concept is conformed to the thing; but rather that it knows *in actu exercito* that it itself is true or conformed to the thing, *i.e.* possessed in itself the similitude of the thing known. ('Ex hoc quod cognoscens habet similitudinem rei cognitae, dicitur habere veram cognitionem.')

[2] E. Lask, *Die Lehre von Urtheil* (cited by Gurvitch, *op. cit.*).

[3] And it is there that it is seen. In fact the mind does not approach from outside the 'distant and isolated' concepts (J. de Tonquédec, *op. cit.*) which he would apply to the real. In throwing itself on the thing in the endeavour to penetrate it, it sees and grasps in it both a diversity of conceptual objects into which it divides it (this is the preparation of the judgment, as it issues from simple apprehension) and the unity of these objects (which it elucidates to itself in the construction of a statement to which it assents, which is the judgment). I would point out here what in my eyes is an error of perspective in the otherwise penetrating pages which J. de Tonquédec has consecrated to the judgment. When he insists on the analytical character of judgment, on its 'first function' which should be 'to discompose' the 'simple thought' (*op. cit.* p. 186), in reality he is speaking not of the judgment itself, but of the preparatory phase which

subject the unity which the simple apprehension (as grasping in it its differing objects of thought) disunited. This unity cannot begin in the mind, since on the contrary the mind breaks it in order to fulfil it anew. It commences outside the mind, in (actual or possible) existence, which in so far as it is held in (*exercita*) is outside the order of simple representation or apprehension.[1] Finally, in order that the judgment should so take place it is necessary that every object posited before the mind should be posited as able to exist outside the mind (or, if it is a question of an *ens rationis*, as if it could exist outside the mind); in other words, it is necessary that our intuition or intellectual perception, far from confronting us with a multiplicity of unresolvable 'simple natures', should confront us with an object found everywhere and everywhere varying, which is being itself, and in which all our notions are resolved without prejudice to the irreducibility of essences. Under these conditions judgment is possible, that is, as a logical movement which in

comes from simple apprehension (itself *in concreto*, vitally ordinated to the judgment); otherwise he does not sufficiently distinguish the simple apprehension or judicative apprehension (which is resolved it may be in the experimental intuition of the senses, or maybe the intellectual intuition of first principles).

[1] Existence is attained and brought to the mind by simple apprehension not in that degree to which it is held or may be held (*existentia ut exercita*) by a subject, but in the degree to which it is itself conceivable *per modum quidditatis*, as constituting a certain intelligible object, a certain quiddity (*existentia ut significata*). It is only in the second *ut exercita, as held*. (Cp. Cajetan, *In Sum. theol.*, i, 2, 1; 82, 3). We should note that the operation of the mind (composition and division), and in the judgment that it is known judgment, is not content with the representation or apprehension of existence; it affirms it, it projects into it as it is effected or able to be effected outside the mind the conceptual objects apprehended by the mind; in other words, the intelligence, when it judges, lives out intentionally itself, by an act proper to it, that same act of existence which the thing exercises or may exercise outside the mind. (It may be said that even in the very act of judgment the transobjective subject is known as subject, that is, intentionally lived by the mind in its function of subject.)

It is here that a new, a capital element of the intellectual order is introduced, which concerns the *esse rerum*, and by reason of which the judgment is called by St. Thomas, the achievement of knowledge ('*judicium est completivum cognitionis.*' *Sum. theol.*, ii-ii, 183, 2). And this in itself presupposes the not expressed, but implicit reflection whereby the mind, when it judges, knows *in actu exercito* its rightful conformity with the thing. (Cp. *supra*, p. 108, note 1.)

On the very important distinction between *existentia ut significata* and *existentia ut exercita*, see J. Maritain, *Songe de Descartes*, pp. 193, *et seq.*

the order of the purely rational (or, in modern terms, *a priori*), progresses from the one to the other. It is not on 'the unity of transcendental apperception' but that (of a simple analogy or proportionality) of transcendental being on which the possibility of the judgment is based.[1] Whether it bears on rational or factual truths, on the 'ideal' or the (actual) 'real', it is thus irresistibly *realist*.

And what is it then that thought wishes to observe if not the thing, the transobjective subject in all its ontological richness, in the infinity of its objectifiable reserves? A pure object (if such a notion were conceivable) would bring with it nothing but itself and having once served and no more, thought could but turn the leaves of the objective world like a book of idle pictures. If the Schelerian idea of a 'perspectivism' of the world of essences has a foundation, it is in the degree to which that world rises from a world of things or of subjects, in which—so that they may each be considered in their rightful essence, or in the relations which mutually support them—new objects of thought are inexhaustibly discoverable as the directions of its attention succeed one another in the human mind.

Indeed the phenomenalist notion of a *pure object*—a notion from which neither the neo-realism of Russell and Whitehead nor German phenomenology has succeeded in breaking free—appears as rightly inconceivable. The unforgivable ambiguity from which it suffers arises from the fact that, in order to conceive it, it is necessary at one and the same time to posit the idea of being (from the instant that one *thinks* of an object) and to reject it (the moment one thinks of a *pure* object). The to and fro between the two terms of this contradiction deludes the mind with the sense of conceiving this entirely imaginary notion; a victim here of its natural propensity for being, that apprehension of being which aids the deceiving idea of its capacity to think that which rejects both this apprehension and all thought. More, by a redoubled equivocation, being, as though it could itself make an abstraction of existence, comes to the point of giving its name to this pure object which makes an abstraction of it, and the philosopher at all cost directs his meditation towards the mirage of an 'ontology' devoid of being. As soon as it is understood that this notion of the pure object demands that one should

[1] 'Quot modis praedicatio fit, tot modis ens dicitur,' St. Thomas, *In Metaph.*, book v, lect. 9.

make an abstraction of being, or substitute *objici* for *esse*, these illusions have no more power to hold us.

Because the primary datum of thought is being it is impossible to think of a pure object separated from ontological stuff holding or capable of holding existence in itself, of a pure object separated from being *in and for itself*, of which the object of sensation or intellection is a determination or an aspect.[1] If this object is not an aspect of a *thing known*, of a transobjective subject,[2] then it must become an aspect of the *thing which knows*: each of the great systems of idealism have endeavoured at any price to escape from this alternative, and they have failed. Husserlian phenomenology likewise fails: it could be shown that when, by means of an ill-conducted abstraction which acts like a separation, it claims to escape any (metalogical) extramental subject, what it does shows up what it says, and it only makes use of his 'I-pole' and the various progressively reconstituted stages of his 'objective world' in thinking despite itself (while all the time rejecting any such thought), of the former as a transobjective subject and the latter as a cis-objective subject existing outside the apprehension of the mind. And when it claims to reconstitute the one or the other in the depth of the transcendental *ego* and the 'universal self-consciousness'[3] it is only persuaded of its success by recourse to a conjuring-trick, which consists in making use of transcendental *being* taken in all its native fullness to reduce it to one of its modalites (to *being in thought*)—in other words, by drawing out of extramental being, which has been once and for all 'put in parentheses', the reality and existence in which the *self* and these *others* are muffled up, to which at the same time all 'real' or 'existent' being is refused, if not in and by the intentional life of the consciousness, yet in their dependence on the transcendental subjectivity[4] and as inseparable from it.

Let it be stated here once and for all: there is no way of 'transcending'

[1] Or which serves as the basis or occasion for the object of intellection, when the latter is a rational not real being.

[2] Or, in the case of a rational not real being, a mental work made by means of such aspects of things.

[3] Cp. E. Husserl, *Méditations cartésiennes*, 4th and 5th meditations.

[4] 'Every imaginable meaning or being, whether called immanent or transcendent, makes part of the domain of transcendental subjectivity, in so far as it constitutes all meaning and being,' (E. Husserl, *op. cit.*).

realism and idealism; no higher position which surpassess and reconciles them: there is only a choice between them, as between good and evil. Any realism which makes accommodation with Descartes and Kant will one day find that it is false to its name.

A DIGRESSION OF PHENOMENOLOGY[1] AND THE *Cartesian Meditations*

It is curious to observe that the origin of the phenomenological movement lies in a form of activation of post-kantian philosophy by contact with the aristotelian and scholastic elements transmitted by Brentano: the notions of the *Wesenschau* and intentionality clearly show this influence. But from the beginning there is a complete deviation in the fact that reflex activity (though clearly recognised as such) has been utilised as if it were primary: it is taken as a basis for immediate *a priori* perception, as though reflection could, in returning on its direct operations and on their already apprehended object, fashion for itself from the latter an object attained before it, more immediately attained (and finally substitute itself for it), and betake itself to the discovery of those evidences which as 'primary in themselves' surpass 'all other conceivable evidences';[2] as though reflex observation, whose proper business is purely critical, could become constituting and constructive.[3] There lies the πρῶτον ψεῦδος of phenomenology.

[1]It is phenomenology as seen by E. Husserl which is in question here. The phenomenological movement in Germany has been highly complex, and it would be a mistake to think of Husserl as its sole initiator. Without speaking of the divergent tendencies attached to the name of Max Scheler, and to-day to those of Nicolai Hartmann and Martin Heidegger, etc., there is the Munich school, which does not follow Husserl's neo-idealism, and of which it is difficult to appreciate the full importance as long as the teaching of Prof. Alexander Pfander has not been published in any complete form (cp. A. Pfander, *Logik*, Halle, 1929). The object of my study being what it is, it is sufficient here to concentrate on that highly significant aspect—which is the best known in France—exhibited by E. Husserl. But it must be clearly remembered that the consideration here is thus limited.

[2]E. Husserl, *op. cit.*

[3]This need to constitute and construct in the heart of the reflective process is marked on nearly every page of the *Méditations cartésiennes*.

This is why phenomenology regards itself as all philosophy, and as replacing the 'naïve ontology' of the older metaphysics. On the other hand, in my opinion what can be retained—after a process of careful straining—of phenomenology and 'the discoveries' in which it glories belongs only to the reflective and critical parts of philosophy. The 'transcendental experience' which it disengages is, in what is authentic in it, nothing

This fundamental misunderstanding is bound up with the phenomenological ἐποχή[1] in so far as it 'puts in parentheses' the whole register of extramental existence and thus separates the object (the essence-phenomenon) from the thing—an ἐποχή of which it must be said that, like the cartesian doubt, it would be legitimate *ut significata*, as envisaged eventuality—recognised as impossible—but which implies a contradiction *ut exercita*, as really lived and experienced. In demanding from the outset, by an imposed postulate whose conditions have not been critically examined, that one should livingly put extramental being 'out of bounds', the possibility is practically and by presupposition admitted of stopping thought short at a pure object-phenomenon, *i.e. of thinking of being while refusing to think of it as being*. It is not seen that the cartesian assertion, according to which, in order to build up a philosophy radically free of 'preconceptions'[2] not based on reason, the mind must first of all cast out *in actu exercito* every certitude concerned with extramental being, is itself a pre-judgment born from a naïvely material conception of the life of the mind: for to allow nothing to enter into a material recipient which has not previously been verified it is essential first of all to empty the receiver of all content; but, since the power of auto-intellection and auto-criticism, of a complete return upon itself, is the privilege of the mind, the latter has no need to empty itself in reality of its certainties in order to critically verify them: exactly that of which it is and remains really certain *in actu exercito* it can ideally represent to itself in doubting of it, in order to realise whether such a doubt is possible, and it is only by such a suspension of judgment, signified, not lived, that it is possible to make critical proof of the primary truths. It is

other than the critical reflection of the mind on itself, and the only 'novelty' is the assigning to it of an impossible task of construction. The first period of phenomenology (the description of the *cogitata* as such) presents from this point of view much greater interest than the second (the wholly artificial reconstitution of 'aprioric structures' of universal reality).

[1]'Suspension of judgment' is the phrase of Pyrrho and the ancient sceptics, used here in a methodological sense.

[2]It is in *starting from this* that it reflectively confirms ('justifies') to itself the veracity of the senses and its own certitude of the existence of the sensible world. So that to pose, as is so often done, the problem of the bearing of intellectual knowledge by bringing into question, as real being other than the *ego*, not first of all possible extramental being but only the existence or non-existence (in act) of the sensible world, is a non-sense.

because the mind is capable of a perfect return upon itself that it can undertake a critical (reflex) description of its *cogitata* as *cogitata*, without any need to practise the ἐποχή of Husserl.

Still more he has not seen that the first, absolutely unbreakable, apodictic certainty of the intellect is concerned with *possible* (metalogical) extramental being, of which it knows in an entirely and eternally certain and necessary way that in so far as it is it is not nothing. But his misunderstanding of the proper life of the intellect as such and confusion of it with that of the senses gives rise to the supposition that this first certitude should bear on the actually given, in the search for it in the pure *cogito*.[1] And he sets *ego cogito cogitatum* as the point of departure for all philosophy; keeping faith with the primary evidence of intuition, it should rather be *ego cogito ens*, the starting-point, not for the whole of philosophy, but of that reflective part of first philosophy which is the critique.

The effect of this prime deviation is that the very notion of intentionality, in passing from the hands of the great scholastic realists[2] to those of the contemporary 'Neo-Cartesians' (it is E. Husserl's own description of himself in his last book), has lost both its efficacy and its value. How indeed could it be otherwise since its whole meaning comes first of all from its opposition to the *esse entitativum* of the extramental thing? Intentionality is not only that property of my consciousness of

[1]'My *ego* given to me in apodictic fashion—the sole being which I can posit as existing in an absolutely apodictic manner. . . .' (E. Husserl, *op. cit.*) My own existence (reflectively grasped is certainly the most basic and irreducible of all existences *in act* given to me. That is why it is practically more important to me than any other. But all actual existence which is not that of the Pure Act is contingent. And it is an *absolute necessity* (but in the order of *possible* existence or of essences) which should include the most basic and irreducible data of *apodictic* knowledge or *science*. This is why the prime datum of speculative knowledge is the principle of identity, not that of the self. The ancients rightly held that the certitude of my own existence, absolute as it may be, is not for all that a *scientific* certainty, because it bears on a contingent object, and so, on the side of the object, it lacks that necessity which is required to constitute a knowledge infrangible *at all points*.

[2]*Cuique suum*. It is singular to see E. Husserl, and many of the critics who write of the phenomenological movement, paying honour to Brentano for his discovery of intentionality. This discovery is at least seven centuries old (for neither was St. Thomas its inventor). It is possible also to observe the dependence of certain characteristic aspects of phenomenology with regard to Duns Scotus, in particular to his theory of ideas and the *esse objectivum*.

being transparent in a given direction, of seeing objects in its own depth, it is above all that property of thought, the privilege of its immaterial nature, by which being in itself and outside the mind, *i.e.* entirely independent of its action, becomes existent in it, posited and integrated by thought for thought's own action, and by which henceforward both exist in it in one and the same supra-subjective existence.

If we do not go as far as this, if we refuse to the mind the power, which is only real if being itself is real, of 'surmounting' and interiorising being in itself, the pure transparence of intentionality is inevitably turned material, being regarded as a 'constituent' of the object through its 'structural laws',[1] by the asking of it to constitute *the other* and confer on it its own proper meaning 'starting from my being as myself'[2] (whereas on the contrary it brings the *other* to me 'starting' from its otherness, and makes me be the other). And even, as so often happens with Husserl, one seems so to speak to brush against the true nature of knowledge, always in the end he passes on one side of the great secret. It is left dark that knowledge does not need to come out of itself to attain the thing which exists or can exist outside itself—the extramental thing which has caused the prejudice it is desired to exorcise. It is in thought itself that the extramental is attained, in the concept that the real or metalogical is touched and handled, there that it is grasped; for the very glory of thought's immaterial nature is that it is not a thing in exterior space extended over another thing, but rather a life superior to all spatial order, which, without quitting itself, perfects itself with what is not itself—the intelligible real whose fecund substance it draws

[1]Cp. E. Husserl, *op. cit.* We know that Husserl, the declared enemy of all subjectivism (in the usual sense of the word), opposes his doctrine of transcendental subjectivity to that, into which Kant fell by inconsequence, which shuts up the mind in a subjectivity which might be called entitative, and according to which the activity of a subject considered *secundum esse naturae* produces or engenders the object of knowledge. For him (see Gurvitch, *op. cit.*, p. 22) the object is neither produced nor engendered, it is by an act of attention or fixation, not of formation, that the intentional synthesis is constituted. But in order that this constituting synthesis may take place in one way or another the essential thing is that it should be constituting with regard to an object (which is why Husserl admits in his own way the 'Copernican reversal' of Kant). To make this the proper function of intentionality is to misunderstand precisely what is most typical in it.

[2]E. Husserl, *op. cit.*

from the senses, gathered by them from the (materially) existent in act. The way to evaporate the rightful mystery of knowledge is precisely to exorcise extramental being, to suppress these ontological (metalogical) 'for themselves', entirely independent of my thought, which my thought makes its own by making itself into them.[1]

Despite the important services which it has rendered to contemporary thought (above all, perhaps, like Bergsonism heretofore by its extra-philosophical influence, notably in the stimulation which various scientific disciplines have received from it), despite its original realist impulsion and its liberating virtue in regard to monism and mechanism, phenomenology runs the risk from the outset of ambiguity. Nothing is more instructive than the way in which, finally vanquished by the false 'radicalism' of Cartesianism, it has ended up to-day, proud of its recovered chains, by indubitably returning to the kantian tradition and by affirming a new transcendental idealism, which is certainly different from kantian idealism, but mainly in the fact that it refuses to 'leave open the possibility of a world of things as such, under no matter what name of limited-concept.'[2] While 'naïve metaphysics' operates with 'the absurd thing in itself'[3] on the other hand, 'for phenomenology . . . being' is a practical idea—the idea of an infinite labour of theoretical determination',[4] and the world also 'is an infinite idea, relating to an infinity of concordant experiences'.[5]

Despite the reserves necessitated by the difference of the two cases, one could say that Husserl's position in regard to Kant is comparable to that of Berkeley to Descartes. Berkeley also, in his battle against the 'thing', believed that he was avenging intuition; in suppressing extramental 'matter' he believed he had retrieved, he also, 'the meaning

[1]These comments do not only apply to the idealism of Edouard Le Roy, of Leon Brunschvieg, and so many others, or to the phenomenology of E. Husserl, but also to the solipsism of Schuppe and the general immanentism of Rickert (*see* on the work of the two latter, A. Krzesinski, *Une Nouvelle Philosophie de l'immanence*, Paris, 1931).

[2]E. Husserl, *op. cit.*

[3]*Ibid.* I will willingly concede the absurdity of the *kantian* 'thing in itself', in itself unknowable and *separated* from the phenomenal (in place of manifesting itself through it). But it is of everything capable of an extramental or metalogical existence of which E. Husserl is speaking here.

[4]*Ibid.* [5]*Ibid.*

which the world (of objective realities) has for all of us, anterior to all philosophy.'[1] Husserl, in order to free transcendental idealism from the 'absurd thing in itself', reconstitutes by a more and more artificial procedure the whole universe of realism in the heart of the transcendental *ego* 'starting from its rightful being'.[2] Though one may call this 'formidable' task the discovery of the apriori constitution of the world of the real and of all possible being by the complete explication of the transcendental *ego*, it remains in reality a reconstitution, and, like all reconstitutions, presupposes an original: the world of naïve realism, from which phenomenological idealism is suspended like a parasite trying to suck into itself its subject: it is by it that it lives, not only with regard to the various levels or stages of objectivity which it reconstitutes after first of all having put them in parentheses, but also in regard to its notional instruments, the *Denkmitteln* which it employs, and which are gathered by way of analogy from the conceptual register of the knowledge of things.

Nevertheless an unexplained residuum remains outside this universal science: the 'naïve' belief in extramental reality. Even if this belief is illusory it is necessary all the same to assign the reason for such a universal and irrepressible illusion; but in that case the method of phenomenology has been betrayed: and if this belief has no need of explication because it finally finds itself reconstituted in the interior of the phenomenological ἐποχή, then it is not illusory and the thing in itself is not absurd, but it is phenomenology to which an end has been put. The truth is that the belief in extramental reality is not reconstituted, but replaced by a substitute; a dispensation from the need to explain it is supposed to be supplied by the production of a counterfeit in the idealist style.

Thus contradiction is in the heart of the business. Extramental being which one began by putting in parentheses in forbidding either its denial or its affirmation finds itself (by the simple fact that in erecting a philosophy one accepts *in actu exercito* the separation of the *object* and the *thing*) practically denied and finally cast out (without ever having been criticised and without even a question whether this separation was possible—a fundamental omission which should cause transcendental neo-Cartesianism to be regarded as a system which is *radically* naïve). Much more logical than Descartes, understanding—but in order to

[1]*Ibid.* [2]*Ibid.*

make himself more cartesian than Descartes and to sacrifice the notion of extramental being—that the cartesian problem of passing from the consciousness of my thought to certitudes concerning the being of things (thanks to the divine veracity) is a 'contra-sense',[1] E. Husserl has undertaken to construct his entire philosophy without coming out of the phenomenological ἐποχή. Nevertheless it comes about that he leaves it despite himself, since he reconstitutes so admirably in the interior of the ἐποχή all that he had left outside and put in parentheses, that in the end everything that was in parentheses finds itself transferred to the interior of the transcendental ecology—everything except extramental subsistence and existence, which have been turned out of the parentheses at the other end and cast out into nothingness. But then there can be no more parentheses and no more ἐποχή. In maintaining the ἐποχή to the last limit it has been suppressed—an admirable achievement certainly in transcendental sleight-of-hand, but equally undeniably a glaring contradiction in fact.

The ambiguity of this last stage of phenomenology is such that it only needs a momentary misunderstanding, a lapse of mind, to think out in realist terms this renovated transcendental idealism. What in effect has been reconstituted in the heart of the 'intentional consciousness', before the *cogito*, is the whole universe of Nature and Culture, and it is certainly true that in so far as it is known this is in the mind. When one involuntarily thinks that this same universe is also (and first)—at least possibly—in existence outside the mind, one has passed surreptitiously into the world of realism. I am indeed not at all sure that it is not thanks to such unobserved slips of mind—the revenge of nature—that idealist philosophers are able to believe that they have thought out their systems.

Finally, it seems that from the beginning phenomenology has advanced by a form of unnatural hybridisation between ontology and logic. It is a grave thing for a philosopher not to be able to distinguish between the *ens reale* and *ens rationis*, and he runs the risk, despite all his protestations against castle-building, of setting to work on the 'elucidation' of a universe of fictions, and of leaving on one side the proper duty of an honest philosophy, which is to assign the reasons for the given data and to win knowledge of them. Other inconveniences will also

[1]E. Husserl, *op. cit.*

spring up. In excluding the transobjective subject, the rightful effects of materiality are introduced into the very world of intelligible essences and the 'a priori', and it is vain to try not to treat this world in empiricist fashion,[1] as those who think with their eyes and their hands treat the concrete world of the sensible; for if the intellect in its proper life is pure, I do not say of those experimental deposits from which it draws all its substance, but from all material co-action and empiric servility, it is because all the contingent, the potential and the material, all that inert mass which can be defined by its resistance to intelligibility, makes part of the world which it is absorbed in and it knows, but is situated outside it as is that world itself. On the other hand, by the fact that the essences perceived by the mind are no longer seized in transobjective subjects existing outside the mind and themselves included in the flux of time, the extra-temporal objects of the intellect find themselves, in an unexpected re-appearance of Platonism, separated from real and temporal existence; and in order to reunite them there is nothing to be done but to invert the intellect, giving time dominance over being, whether like M. Bergson one seeks to substitute time for being, or whether with M. Heidegger to establish being over time. This is to assure the existence of realism by knocking away its foundation.

CONCERNING IDEALISM

It must be obvious from these considerations that the problem of the thing and the object[2] is the central-knot of the problem of realism.

[1]As phenomenology essentially declares that it is an 'eidetic' description or analysis, it would be well, it seems, to remedy this inconvenient point. But the remedy remains insufficient. In making the object of the various intentional functions freely variable, by imagination, in order to retain only their *eidos*, a rightful necessity grasped in an essence is not set before the mind, but only the statement of a factual necessity of the intentional life, a succedaneum of the veritable intelligible necessity. Victor Delbos's comment that phenomenology runs the risk of subjecting thought to the indetermination of the sub-logical, finds in this point in particular another verification.

[2]Various useful comments on this problem will be found in J. de Tonquédec's book which I have already cited, and in that of L. Noël. Cp. René Kremer, 'Sur la notion de réalisme épistemologique,' in *Philosophia Perennis*, vol. i, p. 739.

In those passages of *Réflexions sur l'intelligence* to which L. Noël is certainly referring (*op. cit.* pp. 153-4), my discussion did not exclude reflective descriptions and affirmations, rather it pre-supposed them. Affirmations which moreover are not simple

Philosophers imbued with Cartesianism call all authentic realism 'naïve'. However much one demonstrates that to apply such an appellation to aristotelico-thomist realism is puerile, they will not be undeceived, for to them this naïveté consists in beginning with an act of knowledge of things and not of knowledge of knowledge. Let it be so! The mind must in fact choose its own way from the beginning, must make a primary decision, which will command all its destiny. But the first act of reflection shows that those who have chosen according to nature and without rejecting the first ray of light which shines across our hearts, the first objective evidence, have chosen wisely: and those who choose against nature, who demand another light without pursuing the first, have chosen foolishly; wishing to commence with what comes second.

One does not think of thought until after having thought of the thinkable 'good by existing' (the real or at least possible); the first act of thought is being independent of thought. The *cogitatum* of the first *cogito* is not *cogitatum*, but *ens*. One does not eat the eaten, one eats bread. To separate the object from the thing, the objective *logos* from the metalogical being, is to violate the nature of the intellect, at once rejecting the primary evidence of direct intuition and mutilating reflective intuition (that same reflective intuition on which everything is made to depend) in the first of its immediate presentations. Idealism sets an original sin against the light in the very heart of its whole philosophical construction.

Since Leibnitz the whole endeavour of idealism has been directed to the suppression of all material or subjective causality in order to leave only formal causalities and at the same time to annihilate the 'thing', every cis-objective or transobjective subject, in order to leave only pure objects. Unless its full value is fully restored to the thing it is a vain endeavour to call oneself a realist. Philosophy has become more and more purely reflective, it is only equivocally that it can now call itself

empiric registrations, but rather analyses of a special type, capable of discerning the intelligible constituents and even the nature, as St. Thomas says, of the intellectual act and the intelligence. If on the other hand it is proper to distinguish what is the object as object from what is the object as thing, I do not hold that that is the place to pause between the first and second considerations to solve certain epistemological questions (cp. *op. cit.*, p. 228); as if the notion of a *pure* object which should not be either a thing or that a thing could not be based upon, was, even by abstraction, thinkable.

either the philosophy of nature or metaphysics? for what is the proper object of natural philosophy if not the world of things subject to time and movement, which is also that of the experimental sciences at work on it from another angle? And to what is metaphysics directed except towards a world of truths above time which are realised in temporal existence, and towards a supreme super-temporal reality pre-eminent above all things? While an exclusively reflective philosophy does not judge what is, but the idea of what is, and the idea of the idea, and the idea of the idea of the idea of what is, and all this with a tone of superiority because it has not stained its hands with the real or run the risk of its scraping the skin off them, the courage proper to natural philosophy as to metaphysics is to face these extramental realities, to turn its hand to things and judge of what is. And their rightful humility is to take their measure from things—which is what idealism will not do at any price.

It is scandalised by the idea that an intelligence may be measured by a thing, by an ontological 'for itself' which exists apart from it—in an existence less noble than that which knows it, and to which the intellect needs to unite itself by an effort of submission, which it has no power ever to exhaust. This scandal arises from the fact that intelligence exists not only in the created, but at a very low point on the ladder of spirits; an angelic intellect is not intelligence *per se*: how much less then the human intellect! But indeed the privileges of intelligence suffer no detriment by this, for, far from opposing to the intellect I know not what obstacle of matter absolutely without any connection with its nature, the being of things has a secret and as it were sleeping aptitude for the embrace of the mind, and in taking its measure from them our intellect in reality takes its measure from the intelligence, intelligence in pure act, by which things are measured and from which they draw their being and their intelligibility (and on the other hand, it is again intelligence —the intelligence which illumines, the created participation in the intellectual light of God—which renders things intelligible in act and which by means of the senses and of things determines the intellect which knows;[1] and finally it is it which, under the same illumination

[1] 'Quae a nobis materialibus conditionibus sunt abstracta, fiunt intelligibilia actu per lumen nostri intellectus agentis.' (St. Thomas, *Comm. in de Sensu et Sensata*, lec. 1.) See *infra*, p. 152, note 1.

derived from the Primal Truth, achieves actualising its object within itself, and makes it so much its own—this is the office of the mental word and its letters of spirituality—and it only sees—here below—what it itself expresses, transparent with its own transparence.[1]) The mystery of creation alone can allay the scruples of idealism; and it is this *ascesis* proper to a created intelligence that idealism expressly rejects.

But an obscure and powerful teleological motivisation also intervenes, which idealism unconsciously obeys, so playing false at its own game. The point for it is precisely *not* to be led to a certain end, to avoid a certain final conclusion. If from the very beginning there is so careful an avoidance of things and their extramental consistency regnant over our thought, it is in the need above all, by a secret instinct all the more imperious that it remains unavowed, *not* to come finally face to face with a supreme and transcendent reality, an abyss of personality to which all hearts are open and before which all our thoughts must needs adoringly bow. The bastions and fortifications of idealism thus show themselves like huge works of defence against that Personality who is divine.

Nothing is more significant than these colossal works. It suffices for things to exist for God to become inevitable. Accord to a point of moss, to the smallest ant, the value of their ontological reality, and we cannot escape any longer from the terrifying hands which made us all.

Under these circumstances the humblest definitions of grammar take on a singular and powerful significance. 'The first person is he who speaks.' This describes what I have called the cis-objective subject. He says 'I'—not certainly in the sense of Husserl's 'pure I', stripped of all entitative subjectivity—but because a mysterious ontological and metalogical depth, a universe unto itself and core of liberty, knows itself in this *I*.

[1]Cp. *infra*, p. 153. It goes without saying that I am speaking here of an entirely interior and spiritual expression. The deeper is the intellectual intuition, the more vital and intimate is this spiritual expression by which it is accomplished, and the more inexhaustible it appears in relation to oral and material expression. Cp. the preface to my *Philosophie Bergsonienne*, 2nd edit. It is by design, on the other hand, that I have used the phrase: 'it only *sees*, etc.,' for when the intelligence knows without *seeing* an intelligible, for example, divines or obscurely experiences, or plays with a beautiful thing, the fact is that it knows, I do not say without concepts, but by making use for formal means of something other than concepts, *e.g.* affective connaturality or, as in aesthetic perception, of the intuition of the senses themselves.

Surrounding it there is an immense multitude of transobjective subjects, who are described by the second person, the one 'to whom one speaks' and who speaks to us, each a mysterious core, rich also in a certain metalogical and ontological depth, and whom in this relation of *me* and *thee* wish to be treated with respect, and with love. Thou spring, thou fish, thou swallow: it is charity which comes to supernaturally perfect our feeble philosophical aperception of the relations between beings, and St. Francis will speak of Sister Water and his brothers, the birds and the fishes. No attitude has a more profound metaphysical truth, and it is one which is essentially realist. Evidently for M. Brunschvieg there is no sense at all in a conversation with a bird.

And all these things to which 'I' speak familiarly, what is it that they say? 'The third person is he of whom one speaks.' *He* is in all their mouths, all things speak of him. And while I know him not myself I only hear the voices of all creatures speaking to one another of him: but when I do know him myself—with no other intermediaries than the light and the enunciations of faith—then oh then, it is *Thou*, yet more hidden and more mysterious and more free than all created things or than all men that might be created, it is thou that I hear!

Things are opaque to us and we are opaque to ourselves. Pure spirits see themselves and see all things transparently. For them the object is the subject grasped in its entirety and its inwardness, not parcelled out in aspects as it is for us. But for them, as for us, the distinction between the object and the subject persists, their glance does not exhaust the obediential potency which is in them, nor the sum of all the predicates which will come to things in the progress of time. Subject and object are absolutely identical for God alone, like existence and intellection. He knows himself completely and all things in himself, for his act of knowledge is itself his infinite essence.

Thus then the world of authentic realism is a world of things existing in themselves, a world, an immense family, a *symposium* of individuals and personalities in interaction, as the thing which knows is itself either an individual or a person, and this thing which knows is there in the midst of the others in order to draw them in a certain way into the heart of itself and to feed itself on exactly that which they rightly are.

'There are two ways', says St. Thomas, 'in which a thing can be found perfect. In the first, according to the perfection of its own being, in what is proper to it according to its own rightful species. But because the specific being of one thing is distinct from the specific being of another thing, the result is that in every created thing the perfection which it possesses lacks absolute perfection in the degree to which equal perfections are possessed by all other species, in such a way that the perfection of any thing considered in itself alone is imperfect, as being only part of the total perfection of the universe, which is born from the union of all these particular perfections gathered together in it.

'And therefore, in order that there may be a remedy for this imperfection, another mode of perfection is found in created things, according as the perfection which is the property of a thing is itself found in another thing. Such is the perfection of knowing in so far as it is such, for in the degree to which it knows the known in a certain way exists in it. . . . And according to this mode of perfection it is possible that the perfection of the entire universe may exist in a single and particular thing.'[1]

III. OF KNOWLEDGE ITSELF

This passage from St. Thomas introduces us into the very mystery of knowledge itself. It is time to ask ourselves in what this mystery consists, what is the intimate nature of what we call knowing. It is, it must be admitted, a question which modern philosophers have not begun to treat, because they have never made up their minds to ask it. Neither Descartes, nor Kant, nor the neo-realists, not even the phenomenalists (except, it seems, M. Nicholai Hartmann, who has at least profoundly felt the antinomies with which it is pregnant),[2] have rightly faced it. It is

[1] *De Veritate*, 2, 2.

[2] Cp. N. Hartmann, *Metaphysik der Erkenntnis*, 2 Aufl., Berlin, 1925. In a recent address to the Kant-Gesellschaft (*Zum Problem der Realitätsgegebenheit*, 1931, Heft 32), Nicolai Hartmann has stressed in the most remarkable way the insufficiency of the standpoint of ordinary phenomenology, and the fact that knowledge implies a relation with a being independent of the mind, a 'transobjective' reality. With the current conceptions of phenomenology 'man vergisst die Hauptsache, die Beziehung auf das Seiende, dem die Erkenntnis gilt; ja man hat schon in der Problemstellung das Erkenntnisphaenomen verfehlt. So ergibt sich die paradoxe Schlage, dass gerade diejenigen Theorien, die am meisten von Erkenntnis sprechen, die eigentliche Erkenntnisproblem gar nicht kennen.'

The return to a realist attitude which was shown by many at the meeting of the Kant-Gesellschaft in May 1931 is a most striking fact. Unfortunately a misunderstanding of the rightful nature and proper value of the object of the intelligence as such, as on the other hand of the bearing of the intuition of the senses, has resulted for N. Hartmann, in forgetfulness of the fact that the transobjective intelligible must be sought for in the *possibly* real, and, again, that the senses attain to the extramental real as such, as existing and acting *hic et hunc*, in a demand for the *data of reality* from 'emotionally-transcendent' facts (*i.e.* facts where emotion implies and declares the extramental reality of what affects us). His book contains a brilliant analysis of such facts; and it is obvious that in the concrete our life of knowledge and of emotion are mutually inclusive. But it is also clear that the facts in question, and the sense of the 'toughness of the real', imply the primary value of certain facts of knowledge included in them; by refusing to consider, thanks to philosophic abstraction, the proper order of knowledge apart from anything else, and the treatment in this order of the problem of the thing and the object, the realism of N. Hartmann limits itself to the classification of the evidence of the general consciousness, and remains powerless to base it on reason, to defend and confirm it by a truly critical analysis of the value of knowledge in its various degrees, as is required of metaphysical wisdom.

the peculiar merit of St. Thomas and his great commentators to have frankly formulated this problem, which is the most important one of all noetics, and which cannot be treated as it should be without the bringing into play of the most sensitised metaphysical equipment; and not only indeed to have formulated it, but to have provided the most profound solution. Before attacking it, they remind us of the need to raise our minds to a higher level, for we then enter into another order of things, *et disces elevare ingenium, aliumque rerum ordinem ingredi*: the errors which are so frequent in this region proceeding from the fact that we too often confound a spiritual happening like knowledge with the material happenings which feed our common experience.

I shall take the liberty, *brevitatis studio*, of proposing here a very succinct résumé in seven points of the thomist doctrine of the nature of knowledge. The advantage of these forms of condensation is that they constrain the mind to the production of a synthesis occupied solely with essentials.

1. There is a rigorous correspondence between knowledge and immateriality. A being is knowledgeable in the measure of its immaterialism.

2. Why is this so? Because to know is, by an apparent scandal for the principle of identity, to be in a certain way another thing than what one

is; it is *to become another thing than oneself*, 'fieri aliud a se', *to be or become another in so far as it is another*, 'esse seu fieri aliud in quantum aliud'.[1] Which presupposes, on the one hand, the emergence of the subject capable of knowledge from matter (which restrains or imprisons things in the exclusiveness of their own being); and on the other, a form of union between the knower and the known transcending any material one; for when matter receives a form it is in order to constitute with it a third term, a *tertium quid*, which is informed matter. Thus a material being can become *other*, *i.e.* can change or modify itself, it cannot become *the other*. While the knower, while all the time keeping its own nature intact, becomes the known itself and is identified with it, the knower being thus incomparably more *one* with the known than the matter with the form.[2]

3. *To know* is to the senses and the intellect, taken as such as cognoscitive functions, as *to exist* is to the essence, to the quidditative function. It is a form of existence which defines knowledge. To know does not consist in doing something, nor in receiving something, but in a degree of existence greater than that of being removed from nothingness: it is an active, immaterial super-existence, by which a subject exists no longer only in an existence limited to what it is as a thing included in a certain kind, as a subject existing in itself, but with an unlimited existence in which it is or becomes so by its own rightful activity and that of others.

This is why in God, because he is infinite, existence and knowledge are purely and absolutely one and the same; between the *esse divinum* and the *intelligere divinum* there is not the slightest, even virtual, distinction;[3] his existence is his very act of intellection.

Having come to this point we can comprehend that the formula 'to become the other in as much as other' most certainly defines know-

[1] Cp. *Réflexions sur l'intelligence*, p. 53. John of St. Thomas, faithfully reproducing the thought of Aristotle, St. Thomas and Cajetan, does not say, as H. D. Simonin does in an otherwise perspicacious article, but not on this point (*Rev. des sciences phil. et théol.* May 1931): *become the similitude of the object*, but *become the other*, *become* (immaterially and intentionally) *the object* itself.

[2] Averroes, *In III, De Anima*, comm. v, *digressionis parte ultima*, q. 2.

[3] Cp. R. Garrigou-Lagrange, *Dieu, son existence et sa nature*, 5th edit., p. 399.

ledge, but as taken first of all in what characterises human knowledge, which is primarily directed towards another. An angel knows itself before it knows things; God knows himself, he is himself the sole specific object worthy of his intelligence, and it is in his essence that he knows all things, things possible and things created. In order to give a definition of knowledge capable of including the whole of this analogical span, it would be necessary to say that to know is to be or become a thing—oneself or another—otherwise than by the existence actuating a subject.[1] An angel in knowing is itself and other things otherwise than by its own existence as a limited subject; God by his wisdom is himself and things otherwise than by the existence which actuates a subject.

4. The act of knowledge is not any of the actions which we customarily observe about us, it does not come under either the heading of 'action'—nor that of 'passion'—in Aristotle's table; taken purely in itself it does not consist in the production of anything not even in the depth of the knowing subject. To know is to advance oneself to an act of existence of super-eminent perfection, which, in itself, does not imply production.

In fact there is the production of an image in sensitive knowledge,[2] of a mental word or concept in intellectual knowledge; but this interior production is not formally the act of knowledge itself, it is at once a condition and a means, and an expression of that act.[3]

This is why the ancients called the act of knowledge an action properly immanent, and perfectly vital, which belongs to the heading 'quality'.

5. Wherever it is a question of a knowing being other than God, who is in himself super-eminent over all things, we are constrained, if we wish to conceive of knowledge without absurdity, to introduce the

[1] 'Esse non per modum subjecti,' writes M. Pierre Garin, in his thesis, *L'Idée d'après les principaux thomistes*, Paris, 1932.

[2] Not in the external senses, but in the internal (imagination, memory, etc.). The external sense 'non format sibi aliquam formam sensibilem.' (St. Thomas, *Quodlib.*, v, 9, ad. 2.)

[3] Cp. *Réflexions sur l'intelligence*. On the production of the mental word by the act of intellection, immanent as such and virtually productive, see Cajetan, *In Sum. theol.*, i, 27, 1; 34, 1, ad. 2; 79, 2: John of St. Thomas, *Curs. Phil.*, *Phil. Nat.*, iii, P. q. 11, a. 1; *Curs. theol.*, i, P. q. 27, disp. 12, a. 5.

notion of a kind of existence which is entirely particular, which the ancients called *esse intentionale*, intentional being, and which is opposed to the *esse naturae*, to the being which a thing possesses when it exists in its own nature. For indeed the scandals suffered by the principle of identity can only be apparent, and it is certain that if the characteristic of the knower is to be another thing than what it is, we must needs, to avoid absurdity, distinguish two ways of having existence, conceive of an *esse* which is not the rightful existence of a subject as such or of its accidents.

How is it that the knower is the known? It cannot be according to its natural being that it can be what it is not.

How is the known in the knower? It cannot be according to its natural being that a tree or a stone is in the mind.

It is therefore necessary to admit another form of existence, according to which the known will be in the knower, and the knower will be the known: an entirely tendential and immaterial existence, whose office is not to posit a thing apart from nothingness in itself and as subject, but on the contrary, for another thing and in relation; which does not seal up a thing in its natural limits but disengages it from them; by which the thing exists in the soul by another existence than its own, and the soul is or becomes the thing according to another existence than its own: *intentional* being, which is, according to Cajetan, there to remedy that imperfection essential to every created knowing subject of the possession of a limited nature and the lack by being itself of all the rest.

In another order than that of knowledge, in that of efficient activity is it not equally necessary to admit an intentional manner of existing—the way, for example, in which artistic talent *passes* into the hand and the brush of a painter? For the entire picture is the work of the brush, there is nothing in the picture not caused by the brush, and nevertheless its beauty and intelligible radiance, the spiritual values with which the picture is charged, surpass all the capabilities, in its connection with the material universe, of the causality proper to the brush itself: a causality higher than its own, and superimposed upon its own, must then have passed into it. If you scrutinise everything 'entitative', or existing *secundum esse naturae* in the brush, you will find no element of the painter's art, only the substance and the qualities of the brush and the movement to which it is directed by the hand; nevertheless the art has passed

into it. Scrutinise everything entitative in the transmitting medium of the sensitive qualities, you will only find the properties and the wave and other movements that the physician recognises, you will not bring the soul under the scalpel: its quality has nevertheless entered in, *secundum esse intentionale*, since the senses will perceive it when the waves of the vibrations reach the organ. It is a dream of the materialist imagination to think, like Democritus, that it enters in entitatively, or because it is not so to deny, like modern 'scientists', that it can enter in at all. The *esse intentionale*, even when not concerned with the world of knowledge, is already for forms a means of escape from the slavery of matter; the scholastics frequently call *esse spirituale* this existence not for itself, this *tendenz*-existence by which forms which are not their own supervene in things. I hold that a great field of interests lies open for philosophers in the study of the part it plays even in the world of physics, which is doubtless the cause of that form of universal animation by which movement brings to bodies more than they are in themselves, and colours all nature with a semblance of life and feeling.[1] However this may be, our concern here is with the part it plays in knowledge and the immaterial operations of the latter, the intentional presence of the object in the soul and the intentional transformation of the soul into the object, the one and the other functions of the immateriality (imperfect for the senses, absolute for the intelligence) of the cognitive faculties.

6. What is the means of union of the knower and the known? The medium thanks to which the known is intentionally in the knower, and by which the knower becomes intentionally the known? It is the whole world of intra-psychic immaterial forms which in the soul are like the deputies of the object and which the ancients called similitudes or *species*. This word, *species*, has no equivalent in modern language, and I

[1]The movement of projectiles, which caused so much difficulty for the ancients, could be perhaps explained by the fact that at the first instant of movement and because of it, the qualitative state which exists in the agent and is the immediate cause of the movement (speaking in ontological terms, it is by design that I do not use the terms which belong to the vocabulary of mechanics) passes *secundum esse intentionale* into the mobile object. From this standpoint it would be possible to hold the Galilean principle of inertia viable not only from the point of view of physico-mathematical science (at least, according to the mechanics of Einstein, for a space ideally supposed which would be totally devoid of curvature), but also from that of the philosophy of nature.

have decided that the aptest rendering of it is the expression, *presentative* or *objectifying form*.[1] No more than that of the *esse intentionale*, the notion of *species* is not for the philosopher an element of explication which is already known and fully elucidated by others. They are rather supports which result from the analysis of the data and of which it constrains the mind to recognise the reality—with certainty if the analysis has itself progressed correctly and under the constant pressure of intelligible necessities. It is absolutely necessary that some determination should supervene in the knower, thanks to which what is not its should be in it *secundum esse intentionale* and not like an accident in a substance, and which will be able to exist with the same active super-existence as that of the knower become the known. The species is nothing other than this internal determination.[2]

In the case of sensitive knowledge, the external sense, itself in a state of vital tension, and which has only to 'open itself' to know (all is ready in advance for it, and in this it is comparable to an already acquired intellectual habitude),[3] receives the thing by its qualities acting on the organ, which so offers itself to be felt (we call it 'the sensible in act'), a *species impressa*, a presentative form imprinted on it—let us call it a 'received presentative form'—thanks to which it is specified as by a germ which

[1]The expression, 'presentative form' would be preferable if 'presentative' evoked the idea of *making present* rather than that of *presenting*, which is sufficiently inapplicable to the intelligible *species impressa* (it is the concept which *presents* the object to the mind). The expression 'objectifying form' is better, on condition that it is understood that it is the thing itself which, by this form, is become object (only in a radical manner in the intelligible *species impressa*, in express fashion is the concept); but it is to be feared that the habits of modern language may here induce a misunderstanding.

[2]Cp. St. Thomas, *Sum. Contra Gent.*, ii, 98.

[3]'τοῦ δ' αἰσθητικοῦ ἡ μὲν πρώτη μεταβολὴ γίνεται ὑπὸ τοῦ γεννῶντος ὅταν δὲ γεννηθῇ, ἔχει ἤδη ὥσπερ ἐπιστήμην καὶ τὸ αἰσθάνεσθαι. καὶ τὸ κατ' ἐνέργειαν δὲ ὁμοίως λέγεται τῷ θεωρεῖν.' (Aristotle, *De Anima*, B. 5, 417, b. 16-19.) Cp. St. Thomas's commentary, lect. 12: 'Quod nondum habet sensum et natum est habere in potentia ad sensum. Et quod jam habet sensum et nondum sentit est potentia sentiens, sicut circa scientiam dicebatur. . . . Sensum autem naturaliter inest animali: unde sicut per generationem acquirit propriam naturam et speciem, ita acquirit sensum. Secus autem de scientia, quae non inest homini per naturam, sed acquiritur per intentionem et disciplinam. . . . Cum autem animal jam generatum est, *tunc hoc modo habet sensum, sicut aliquis habet scientiam quando jam didicit*. Sed quando jam sentit secundum actum, tunc se habet sicut ille qui jam actu considerat.'

has entered into its depths; and having so become intentionally the sensible in the initial or 'prime' act (the sense and the sensible then make only one principle of operation), in the terminal or 'second' act it becomes it, in its own immanent action, and then makes only one act with the felt—not without producing at the same time an image of the latter, a *species expressa* of the sensible order in the imagination and the memory.

The intelligence knows things in forming them in the fruit which it conceives in the bosom of its own immateriality. The Thomists, following Aristotle, recognise in it an active light (the *agens* or activating intellect) which, making use of sensible representations and disengaging the intelligibility which they contain *in potentia*[1] (which is not possible without leaving on one side the individualising notes enclosing the sensible as such), specifies the intelligence by means of a *species impressa*, of a 'presentative form' abstracted from the sensible and 'received' by means of it. This is then the prime or initial act of the intellect; it has become, as indeed a principle of action, intentionally the object, which in its *species* is hidden in its depths like a fecundating seed, a co-principle of knowledge (according as the intellect, the sufficing principle of its own proper action, is already itself).[2] And it is thus, actuated by this *species impressa*, and producing thus in it, like a living fruit, a mental word or concept, a *species expressa* of an intelligible order, an 'elaborated presentative form', in which it brings the object to the sovereign degree of actuality and intelligible formation, that it becomes itself in ultimate act this object. If the distinction between the prime and the second act re-appears again thus in the act of knowing, it is because this last, as I have already said, constitutes in itself alone a whole metaphysical order, where are re-united, transposed into the same line which

[1]Material things are sensible in act, but only potentially intelligible, and the whole process of human knowledge consists in bringing them progressively, first to intelligibility in act (in the *species intelligibilis impressa*), then to the state of intellection in act (in the mental word and the intellective operations).

[2]'Intellectum est intelligens . . . ambo se habent ut unum agens.' (St. Thomas, *De Veritate*, 8, 6, ad. 3.) Cp. Cajetan, in *Sum. theol.*, i, 14, 1: '. . . Cum cognoscens debeat esse *sufficiens principium* suae propriae operationis, quae est cognoscere—quia hoc omnibus perfectis naturis commune est—oportet quod sit *specificativum* principium illius, quod est esse *cognitum*.'

is that of knowledge, at once the distinction of the essential form and the existence in the line of being and that of the operative form and the operation in the line of action. Is not knowledge at once existence and (immanent) action? The soul, by its faculties of knowledge, becomes first (intentionally) the object in the prime act, in order to become it as a result in the second, as nature exists before it acts.

7. In what is concerned with the *species* or presentative forms, it is necessary to distinguish carefully between two very different parts or functions. On the side of immaterial forms, these *species* are modifications of the soul, and by this right they determine the faculty in the same way as any other form determines any other subject, but these modifications of the proper nature of our soul, these entitative modifications, are not pre-requisite to knowledge; they make no part of knowledge.

On the other hand presentative forms are, in so far as they are means to knowledge, purely and formally deputies of the object, simply its similitudes, *i.e.* in the soul they are the object itself detached from its own existence and made present in an intentional and immaterial state; in this way they do not determine the faculty as a form determines matter or a subject, but in relation to the entirely immaterial and supra-subjective union by which the one becomes, first intentionally in the first act, then in the second act and by its vital operation, the other in itself. And this entirely immaterial information, in which the soul only receives or experiences in order to exercise its own vital activity, to bring itself in act into an existence not limited to itself, is what constitutes knowledge.

In thus making a résumé of knowledge, it shows itself to us as an immanent and vital operation, which essentially consists not in making, but in being: in being or becoming a thing—itself or others—otherwise than by the existence actuating a subject; which implies a much higher union than that of the form and matter composing a conjunction or *tertium quid*, and which also presupposes that the object known is intentionally made present in the faculty thanks to a *species*, a presentative form; finally, that intellectual knowledge[1] is accomplished thanks to a

[1]It has not been my intention here to treat specially of sensitive knowledge. (For the mystery proper to this mode of knowledge, which implies immateriality while all the while being the act of an organ and which the philosopher can only in the last analysis explain thanks to the universal motion of God working in all things, a motion which is not only generally prerequisite for all the actions of created things, but also in particular for the objective influence of bodies on our senses, see the remarkable writing of R. Garrigou-Lagrange in *Le Réalisme du principe de finalité*, 1932: cp. Yves Simon, *Introduction à l'ontologie du connaître*, 1933.) I would only here draw attention to the fact that while the object of intellectual knowledge is attained, as I have said on pp. 139–141, in the concept and in the mind, the object of the external senses on the contrary is attained not in the word or image, but such as it is outside the mind, in the very action, extramentally, of the thing on the senses: *sensus secundum actum sunt singularium quae sunt extra animam* (St. Thomas, *In De Anima*, book ii, lect. 12), *sensatio terminatur ad res prout extra sunt* (John of St. Thomas, *Phil. Nat.*, iii, P. q. 6, a. 1 and 4); that is to say—for sensation is not a transitive act, but an immanent act which is accomplished in the senses—that the end of the sensation (like the end of every immanent operation, an end contemplated or loved, not produced) is in the subject itself, *in ipso operante*, but on the other hand the sensible reality is in the senses—by its transitive action, *actio in passio*—such as is outside the soul; sensation, while all the while terminating in the senses, thus terminates in the sensible externally, *prout est extra*, in the action of the thing on the senses; and the existence in act, outside the knowing subject, of the thing present in it by its action, is one of the constituent factors of the object as such of the senses; the wholly immanent act of sensation, whose beginning is the *species impressa*, has an end, an object which in its very objectivity implies the existence in act of the thing: to such a point that in the absence of a thing actually given by its action (even if a star had ceased to exist at the moment when its light reached us, it is yet present by its action), sensation in the rightful meaning of the word (I do not mean an imaginative perception or a hallucination) is absolutely impossible. 'Si organum sentiendi non moveatur a rebus extra, sed ex imaginatione vel aliis superioribus viribus, non est vere sentire' (St. Thomas, *In IV Sent.*, dist. 44, q. 2, a. 1, sol. 3). 'Cum sensum non sentiat nisi per hoc quod a sensibili patitur . . . sequitur quod homo non sentiat calorem ignis si per ignem agentem non sit similitudo caloris ignis in organo sentiendi. Si enim illa species caloris in organo ab alio agente fieret, tactus etsi sentiret calorem, non tamen sentiret calorem ignis nec sentiret ignem esse calidum, cum tamen hoc judicet sensus, cujus judicium in proprio sensibili non errat' (*De Pot.*, 3, 7). Cp. *Sum. theol.*, iii, 76, 8, and the very just remarks of J. de Tonquédec, *op. cit.* It is this resolution of the knowledge of the senses in the thing itself and in actual existence which finally is the primary foundation for the veracity of our knowledge. (Cp. John of St. Thomas, *Curs. Phil. Nat.*, iii, P. q. 6, a. 1.)

In thus particularising the scholastic theory of sensation, *i.e.* in admitting that the intuition of the senses bears on the externally real in itself, not as taken from the standpoint of nature or of essence (which is the proper object of the intellect), but as it actually *acts* on the senses by its qualities, or as it is exterior in its *action* on the senses (an action which is something real but which is accomplished in the organ), it is possible to reply without difficulty to the principal objections drawn from the 'errors of the

mental word or concept, a presentative form proffered from within itself by the intellect, and by which it intentionally becomes in the final act the thing taken as such or according to its intelligible determinations.

THE CONCEPT[1]

Thomists distinguish between two forms of *sign* which are essentially different, what is called the *instrumental sign* and the *formal sign*. An instrumental sign is something which once known in itself makes another thing consecutively known: a trail of smoke rising to the sky, a

senses' (the apparent curvature of a stick under water, the Döppler effect, etc.). The sensible quality is perceived in effect *such as it is in the action* which a body exercises upon it, and in the instant that it attains the sense after transmission through the (internal or external) medium. The fundamental *realistic* value of sensible perception and at the same time the measure of *relativity* which it implies, on account of the materiality with which it is bound up, are thus at once safeguarded.

If it were desired to draw out a sketch-plan of the diverse moments of sensible knowledge and intellectual knowledge, one could do so like this:

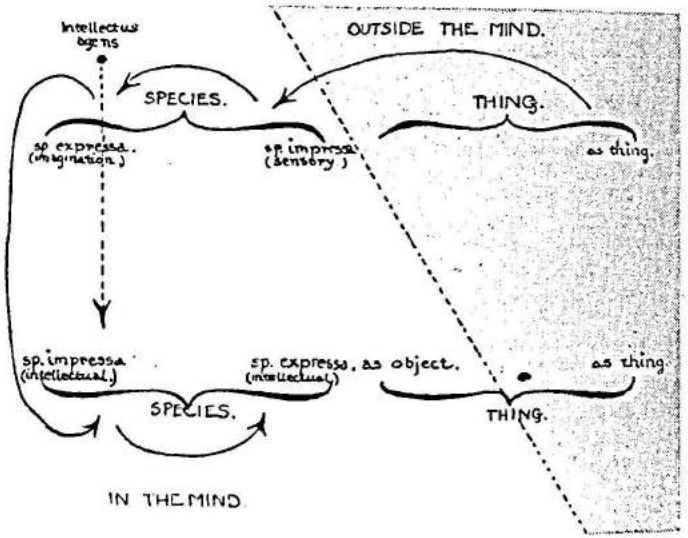


FIG. 6.

[1]For a more detailed exposition, I would refer the reader to the chapters which treat the same theme in *Réflexions sur l'intelligence*, chaps. i and ii (cp. *La Philosophie Bergsonienne*, preface to the second edition, Part ii, chap. 2), which the following paragraphs, like the preceding ones, presuppose and complete.

portrait painted on canvas which we see in a gallery, are objects on which our knowledge rests for a moment and passes on from them to other objects which are known thanks to them, to the fire of which the smoke is the effect and the sign, to the sitter of whom the portrait is the image and the sign.

A formal sign is one whose whole essence is to signify. It is not an object which, having at first its full value as an object, nevertheless primarily signifies some other object; it is something which makes itself known before being itself known as an object, or more precisely, something which before being itself known as an object by an act of reflection, is only known by the knowledge which is conveyed by its means to the mind of the object, in other words, which is known not in 'appearing' as an object, but by 'disappearing' as object, because its essence is to relate the mind to something other than itself.[1] Everything which has been established up till now enables us to comprehend that the *species impressa*, or enlarged presentative forms which intervene in knowledge, are formal not instrumental signs. Remembrance or the presentative form held in the memory and which the memory uses *hic et nunc* is not *what* is known when we remember, it is the *means* by which we know; and what we know by this means is the past itself, the thing or event held in the substance of our past. The concept or mental word is not *what* is known when our intellect is at work; it is the *means* by which intellection takes place; and what we know by this means is the nature or intelligible determination in itself of some actual or possibly existing thing. These (elaborated) presentative forms[2] are the sole realities which

[1]See *infra*, pp. 147-50.

[2]Received presentative forms (*species impressae*) are not called formal signs by the scholastics, because they are at the beginning, not the end, of the act of knowledge, and thus are not themselves known (*in actu exercito*) in the same knowledge as attains the object. They form part of the pre-conscious equipment of knowledge; if consciousness can attain to them (cp. *Sum. theol.*, *i*, 85, 2: *Contra Gent.*, ii, 75; *Compend. Theol.*, cap. 85), it is by the mind's reflection on its acts ('secundum eamdem reflexionem intelligit et suum intelligere et speciem qua intelligit,' *Sum. theol.*, *ibid.*), and only in so far as it is conscious of the object of which it is the *species* ('intellectus cognoscit speciem intelligibilem non per essentiam suam, neque per aliquam speciem, sed cognoscendo objectum cujus est species, per quamdam reflexionem,' *De Veritate*, 10, 9, ad. 3). The intelligence actualised by intellection of the object has become (but only in so far as it is so actualised and it perceives the object) intelligible in act to itself (for nothing is

correspond to the notion of formal signs, a notion 'cut to their measure', according to the exigencies of an analysis which respects the rightful nature of knowledge, and belong only to it. All the other signs of which we have experience are instrumental ones. This is why, the moment one neglects or forgets the irreducible originality of the things of knowledge, presentative forms are so easily confounded with instrumental ones, just as the immanent activity of sensation and intellection is confused with the transitive activity proper to bodies, and at once knowledge perishes.

St. Thomas, refuting beforehand certain idealist positions, took great care to point out that the *species* or presentative forms are not the objects of our knowledge, but pure means thereto. They only become the objects of knowledge reflectively, and thanks to the production of a new concept. If, he explains, our knowledge stops at them, in other words, if it is our own representations that we know, then, on the one hand, all sciences would be absorbed by one unique one, psychology; on the other hand, contradictions would be true, since a true judgment would be a judgment in conformity with our representations: he who decided that 2 plus 2 equal 4 and he who decided that 2 plus 2 do not equal 4 would be equally right in each declaring according to their respective representations. Thus presentative forms, concepts in particular, are pure means of knowing; the scholastics call them *objectum quo*, mental objects *by which* knowledge takes place. What is known thanks to these immaterial *species*, they called *objectum quod*, the object *which* is known.

If we should group the various elements which coalesce in an act of in-

intelligible otherwise than it is in act); and it is by the same reflection on its *intelligere* extending itself by degrees, by the same and only act of consciousness of its knowledge of the object, that it takes consciousness, in the degree of their existence and nature (in so far as it knows them as origins of that act, which they are by their very essence) of the *species impressa*, *habitus* and potency—and, only as to its existence, of the soul itself (which 'non est principium actuum per suam essentiam, sed per vires suas,' *De Veritate*, 10, 9. Cp. *supra*, p. 108, note 1). An act of consciousness which is singular and concrete and an entirely different thing than the abstract and universal (and also reflective) scientific knowledge of the nature of *species*, of *habitus*, of potency and of the soul.

It was by an inadvertency, which I hasten to correct here, that in certain passages of *Réflexions sur l'intelligence* the *species impressa* was called 'formal sign'. This should be corrected and 'pure means, *quo*' read in its place.

tellectual knowledge in a synoptic table, we should obtain the following scheme, whose scholarly aspect needs excuse, but which is of assistance in clarifying certain important distinctions which in my opinion are capital.

	In the Mind	*Outside the Mind*
St. Thomas	Concept (Quo): as modification of the subject; as *species* (formal sign) — having intentional existence	Thing (Quod): object (formal object); as thing (material object) — existence in nature
Descartes	Idea (Quod): 'formal' reality of the idea; 'objective' reality (of the idea)	Ideat (Quod): thing which resembles the idea [The Intentional has disappeared]
Berkeley	idea-thing	no things
Kant		phenomenal thing-in-itself unknowably built up.
Hegel	[In Absolute Thought] (productive spontaneity); auto-objectification of the mind	No thing-in-itself if not thought itself
Phenomenologists and 'Critical Realists'	[In Intentional Consciousness] (The intentional object-essence thing has re-appeared)	No thing-in-itself
American Neo-realists	[In Consciousness]	The immanental thing-thought in so much as it is thing

I have distinguished two elements in the concept: an entitative function, by which it is a modification or accident of the soul, and an intentional function, by which it is the formal sign of a thing, in which

the object is grasped by the mind. This object which is grasped by the mind in and by the concept is the thing in itself, taken according to one or other of its determinations, and which, first by sensation and then by abstraction has been brought—though stripped of its proper existence—within the mind. For the three first terms of this diagram are all inside thought; it is in the depth of thought that the object is attained,[1] in the heart of the intelligence that it is known (which is why the ancients often called it *objectivus conceptus*), it is only the thing in its own proper existence (possible or actual) which is extramental and metalogical. But what is capital is that while existing under two different conditions, in the concept in a state of universality and of abstraction which enables it to be manipulated, divided, compared by the mind and also enter into the connections of discourse—and in the thing in one of individuality and concretion, nevertheless the *object* and the *thing* are not two known terms, two *quods*, but one: it is one and the same *quod*, which exists for itself in the thing, and which is attained by the mind as object.

Let the *thing*, for example, be Peter. He exists outside the mind under certain conditions: he is not only man, but animal, substance, etc.; philosopher or musician, ill or well. Let the *object*, for example, be Peter as the object of thought 'man', which has in Peter and outside the mind a natural existence, and in the concept and in the mind an intentional existence (and which in the degree to which it is known or posited before the mind has only an ideal or rational existence).[2] It is essential to

[1] 'Objectum quod intelligitur debet esse intra intellectum et intra ipsum attingi.' (John of St. Thomas, *Curs. theol.*, i, P. q. 27, disp. 12, a. 7, n. 4.) 'Intellectus non intelligit nisi trahendo res ad se, et intra se considerando, non extra se inspiciendo. Et D. Thomas docet rem intellectum non posse esse rem ut ad extra, sed *ut intra*, et ut est unum cum intellectu, ut q. 9 *de Pot.* a. 5, et q. 8, a. 1, et locis infra citandis.' (*Ibid.* a. 5, n. 5.) Cp. *De Veritate*, 4, 2, ad. 7

[2] Three forms of *esse* must therefore be distinguished: the *esse naturae*, by which the thing exists outside thought, is, in itself, singular and concrete: entitative existence or as thing. The *esse intentionale*, by which the thing exists in thought in order to be known, is, in itself, abstract and universal: representative existence or as sign. Equally abstract and universal, the *esse cognitum seu objectivum*, by which the thing exists in and for thought, in the degree to which it is known, is purely ideal, and implies no real determination neither in the thing nor in the mind (unless presumptively in the degree to which the *being thought* of the object presupposes the *thinking* of the mind): ideal existence

concept to be abstract and universal.[1] It is essential to the extramental thing to be singular and concrete. The object, on the other hand, which in the thing exists with natural existence, is singular and concrete, as is proper to the thing, and which exists in the concept with intentional existence, which is abstract and universal, is indifferently one or the other.[2] It is posited in the mind in a state of abstraction and universality, which comes to it from its existence in the concept, where it is attained by the mind, but this state is not essential to it, since in the judgment, in the declaration 'Peter is a man', for example, I identify Peter and the object of thought, man.

As to the concept or mental word which I have in mind when I think 'man', it is held to be the sign of the thing, the similitude or deputy of the object, an inward end in which the object is intellectually perceived (*terminus in quo*). But let us be on our guard against that materialisation or spatialisation which language always brings in its

or as signified *reduplicative ut sic* (this existence, otherwise, is only of interest to the mind's logical reflection on itself, which is why it has not been dealt with here. On the *esse cognitum*, cp. John of St. Thomas, *Curs. theol.*, i, P. q. 12, disp. 15, a. 3: R. Dalbiez, 'Les Sources scolastiques de la théorie cartésienne de l'être objectif', *Rev. d'hist. de la phil.*, Oct.-Dec. 1929.)

The two other forms of existence, on the other hand, are of a real or 'physical' (in the scholastic sense of the word) order: the first positing the thing in nature as divided from nothingness; the second positing its presentative form in thought and directing the mind on the thing—and being also the form of existence whereby the mind is the thing. Immaterial existence is immaterial and non-entitative, not for itself, yet real; it has this formal effect not by what the thing is (if not in the mind, by its presentative form), but by what the mind which is the thing knows; it really, physically, affects the *species* which makes known and the mind which knows. It brings a tension, a stimulation to the mind, a plenitude; it makes it fecund (in the *species impressa*) or proceeds from it as it perfects itself (in the *species expressa*).

[1] Which does not, I would remark *en passant*, prevent there being a *reflex* concept, which is rightly and distinctly so, of the *singular*. Cp. John of St. Thomas, *Curs. Phil. Nat.*, iii, P. q. 10, a. 4.

[2] So considered *secundum se, seu in statu solitudinis*, nature is neither singular nor universal. Considered *secundum esse quod habet in rebus* (*esse naturae*), it is, in fact, singular. Considered *secundum esse quod habet in abstractione intellectus* (*esse intentionale* and *esse cognitum seu objectivum*) it is, in fact, universal. The whole of this doctrine supposes the real distinction (in everything which is not God) between nature and *esse*. Cp. St. Thomas, *De Ente et Essentia*, chap. 4; John of St. Thomas, *Curs. Phil.*, log. ii., P. q. 3. a. 1.

train if we are not careful. The object is by no means in the concept as a material content in a material container, it is no material thing enclosed in another; it is an immaterial 'word', omitted by the mind in explaining the object; to contain, for it, is simply and purely to know. The object exists in the concept and is attained in the concept in the sense that in proffering the concept, in the fulfilment of this intellectual production, the immanent act of intellection attains by this and immediately the object, and attains it clad in the conditions of the concept; and this is only possible because the concept is only a sign, a deputy or similitude of the object by right of the formal sign, as was pointed out above.

What does this mean, if not that the notions of deputy or similitude or image must be purified here of all those features which would belong to things coming before the eyes of the mind, like a portrait before our bodily eyes? But then, if the concept is not a thing resembling the object, what remains of it? It remains being—as existent intentionally in the soul, and so carrying the object to the ultimate degree of spirituality, as *making known* what the thing or object is by right of the term *known*. The concept and the thing make two from the point of view of entity; but as formal sign and in the line no longer of being, but of knowledge, it must be said that it and the object do not make two. The fruit of intellection in act, its content, is the intelligible object itself, but this intelligible content, which as object is set before the mind, as concept is vitally proffered by the mind, and has for its existence the act of intellection itself; as to its intelligible constitution therefore the concept is identical with the object—indeed I do not say in as much as it will be *what* is known, but exactly in as much as it is the sign and inward end *by which* the intellect becomes, in ultimate act, what it knows. It has just been pointed out that the formal sign is not something known at first which consequently leads to the knowledge of another. Now it is understood that it is something known in the very degree to which it makes known and by the act of making known. The immanent reason of the presentation of the object to the intellect in act, the concept or mental word is steeped in intellectuality in act; to be thought in act, to terminate intellection in act, is its intrinsic denomination, since it is in it that the object like the intellect achieves the ultimate act of intellectuality. But it is not as object that

it is thought and known, it is not as signified end that it is *intellectum in actu*, grasped and conpenetrated by intellection in act, it is as signifying end.[1]

Finally, the concept in its entitative function and as modification of the subject and the concept in its intentional function and as formal sign are not two distinct things (just as intentionality is not precisely a thing-in-itself, but rather a mode). These are two formal aspects of two formally distinct values of the same thing, the intentional function only applying to knowledge, the entitative function to the being of nature (on this occasion, the soul itself). As the divine essence has itself, in being intellection in pure act, the value of both *species impressa* and *species expressa* for the intelligence of the blessed, as the substance of an angel is itself the *species impressa* for its intelligence, the entity of the concept is in itself for us the formal sign of the object. As thing or entity the concept is an accident, a quality of modification of the soul[2]; but as arising in the soul as a fruit and expression of the intelligence already formed by the *species impressa*, already 'perfect',[3] and under the action

[1] Verbum est 'quiddam mente conceptum *quo* homo exprimit mentaliter *ea* de quibus cogitat'. (*Sum. theol.*, i-ii, 93, 1, ad. 2.)

On the nature of the concept and its identity, with regard to intelligible constitution, with the object, *see* the long discussion in Appendix i, apropos of the criticism offered by M. D. Roland-Gosselin. It gives me pleasure to mark the agreement which J. de Tonquédec has exhibited towards my position on this important question (cp. *op. cit.* pp. 145-6).

[2] The scholastics class it among the qualities of the first kind (dispositions and habits), because it suitably disposes nature in regard to knowing (cp. John of St. Thomas, log. ii, P. q. 18, a. 2). But with this difference from habitude in the ordinary sense of the word, which belongs to the subject and its dynamism, the concept comes from the side of the object, which it presents to the mind.

[3] Actuated *in actu primo* by the *species impressa*, the intelligence is the sufficing principle of its own operation. This is why Aristotle and St. Thomas call intellective action *actus perfecti*, the act of that which is already in act. 'Hujusmodi autem actio est actus perfecti, id est existentis in actu, ut dicitur in 3 *De Anima* (lect. 12).' (*Sum. theol.*, i, 18, 3, ad. 1.) The apocryphal opuscule *De Natura verbi* has a precious passage on this theme but which needs to be carefully understood: 'Prima actio ejus per speciem est formatio sui objecti, quo formato intelligit, simul tamen tempore ipse format, et formatum est, et simul intelligit, quia ista non sunt motus de potentia ad actum, quia jam factus est intellectus in actu per speciem, *sed processus perfectus de actu in actum*, ubi non requiritur aliqua species motus.' John of St. Thomas for his part writes: 'Ex quibus patet pertinere ad ipsum intellectum, suo actu qui est intelligere, formare sibi objectum in aliqua similitudine repraesentante et intra se ponere, ibique unire per modum termini seu objecti ad quod intelligere terminatur, sicut per speciem impressam unitur ut principium

of this created participation in the intellectual power of God, of that centre of immateriality perpetually in act, the highest point of spiritual tension naturally present in us, what should be called the active intellect (*intellectus agens*), whence the intellect which knows derives all its formative energy,[1] this quality, this modification of the soul which is the

determinans intellectum ad pariendam notitiam. Ille autem actus quo formatur objectum est cognitio: *cognoscendo enim format objectum, et formando intelligit*, quia simul format, et formatum est, et intelligit. . . .' (*Curs. theol.*, i, P. q. 27, disp. 12, a. 5, n. 5). It nevertheless remains that in as much as the object is not formed in the word, the actuation of the intelligence is imperfect with regard to its end, and this is why this *processus de actu in actum*, 'perfect' in regard to the principle of intellection and as the *species impressa* has formed and actuated the intelligence, at the same time in itself constitutes a *fieri*, where, in the very instant that it is made, it *perfects* the actuation of the intelligence with regard to its end in producing the word and in forming by it the object. Moreover, the word itself is not perfect with us at the first stroke; rather on the contrary, it is ceaselessly retaken up, progressively elaborated and ripened in the process of discourse. (Cp. St. Thomas, *In Joann.* i, 1.) 'Verbum debet exprimere rem ut vitaliter attactam ab ipsa cognitione, ergo non solum ut intelligibilem in actu primo, sed ut intellectam in actu secundo. . . . Aliquando procedit verbum ex necessitate in indigentia, quia objectum ipsum non sufficienter explicatum, et evolutum, et ita proceditur ab imperfecto ad perfectum, sicut in nobis fit per discursum et cogitationem, et sic praecedit verbum intelligere perfectum, sed procedit ab intelligere imperfecto et in fieri; et generaliter quandocumque formatur verbum, ipsum fieri verbi etiam est intelligere in fieri. Aliquando vero procedit verbum ex abundantia intelligendi. . . .' (John of St. Thomas, *Curs. Phil.*, *De Anima*, q. 11, a. 1.)

Causae ad invicem sunt causae in diverso genere. Without there being the least priority in time on one side or the other, the concept is at once produced by intellection in act and a condition of it (on the side of the object). It is the intelligence itself which actualises itself *in actu ultimo* in forming it.

[1]It would be in effect erroneous to think that the rôle of the *intellectus agens* stops at the formation of the *species impressa*. St. Thomas had a much higher idea of it, whose metaphysical importance is often misunderstood. The active intellect is the signature in us of the divine light. While the force or intellectual light of an angel and its vitality are identically one and the same, with us there is a double action. The knowing intelligence, which is at first void of forms, has in itself the vitality characteristic of knowledge, is capable in itself of vitally becoming the object. Nevertheless the virtue which it thus possesses is only actualised by the effect of an intellectuality ceaselessly in act which can alone account for the process of immaterialisation or intellectualisation of which we are the authors, and which is already in itself at the supreme degree of actuation, but without an object, and in order to illuminate, not to become. The *intellectus agens* is thus the *activator* of the intelligence, its light, the core of all its force: 'principium activum proprium, per quod efficiamur intelligentes in actu. . . . Philosophus dicit, ut quod intellectus agens est ut habitus quidam et lumen . . . et in Psalmis dicitur: signatum est super nos lumen vultus tui.' (St. Thomas, q. disp. *De Anima*; cp. *De Veritate*.)

concept has (like all the objectifying forms) the privilege of transcending the function of entitative information exercised by it, and of being present in the faculty like a spirit. It is from the intelligence itself, from the intelligence in living act, that it holds this privilege, as though the intelligence gathered all its own spirituality into this one active point, there to bring it to a maximum. Thus the concept is in the intelligence not only entitatively or as a formative form, but also as a spiritual form not absorbed in the actuation of a subject in order to constitute with it a *tertium quid*, but on the contrary as actuating or rather terminating the intellect *per modo intentionale* and in the line of knowledge, in the very degree to which it expresses and volatilises the object.

On the other hand, this form which the intelligence, primarily put in act by the *species impressa*, engenders in itself through the discontinuous light of the active intellect, is truly, as I have said, the pure similitude or spiritual ignition of the object, or rather the object itself made mind,[1] and *intentionally* present, not as object, but as sign: because its entire specification comes from the object, the intelligence which illumines and that which knows being for it equally indeterminate. Thus the concept (in its intentional function) and the object are indiscernible,

And again: 'cum erit anima a corpore separata, per intellectum possibilem recipiet species effluentes a substantiis superioribus, et *per intellectum agentem habebit virtutem ad intelligendum*.' (*Ibid.*) And in the *Contra Gent.*, iii, 15: 'Cum anima a corpore tali fuerit separata, intellectus possibilis intelligere poterit ea quae sunt secundum se intelligibilia, scilicet substantias separatas, *per lumen intellectus agentis*, quod est similitudo in anima intellectualis luminis quod est in substantiis separatis.' The conclusion can be drawn from this that, in the state of union with the body, it is under the actuation of the *intellectus agens* that the intelligence, already made fruitful by it by means of phantasmata, and formed in the first instance by the *species impressa*, produces in itself the *species expressa* and actuates itself *in actu ultimo*.

[1]If it is better to know than to love inferior things (*Sum. theol.*, i, 82, 3), it is because they exist in the mind in a higher mode than their own. This is why 'in a general way, material realities are more efficaciously known *per similitudinem* than they would be *per essentiam*' (M. Roland-Gosselin, *art. cit.*) Cp. *De Veritate*, 3, 1, ad. 1, 2; *De Pot.*, 7, 7, ad. 2. These passages (which refer to God's knowledge of things in his essence) must nevertheless be understood in a very formal sense. It is from the standpoint of the immateriality of the *esse* that material things are better known *per speciem* than they would be by their essence, supposing that the latter could be, despite its materiality, a medium of knowledge. It is clear that from other standpoints we know much less of things in knowing them *per speciem* than if we were able to know them in their essence. The essence of God is itself 'supereminens similitudo rerum'.

save as the one makes known and the other is known, the one is a sign and the other the signified, and that the one exists only in the mind and the other in the mind and in the thing.

By this we comprehend that the intuition proper to the intelligence lives (at the lowest stage) in abstract perception working by means of the concept,[1] and that for the things which fall in the first place within the grasp of our intelligence this perception may be absolutely infallible, giving us those first principles, known by themselves, which direct the whole development of apprehension. And yet—because our intelligence must so form its objects for and by itself, and in the degree to which it advances in knowledge, actively draw from the same received presentative form (*species impressa*) those varied concepts which disconnect the aspects of one intelligible nucleus according to the diverse directions of attention prevailing in the mind (for things are not only brought in the *species impressa* to intelligibility in act, they are also, in the heart of the intelligence, inventoried and debited in multifarious ways in order to be brought in the concept to the final degree of intellection in act)—it is equally comprehensible that the work of concepts may be complicated and tortuous, progressing from the indeterminate and generic to the determined, admits a large measure of artificial construction, causing us often to take wholly indirect views of things or 'confused, partial, derived or negative'[2] ones, and in short, runs the risk of error in the degree to which it advances, and that not only in facts of judgment or reasoning, but also in the very facts of abstract perception. For when our intelligence is already occupied by these forms, the new concepts which it engenders, and whose formation does not only depend on the thing, but also on the already possessed objects by means of which the new object is set before the mind, may well be formed awry. Doubtless, when these are not pseudo-concepts presenting to the mind a complex of contradictory elements (*e.g.* the greatest whole number or the most perfect world), they always present to the mind some aspect of the real—or some rational being founded on the real—but one which can be so arbitrarily reconstructed and cut about that the product is meagre,

[1]Cp. J. de Tonquédec, *op. cit.* He points out that Aristotle in this connection used the word 'ὄψις, view', *Nic. Eth.*, i, c. 5 (al. 4), cp. *De Anima*, iii, c. 4.

[2]M. D. Roland-Gosselin, *Bulletin thomiste*, Jan. 1928.

if not illusory. Thus we see certain concepts, made use of by science truly for long enough, and which are certainly not absurd, vanish for ever, leaving no trace: the ancient concepts of chemistry with its phlogistic,[1] for example; we can find in the sociology which stems from Comte and in modern psychology concepts equally perishable.

CERTAIN IDEALIST POSITIONS AND ATTEMPTED REACTIONS

If now we return to our diagram, it is easy to pick out the classically significant moments for modern idealism. The latter is characterised, truly we must admit, by a radical misunderstanding of the very nature of the idea itself, and of the intentional function of knowledge, which is henceforth conceived in the terms of an event in the material order. Descartes clearly perceived that the known object is known within thought; his capital error was the separation of the *object* and the *thing*, in the belief that the object is inside thought not as an intelligible made present in the mind by an immaterial form, with which the mind identifies itself intentionally, but like an imprint stamped on wax. Thereby the intentional function disappears, the known object becomes something belonging to thought, an imprint or portrait which is innate, and intellection stops at the idea (regarded as an instrumental sign). This portrait-idea, idea-thing, has for double a thing which it resembles, but which is not itself attained to by the act of intellection. Here, therefore, are two separated *quods*, and there is need of the divine veracity to assure us that behind the *quod* 'idea' to which we attain there rightly is a *quod* 'thing' which corresponds to it: thought cannot achieve it by itself.[2]

[1]See, on this point, certain interesting comments in E. Meyerson, *De l'explication dans les sciences*, vol. ii.

[2]Certain flaws in scholasticism (*e.g.* the Vasquezian notion of the *conceptus objectivus*, pointed out in P. Geny's *Critica* and in my *Réflexions sur l'intelligence*, and the Scotist notion of the *esse objectivum*, pointed out by R. Dalbiez, *art. cit. supra*) prepared the way for this great cartesian error. The latter is vigorously denounced by L. Noël (*op. cit.*). 'Few scholastics, if any,' R. Kremer has written, on his side, 'would maintain that what we know directly is only a copy, a subjective print of the object. In any case, for the ancients and St. Thomas, it is indubitable that we know, not the representations of things, but things themselves (*vide e.g. Sum. theol.*, i, q. 85, a. 2); and to know is to have this object for the normal end of intentional activity. The subjective intermediary which

Thus the idea becomes, as Locke said, the immediate object of thought.

Berkeley perceived, not without reason, that under these conditions there is no legitimate reason for preserving this thing which is the double of the idea, and he believed he was returning to the evidence of commonsense when he affirmed that we have an immediate perception of objects, but that these objects are our ideas.

Finally Kant, admitting anew, like Descartes, a *thing* (*das Ding-an-sich*) hidden behind the *object*, but regarding it as constructed by the activity of the mind according to its *a priori* laws, arrested our knowledge at that of so-constructed phenomena, the thing in itself remaining unknowable.

All these philosophers equally neglect the rightful nature of knowledge. They envisage the work of knowledge on the plan of material activities, holding that an activity *ad extra* which is essentially immanent. For cartesian innateness, thought is essentially passive; it is matter which has received an imprint: it is equally so for the empiricists, who regard this imprint as stamped on thought not by God, but by things. Kant wished to restore the activity of thought, but always in accord with the same type of a transitive or productive activity imposing a form on matter: in this case the form belongs to the side of the mind: concepts are empty forms, and it is sensible matter which will be subsumed and organised by these forms. The inexhaustibility of the thing as subject having been thus transferred, by virtue of the 'Copernican principle', from thought as generative to the subject, the former appears as an indefinite process for the manufacture of objects.

Indeed, the intentional function having disappeared, knowledge becomes perfectly unintelligible. For in the entitative order it is clear that a thing cannot be another than what it is. Our idealists think it absurd, as they say, to look for something *outside* thought. Everything is absorbed into it, and henceforward knowledge is its self-development in the

serves to make things known is not known by us in the first instance; its existence manifestly depending on that primary direct knowledge, This is, in my opinion, the essential thesis of "immediate" or "direct realism".' (*Art. cit.*, *Philosophia Perennis*, vol. ii.) On Descartes and scholasticism, see also E. Gilson, *Etudes sur le rôle de la pensée médiévale dans la formation du système cartésien*, Paris, 1930, and J. Maritain, *Le Songe de Descartes*, Paris, 1932.

same way as an animal or a plant, a lichen or a polypus, vegetates and grows.

As to the present-day reactions against idealism, reactions which certainly in my eyes appear seriously incomplete, they are seen under two principal aspects. On the one hand the neo-realist school (Perry, Spaulding, Marvin, Montague, etc.) by insisting on the immanence of the thing in knowledge seem to misconceive the whole distinction between *thing* and *object*, and to enclose the extra-mental thing itself in thought, which has all the air of a contradiction.

On the other hand, a more important group—to which it is possible despite their differences, to attach at once thinkers like Russell and Whitehead, and those who have chosen the name of 'critical realists' (Strong, Sellars, Santayana, etc.) as well as the German phenomenologists—stop knowledge at an *object* which is no longer a product of the mind, as it is for the idealists, but rather an *essence*, an *irreducible datum*, an intelligible independent of the mind or at least proffered to it by an intuition. But this object-essence remains for them, as for Kant and the whole modern tradition, separated from the transobjective subject or extramental thing. The latter is only hypothetical and enigmatic, and indeed, by the principle of economy and Occam's razor, it would be better to pass it by. Or indeed it is held 'absurd'; and, remaining without observing it in a certain dependence on Hegel, against that panlogism against which at bottom they are reacting, but from which they have learnt to confound logic and ontology, they endeavour like Hegel to re-absorb the thing into the idea, and characteristics are attributed to the object, taken in entire separation from any transobjective subject, which only in reality come from thence: no longer that reality in itself which Hegel accorded to the Idea, but unproducibility by the mind, and irreducible consistency of essence.

This process makes of the object, which is neither an aspect of a thing nor a modification of the mind, something entirely irrational, and knowledge itself an entirely unintelligible process, neither vitally immanent nor productive; which, moreover, if it is neither productive nor transformative as Kant wished it to be, thereby remains rightly without an end: not in the very true sense that knowledge continues to penetrate endlessly into things in adding truth to truth, but in the sense that,

only laying hold on a thing by rules, it can only, despite the ephemeral constructions reared by the theoreticians of this idealism *redivivus*, endless over-reach itself by substituting one truth for another, without ever being possessed of any one.

THE UNIVERSE OF EXISTENCE AND THAT OF INTELLIGIBILITY

Everything which has been said of the concept implies the aristotelian theory of *abstraction*, according to which the intelligence actively draws from sensible data, from things as they are first of all attained by the senses, a content in which intelligibility is potentially found—an operation which is only possible by leaving out all those individualising characteristics which are found in the thing as such. It is this intelligibility that the intellect actualises, and proffers in the concept, and is the object known by it. If one thus distinguishes, as Aristotle and St. Thomas did, the *thing* and the *object*, but without separating them, and, while maintaining their unity, what comes from the thing and what comes from the mind are considered apart in knowledge, then it is comprehensible how, from the things which exist outside the mind, which make up what we may call the universe of existence, the mind draws a world of abstract conceptual objects and universals, which may be called the universe of intelligibility or of human knowledge, which, on the one side, in order that it may be known is detached from the universe of existence, and, on the other hand, is identified with it for its subsistence. Thus it is most certainly the things of the world or existence which we attain to in attaining to the world of intelligibility, but neither in their singularity nor in the contingence of the flux of their singular eventualities. Our senses so attain to them: science only attains to them directly in the natures and universal determinations which give the grounds for their intelligible necessities. And it is in returning, as Cajetan says in a passage quoted above,[1] by the ministration of the senses, to singular and contingent things that the universal is realised; in the re-integration of the intelligible in the existent, whether in the sensibly existent, or in the spiritually so, that it achieves its grasp of the

[1]Cajetan, *In Anal. Post.*, i, 1, c. 8. *Vide supra*, chap. i, p. 35.

real.[1] (The one, the sensibly existent, is the origin of all our knowledge: the other, the mentally existent, may be reflectively experienced when the mind knows itself by its acts, or may be attained to by reasoning when it knows God and the spiritual world—by analogy with sensible existence, with which our mind must still be in relation in some degree even in the knowledge of the supra-sensible.)

It must not be forgotten that if, in effect, the singular as such is not the object of science, and is not directly seizable by the human intelligence, it is nevertheless indirectly seizable, in reflex concepts; and it is in it (as transobjective subject) that science ends, completing the circle of its intelligible motion. This is why we have need of the senses, not only to draw from thence our ideas of things, but for the resolution of the judgment, which in one way or another (and even when the judgment is not verified by the sensible)[2] must needs take place in the senses, *sicut extremo et ultimo, ad quod resolutio fiat*,[3] because judgment is concerned with (actual or possible) existence, and 'sensible and visible things' are for us the paradigm of the existent.

For St. Thomas a science of nature which did not return to the singular real would be not science, but a dream. And it is the same, analogically, for metaphysics, which also returns to the singular, and for mathematics, in so far at least as it comes back to an intuitively constructible singular, where its fundamental entities have an imaginable existence.[4] In effect, 'the end in which the knowledge of nature is achieved is the

[1]Even in mathematics, which makes an abstraction of the order of existence, there must be a return to the *imaginably* existent, *i.e.* the constructibility of imaginative intuition, at least indirectly or by analogy and in relation to directly constructible entities. Thus non-euclidian geometries, for example, definitely keep their full logical security from the possibility of our ability to construct euclidian models of them, the intrinsic coherence (*i.e.* exemption from internal contradiction) of euclidian entities being itself assured by their existence for the imagination.

[2]See *supra*, chap. i, pp. 67–71.

[3]St. Thomas, *De Veritate*, 12, 3, ad. 3. It is notable that the judgment, the intuition of the senses, and also the appetite are all three of them related, though in very differing fashions, to the *esse rerum*: the judgment as declaring how the thing attained in our notions compares with this (actual or possible) *esse*: sensible intuition as so attaining the sensibly existent in act; the appetite as bringing the subject to bear on the thing as it exists in act.

[4]See note 1, *supra*.

thing attained by the senses, above all by that of sight. As the cutler does not seek for further knowledge of the knife than is required by the work he has in hand, that is, to make this particular knife, in the same way the wise man only seeks to know the nature of a stone or of a horse in order to find the reason of the things which the senses are aware of: and as the judgment of the artisan of the knife would be deficient if he ignored the work in hand, the judgment of the scholar would be equally so if he ignored the evidence of the senses. On the other hand, all that is known by our intelligence (even mathematical beings and metaphysical realities), in the present state of the soul's union with the body, is known in some relation to the sensible things of nature. Thus it is impossible that the judgment of our intellect should not be deficient when the exterior senses are closed up by sleep.'[1]

It is indeed not true to say that there is only one world of intelligibility drawn by abstraction by us from the world of existence. There are as many universes of intelligibility as there are degrees of materialisation or otherwise in the object.

RATIONAL BEING

The mind does not only abstract from the sensible those intelligible natures which are realised in the world of existence: it does not only set before itself those natures or the notions which are born from such, in consideration of the world of existence, all of which are able to exist: in brief, it does not only conceive of real beings, *i.e.* beings capable of existence, it can also construct in the image of such natures, *ad instar entis*, objects of thought *incapable of existing* outside the mind (*e.g.* gender and species, the subject, the predicate, etc.) which the ancients called rational beings, *entia rationis*.

These objects of thought, which do not merit the name of essences, for essence is the capacity to exist (*esse*),[2] are not wholly created by the mind. They are made up of elements which are essences or intelligible aspects first of all grasped in things. For example, the object of thought

[1] *Sum. theol.*, i, 84, 8. Cp. *De Veritate*, 12, 3, ad. 2.

[2] 'Essentia dicitur secundum quod eam et in ea res habet esse' (St. Thomas, *De Ente et Essentia*, c. 1). 'Non habet (ens rationis) essentiam aliquam.' (Cajetan, *Commentary*, c. 1, q. 1.)

'nothingness' is made up of 'being' to which is joined the notion of negation. In themselves these are only non-essences (*negations* or *privations*)—a chimera is a non-being conceived in the likeness of an animal—or *relations*, which although they indubitably cannot exist outside the mind, have nevertheless the same intelligible content and definition (προς τι) as real relations. Such objects are not things, nevertheless they are not *pure objects* separated from any transobjective subject like the 'phenomena' of the moderns,[1] for they are conceived in the image of such subjects (a preliminary knowledge of which they presuppose) and they are constructed from elements drawn from the real: far from being separated from these they are thus doubly bound up with them. The (actual or possible) real remains their foundation and their occasion; from thence they draw all their objective consistency. If we can make judgments about them, it is because we treat them *as if* they were things: 'ratio de eis (non entibus) negotiatur quasi de quibusdem entibus, dum de eis affirmat vel negat aliquid.'[2] And if the mind can be true or false with regard to them, it is by an indirect connection with the reality which makes their foundation and occasion. If you suppress the nature of a circle or that of a square, you cannot say that a square circle is unthinkable; if you suppress the whole of apprehensible nature in its

[1] Let it be added that they are *made* by the mind before being *known* by it as rational beings. I employ the ideas of blindness or of death to signify that a man has lost his sight or ceased to live, long before knowing these rational beings as such, or perceiving that I am thinking of death or blindness as if they were things. From this angle '*esse est percipi seu intelligi*' is not even true of a rational being: it exists in the mind before being known: and without doubt (and that is how the idealist formula is applicable to rational being) this existence in the mind is itself only an *esse objectivum seu cognitum*, but which refers to the *cognosci* of the real elements with which the rational being has been constructed and at the instance of which it is conceived, not to the *cognosci* of the rational being as such. It is only possible to say purely and simply '*esse est intelligi* (ipsum intelligi intrinsecum)' of the mental concept. 'Cognitio formans ens rationis non est reflexa respiciens ipsum tamquam rem cognitam ut quod, sed illa cognitio directa, quae *ipsum non ens reale, vel quod realiter relativum non est*, denominat cognitum ad instar entis vel relationis realis. . . . Non . . . cognitio reflexa quae praecise ens rationis denominatur cognitum ut quod, sed cognitio directa qua denominatur cognitum ad instar entis id quod non est, formaliter et per se primo format ens rationis.' (John of St. Thomas, log. ii, P. q. 2, a. 4, *dico ultimo.*)

[2] St. Thomas, *In Metaph.*, book iv, lect. 1, n. 540.

various degrees of determination, you cannot say that the species is a portion of a genus.

If, as the critical realism of Aristotle and St. Thomas teaches, extramental intelligible being is the first object of the intellect, and if the existing real is first of all given us through the senses, we can be certain that our first intellectual apprehensions do not bear upon rational beings. *Ab actu ad posse valet consecutio*: since there are ants the ant is possible. And as to the possibility of being in general, it is certified for us, independently even (by right) of all actual perception of existence,[1] by the very first intuitive judgment of our minds, which precisely affirms that being is not not-being.[2] But how can a philosophy which only starts from thought, and according to which the mind attains at first only to itself, be sure that all the objects of our thought are not rational beings? This is where the malign Genius plants his barb: the problem which was crucial for Descartes (and for Leibnitz). By that violent retorsion, that living contradiction which is in the heart of idealism, how is it possible finally to avoid the question whether being itself, in the image of which rational being is made by thought, and which in the first instance is conceived by the intellect as a (possible) reality—whether being itself is not a rational being?

God does not make rational beings; it is a mark of the weakness of our abstract intelligence that in so many cases it has no power to conform itself to reality except by constructing these rational beings. We can only grasp the wounds of being in conceiving of them in the image of being.[3] 'Tunc efficitur ens rationis, quando intellectus nititur

[1]Cp. *supra*, p. 111, note 1.

[2]Thus 'we see at once that it is not only inconceivable, but *really* impossible for a thing at once to be and not be. And we thus affirm already the objective and ontological value of the principle of contradiction *before making any judgment on existence*, before reflecting that this primary affirmation presupposes ideas, and before *verifying* that these ideas come to us, by abstraction, from the sensible things laid hold of by our senses.' (R. Garrigou-Lagrange, *art. cit.*)

[3]And we can only perceive relations in forming a separate concept of them, abstracted from the subject where they have or have not their foundation. Being in itself only one of a pair, one, if I may put it so, among things, not implying in its notion either the exigence of existing in itself or of existing in something else, but a pure connection between this and that, relation is an intelligible object which does not necessarily in itself imply ontological grounds, and is only real by reason of its basis in its

apprehendere quod non est, et ideo fingit illud, ac si ens esset.'[1] Let it be noted here that if there are rational beings (like the square circle, the greatest possible whole number, the chimera, the best of all possible worlds) which cannot exist because they are intrinsically contradictory —they are the thieves and forgers among rational beings—there are, on the other hand, numerous others, honest rational beings, which cannot exist, not because they are composed of impossible characteristics, but because their place in existence is incompatible with one of their objective features. The notion of the predicate is not absurd, but it would be absurd to attribute an existence outside the mind to a predicate, which is defined by a certain function which a thing possesses in so far as it is known.

Implicit in the notion of them as some relation to something real attained by the mind is, we say that these rational beings are *founded on reality*. It thus happens that a rational being, which cannot exist outside the mind as it is itself presented to the mind, *i.e.* as a being, can very clearly show, by reason of its foundation on the real, what exists outside the mind, and it is indeed only constructed for that end. To say that Neptune is observed by an astronomer is to posit a rational relation in Neptune, but it is certainly real to say that the astronomer observes Neptune. Evil is a rational being in the sense that to think of the bankruptcy of good which there must be in a subject I am forced to conceive of it as if it were a thing. But evil exists most really and positively in the sense that the subject in question is thereby mutilated or deprived of something which should be vitally in him. The physician does not find deafness in the ear and he does not look for it in order to destroy it as he would a colony of bacteria, nevertheless it is a very real thing to be

subject. 'Quia ex proprio conceptu est *ad aliud*,' John of St. Thomas profoundly says, 'requirit fundamentum, non solum ut existat, sed etiam *ut sit capax existendi, id est ut sit entitas realis*.' (Log. ii, P. q. 17, a. 2.) Abstractive understanding can thus conceive of this object of thought as well where it has a real foundation in the subject connected with one term (the relation is then real, thus the ship really draws away from the shore) as where it has no real foundation in the subject (if there is then for all that a real foundation, or a rational relation founded on the real, as when it is said that the shore draws back from the ship). On the conditions necessary for a relation to be real, see John of St. Thomas, *art. cit.*

[1]Oposc. (apocr.), *De natura generis*, c. 3.

deprived of the sense of hearing: the rational being 'deafness' is founded on a very real derangement in the internal organism of the ear.

Moreover it is in very differing degrees that such and such an object of thought can be affected by the note of unreality characteristic of rational being. Evil and deafness, while all the while referring to the very real fact that a subject lacks a good which should be there, are, in so far as they are objects set before the mind like a substance or a quality, not-beings. A geometric surface is a possible being (if it is a euclidian surface) affected by a rational condition which prevents it existing in nature with that absolute absence of density which its definition implies: movement is *par excellence* the reality of sensible nature, but we can only conceive of it by retaining in the memory that part of it which has already lapsed, so that 'if the soul did not exist' time and movement 'would not be',[1] *i.e.* with that unreal consistency (rational condition) with which our apprehension endows them.[2] It is very important, as we shall see in the next chapter, to consider the part played in our knowledge by these rational beings founded *in re*.

[1] 'Ἀδύνατον εἶναι χρόνον ψυχῆς μὴ οὔσης. . . .' (Aristotle, *Phys.*, iv, 14, 223-6.) See J. Maritain, *Philosophie Bergsonienne*, and *Theonas*.

[2] In the two latter cases the mind has 'completed' the real with some unrealisable element, and it is only for this reason (*completive*) that the object conceived by it is an *ens rationis*. Cp. Cajetan, *In I*, 28, 1, *Ad primum vero dubium*; St. Thomas, *In I Sent.*, dist. 19, q. 5, a. 1.

CHAPTER III

OUR KNOWLEDGE OF SENSIBLE NATURE

1. THE MAJOR TYPES OF KNOWLEDGE

I HAVE SAID that science—in the precise though very general sense of knowledge in a perfect and irrefragable mode—attains to those intelligible universes immanent in the universe of existence; but these it considers apart, in order to impress them in some way on the universe of existence. These universes of understanding are made up of abstract natures (grasped in themselves or their substitutes), of laws and necessary relations, while the universe of existence is a universe of individuals and events. In this universe there is contingence and hazard, an irreversible flux of singular formations in interaction, none of which ever reappear again in exactly that form; there is liberty. This is the universe in which we live, in the midst of particular and contingent circumstances. It is absurd to imagine that it can ever be wholly under the dominion of science, for all these features which I have enumerated are not, as such, objects for science, in the precise sense of the word. The knowledge of the world of existence, exactly in the degree to which it is concrete and existing, belongs, from the point of view of speculation, to experience and to history, to the certitudes and perceptions of memory, the constatation of facts, to conjecture and well-founded opinion, in short, to the work of the intelligence when occupied with the senses: from the practical point of view, it belongs to art, to prudence, to knowledge by connaturality. Science, apprehension in the strict sense of the word, only considers those intelligible necessities which this world invests with its reality. Each of our types of knowledge considers in the world its own universe of intelligible necessities and that alone. Nevertheless there is a supreme form of knowledge, a prime-knowledge, a knowledge of first principles, which can consider all these differing universes together, not in order to substitute a particular form of knowledge which it ap-

plies to each in turn, but in order to comprehend its own form of apprehension, to defend and justify its principles, and thus to establish unity.

What then, at least in their most general types, are these diverse universes of intelligibility which our intellect sets before itself when it endeavours to disengage itself from the senses? The aristotelian tradition which I have already recalled,[1] recognised three principal types, which correspond to what Thomists call the three degrees of abstraction: the universe of the principles and laws of mobile and sensible nature, the world of PHYSICA: the universe of quantity as such, the world of MATHEMATICA; the universe of being as being, and of intelligible objects which, as such, do not require matter as a condition of their realisation, the world of METAPHYSICA.

Is it desired to give to these three degrees of abstraction, names more in conformity with the habits of the modern didactic vocabulary? We can say, making use of the terminology proposed in chap. i that if the assemblage of what the knowing subject can attain to in the transobjective subjects submitted to the grasp of its intelligence (*i.e.* which proffer themselves to it in order to be turned into its objects),[2] constitutes in a general way the *transobjective intelligible*,[3] the first zone with which the human intellect is in relation in this vast totality, is the universe of those objects which can only be realised in sensible or empiric existence, what we may call the universe of the *sensibly real*. How is it possible to surpass this universe? Either in rightly escaping from the real and the renunciation of the endeavour to co-ordinate knowledge with that supreme value which is existence apart from the mind, *i.e.* by application to objects which (if they are realisable) can only be realised in sensible existence, but which are conceived of without relation to existence, as it is in the second zone of transobjective intelligibility, the universe of the *preter-real*, the universe of the mathematician: or by rising beyond the sensible, in application to objects which are conceived in relation to that supreme value of extra-mental existence, but which are realised in a non-sensory, non-empiric existence: this is the

[1] Cp. chap. i, pp. 44-7.

[2] These subjects which are proportionate (connatural) to the human intellect are corporeal and sensible things.

[3] In the didactic terminology proposed here the word 'intelligible' is taken in the sense of intelligible *to us*.

third zone of transobjective intelligibility, the universe of the *trans-sensible* —the universe of the metaphysician—which opens out into the world of the (to us) trans-intelligible, which can only be known by analogy.

These three general types of understanding belong to the order of speculative knowledge.

If it is a question of the order of practical knowledge, then, from the heights of metaphysical understanding, the mind returns towards the world of existence as such, and comes, by the stages of moral philosophy and the practical sciences which are its continuation, then of prudence, finally to the point of immediate contact with the singular action requiring regulation. This practical order, however, is not in this present instant, our theme.[1]

In the speculative order, metaphysics is that supreme and master-form of knowledge which was referred to above. It is possible to ask with Kant if metaphysics can be a science (to which I answer, Yes), or with Maine de Biran and Bergson if it is in itself an experimental science (to which my answer is, No). In any case, no other form of knowledge, in particular none of the experimental sciences share with metaphysics the universe of the trans-sensible, or the third degree of abstraction. Inversely, neither philosophy or any ontological form of knowledge shares with mathematics the universe of the preter-real, or the second degree of abstraction.

On the contrary, in the first degree of abstraction we find two differing forms of understanding, one of an ontological order, the *philosophy of nature*, one of an empiriological order, the *experimental sciences* ('Science' *κατ' ἐξοχήν* in modern terms), which share out among themselves the sensible and mobile universe. Thus it is in this degree that we encounter in its most significant form the problem, or perhaps is it necessary to say, the conflict, of science and philosophy. We have already taken cognisance of this problem, as it first of all presents itself to reflection, *i.e.* from the primarily methodological standpoint of the theoretician of the sciences. Now we shall endeavour to penetrate it from the point of view of critical philosophy. For this it is necessary to return to the consideration of physico-mathematical science, in order to examine afresh this queen and goddess of the experimental sciences.

[1] This is considered in chapter vii.

MODERN PHYSICS CONSIDERED IN ITS GENERAL EPISTEMOLOGICAL FORM

Such a science, we have seen,[1] appears first of all as a mathematisation of the sensible; claiming from induction well-founded empiric data, but in order to subject these to a form of deduction and a rule of explication which are of a mathematical order, it belongs to that epistemological type which the ancients called 'intermediary sciences' (*scientiae mediae*), sciences which overlap the borders of physics and mathematics, which are materially physical and formally mathematical so that they have at once more affinity with mathematics than physics in their laws of explications, and are in the end by which they verify their judgments, more physical than mathematical.[2]

One primary point must here again be made clear, which has already furnished a theme in the chapter consecrated to scientific experience: it is not the nature of physical causes considered in itself which forms the object of physico-mathematical research. Physico-mathematics works in the terms of the physical real, but in order to envisage them from the formal standpoint of mathematics, and of mathematical laws which connect together the measurements collected by our technical instruments from nature. All its concepts are resolved in the measurable. And what verifies the deductive synthesis which it erects is simply the coincidence of its numeric results with the measurements given by experiment; it does not follow that the mathematical beings which intervene in this synthesis represent determinatively real causes and entities which are like the ontological articulations of the world of sensible nature.[3] Physical theory is verified *en bloc*, by means of the correspondence established between the system of signs which it employs and the measurable data which have been recognised by experiment.

But a second point needs also to be signalised, which relates to the observation I have just recalled, the point that physico-mathematical knowledge, while all the time taking its formal texture from the mathematical order, nevertheless remains, in the end to which it is directed, more physical than mathematical: and ontological pre-occupations

[1] Cp. *supra*, chap. i, pp. 52–6. [2] Cp. *ibid.*
[3] Cp. *supra*, chap. i, pp. 76–7.

enter obliquely into it. Without constituting a science of physical being as such, it *obliquely* admits ontological values.

The system of mathematical relations which it seeks to establish between sensible phenomena, and which constitutes its highest formal object, does not in itself sufficiently satisfy or stimulate the mind of the scientist. His interest is directed towards the physically real. By reason of the reality on which his science is founded and towards which it leads, of the invincibly ontological tendency of the human mind, and the pressure exercised on all sides, despite himself, on him by the principle of causality, he is necessarily led to integrate in his mathematical deductions—in the very domain of his own science—into his formally mathematical explanation of observed appearances, a system of principles and causes of an (ontologically) physical order which he has built up anew for that end. (In the same way we often find, in the initial principle of a new theory, the intuition of some explanatory entity which is physically conceivable.)[1] And thus such a science admits of a relation with real being, not only considered as the inexhaustible source of obtainable measurements, but also as the foundation for those reconstructions of which I have just spoken.

One thing must be particularly observed: the so constructed entities may be real or rational beings—to him the point is entirely indifferent. It is for the philosopher, if he can, to draw any such distinction between the diverse entities set in action by the physicist. The physicist himself is not troubled by any such question, for all that is important to him is the

[1] These mathematical manipulations bring certain consequences in their train, to which M. Emile Picard has rightly drawn attention. 'If it is asked to what the wave-theories of Fresnel are attached, it is necessary to reply, and we here touch on a point which is capital for scientific philosophy—to a system of *differential equations*. Now these, as is too often forgotten, have only been formed, starting from the molecular conception of the ether-medium, by the making of numberless hypotheses on the relations of this ether with ponderable matter, and in passing from discontinuity to continuity so as to obtain these differential equations, which have moreover been reduced, in order to escape inextricable analytic difficulties, to linear form, as in so many of the questions in mathematical physics. More or less analogous conditions present themselves elsewhere and, under these conditions, it is comprehensible how difficult it is to definitely condemn the initial conditions of a theory.' (E. Picard, *Un coup d'œil sur l'histoire des sciences et des théories physiques*, a lecture, delivered to the Académie des Sciences, Dec. 16th, 1929.)

explicative value of these entities as functions of the system of equations of physical theory. So that his ontological appetite is as well, if not better, satisfied by rational as by real beings.

It is moreover possible that he will be shocked to hear the philosopher speaking in such a way: for a vast misunderstanding rises from the fact that the two attach a different meaning to the word 'real'. The philosopher opposes real being and rational being in the critical and logical sense which I have here explained, and it is very important to him to discover to which of these two categories the entities with which he is dealing belong. This opposition and this investigation are alike uninteresting to the physicist as such; more, he ignores them. And he assumes, on condition that they are defined by measuring operations which are at least theoretically realisable, that the entities of which he makes use are real, *i.e.* that they express in an authentically physical way the real bearing of nature. 'I entirely believe', replies the philosopher, 'that they have been made for that, but that is only more manifestly the proof that they are *entia rationis*'. The physicist immediately adds at that, as though to contradict his colleague, that these real entities are only 'shadows' or illusions, and that it would be ridiculous to ask of them anything concerning the essential nature of matter. . . .

REAL BEING AND RATIONAL BEING IN PHYSICO-MATHEMATICAL KNOWLEDGE

This is a typical instance of the important part, indicated at the end of the preceding chapter, played by rational beings in human knowledge. Because rational being—the order which is maintained by our conceptual objects taken exactly as known, *i.e.* according to the life which they lead in our mind—because rational being constitutes the specific object of logic (that is the privilege of that science), we are tempted to believe that these *entia rationis* only play a part in logic: a grave error indeed. Already, in general comprehension, rational beings are made use of at every instant: it is so, for example, every time we say '*Evil* has triumphed in his soul', or 'he is a victim of *deafness*', or 'the sun *rises*', for *evil* and *deafness* are privations, not essences capable of subsistence, nor does the sun mount in the sky. Mathematics is constantly creating rational beings, such as an irrational number, imaginary number, transfinite number, outline-spaces, etc.[1] And it is obvious that a form of knowledge of the physically real which does not scrutinise in themselves, in their own physical or ontological reality, its causes and essences, but which reconstructs this reality purely from the point of view of the relations of measurement which it contains and according to the exigencies of mathematical deduction in the most generalised form possible, will necessarily make use of a great number of rational beings as its indispensable auxiliaries. Among the entities which enable the physicist to think out his numerical records in use under the present conditions of physical observation, they will be of every kind, from the multitude of more or less elaborated *entia rationis* which only respond to experimental authentifications and which translate conceptually the observable causations and structures of the real,[2] to those entities, such as the atom or the electron, which appear, in what is concerned with the question *an sit*, as realities (something exists which the words *atom* or *electron* determinatively enclose), and, in what is concerned with the question *quid sit*, as images which are not only approximations to, but symbolical of primordial parts of the spatio-temporal organisation of matter (we may say that they are symbolic reconstruction of real beings);[3] up to those entities, of which Einsteinian 'time' offers to-day the most famous example, which are in the full sense rational beings, substitutes for realities whose ontological value has no interest for science. Naturally I am speaking of rational beings founded on the real, for they

[1] I hold 'transfinite number' a *real* entity (of absolute potency) with regard to the infinite *transcendental multitude* implied by the notion, but an *ens rationis* with regard to the *general unity* which fulfils its notion (which is only a unity of apprehension), and which so to speak, allows for the return to and the analogical re-imposition of a mathematical order, and mathematical considerations of equality, integrity, etc., in that purely metaphysical order to which the whole transcendental multitude taken simply as such belongs.

'God', said Kronecker, 'made whole numbers; all the rest is the work of men.'

[2] See *infra*, p. 195, note 2.

[3] M. Wolfers rightly complains that 'many students have taken to the habit of reasoning about electrons, protons, photons and atoms, as if they were pawns in a game of chess, forgetting that these terms still contain a crowd of hypotheses, obscurities and subjective ideas.' (*Transmutations des éléments*, Paris, Soc. d'édit. scientif., 1929.) On the physical significance of wave mechanics, cp. André George, *L'Œuvre de Louis de Broglie et la physique d'aujourd'hui* (1931). 'The attempts at physical presentation by more or less traditional means have all come to a non-plus.'

are founded on the real behaviour of nature, on measurements and facts really found in nature—for example on Michelson's results; there remain also other rational beings, entities incapable of existing as such, and which have no more intrinsic and direct ontological value than the material models constructed in space by Lord Kelvin.

How are we to comprehend this formation of explanatory entities, which all present in the most diverse degrees the aspect of *entia rationis*, and which nevertheless remain all the time founded on reality? It is by applying ourselves to an exact doctrine of quantity that we can answer this question.

Considering things from the standpoint, not of the physicist, but of the philosopher, and to express ourselves in his language, quantity, *i.e.* the extension of substance and the metaphysical unity of its parts which are diverse with regard to position, is a real property of bodies. There are, in nature, dimension, numbers, real measurements,[1] real

[1]Cp. R. Dalbiez, 'Dimensions absolues et mesures absolues,' *Revue thomiste*, Mar.-Ap., 1925. To make more exact what I have said in *Theonas*, when basing oneself on the aristotelian doctrine of the three kinds of predicative relations (*Met.*, v, 15: St. Thomas, lesson 17: cp. John of St. Thomas, *Curs. Phil.*, log. ii, P. q. 17), it is requisite to distinguish the measurement *of specification*, which is the basis for relations of the third kind and which rules measurement *secundum commensurationem esse et veritatis* (this measure is of another order than what is measured), from the measurement *of comparison*, which is the basis for relations of the first kind, and which in particular is the comparison of number and unity, standards of scale (mathematical measurement).

Our physical measurements imply a *transcendental relation* (or *secundum dici*) between our unities and instruments and the reality which is to be measured; a real (predicative) *secundum esse* relation of the *first* kind between our unities and the measured quantity (the measure of comparison); and a *secundum esse* relation which is rational (not real) of the *third kind* which makes the being of the measured depend on our measurements (in the fashion in which we conceive of them)(measurements of specification).

Outside these (ontologically) real measurements of specification—which can be concerned with quantity in itself (for, in my opinion, it is to this category that *mensura intrinseca* 'quae est in mensuratio sicut accidens in subjecto' (St. Thomas, *In Sent. II*, dist. 2, q. 1, a. 2, ad. 1; must be referred, as a body is intrinsically 'measured' by its own dimensions, ontologically determined)—there are in nature real measurements of comparison, which are ontological measurements, according to which things, and their dimensions in particular, are extrinsically determined and bound up with another in a unity of co-ordination and subordination ('unumquodque mensuratur simplicissimo sui generis', *Sum. theol.*, i, 10, 6: cp. *In Met.*, x, 2), and which the philosopher can call numbers (in the sense in which, according to St. Thomas, as is pointed out below, number exists *a parte rei* and as numberable before being numbered) but which has

space,[1] real time,[2] and it is under the conditions and modalities of this real quantity, quantitatively measured and regulated, that the interacting causes in nature develop their qualitative activities. *In mensura, pondere et numero*. Physical reality breeds a rich harvest of entitative riches irreducible to terms of quantity; but by reason of its materiality, and because it emanates from the substance of bodies mediatized by quantity, this world of qualities is intrinsically subject to quantitative determinations (that is why it is accessible by our extrinsic and artificial measurements). Quantity thus ontologically considered, as the first accident of corporeal substances and as the matrix of cosmic activities, is the object of consideration for the philosopher of nature, who is otherwise incapable of passing on from this to the consideration of those quantitative determinations to which the physical world is subject and of rediscovering for human use the heights and depths of nature.

But quantity can be considered in another way: when disengaged from its subject by *abstractio formalis*, set before the mind in itself, as constituting in itself a separate universe of knowledge (the universe of the preter-real), it is then treated no longer ontologically and from the point of view of being, but quantitatively or from the standpoint of those relations of order and measurement which sustain the objects of thought so discernible as the forms or essences which are proper to them. Thus considered it is the object of the mathematician. I am well aware

nothing to do with the numbers found by the observer (the numeration of the physicist). It is so, for example, that time is bound up with the most fundamental form of movement (what the ancients sought for in the movement of the stars, and to-day is rather sought for in the movement of light or inter-atomic motion), the measure of another time than that of the material universe. (Thus St. Thomas says, for the concept of measure can be applied analogically, that there is only one *aevum*, measured by the duration of the first angel.) But the measure or scale of nature escapes us, because in reality this is not a question of a scale which can be applied to a quantity, but only the ontological basis for such an application. Those measuring instruments belong to the Mind which created the measure and scale of the universe.

St. Thomas explains (*In Arist. Phys.*, iv, 23) that without a numerating mind *numeration* is impossible, but that there may be numbers: 'Sicuti possunt esse sensibilia sensu non existente, ita possunt esse numerabilia et numerus non existente numerante.' That is to say, that then this number is not numbered (in act). It cannot be called 'reckoned number' unless offered to numeration. 'Numerus numeratus dicitur . . . id quod numeratur in actu, vel quod numerabile.' (*Ibid.* lect. 17.)

[1]See *infra*, pp. 201-6.

[2]See J. Maritain, *Theonas*.

that for many modern theorists of pure mathematics the latter has no object, but only purely formal logical relations, so that according to the celebrated definition of Bertrand Russell, it can be reduced to 'a study in which one ignores that of which one is speaking, and does not know if what one says is true', a discipline without content, and in which such objective content as survives is furnished by the physicists. But this nominalist tendency, in my opinion, only prevails in mathematics because an unjustified abandonment of intuition goes hand in hand with the precious rational acquisitions represented by the development of the axiomatic.[1]

This intuition is not intelligible intuition (nor pure intuition, in the kantian sense), as the geometricians for long believed, giving themselves for object a world of platonic models cut out from the amorphous background which these figures defined (*i.e.* the eternal and conditioning universe) and which was called 'space': neither is it an experimental intuition, springing from external perception, the observations and measurements which are affected thanks to the senses and our instruments. It is an imaginative intuition, an intuition of 'inward meaning',

[1] As M. René Poirier has rightly pointed out, 'the word, axiomatic, can be applied to a theory whose postulates and indefinables are made evident. Every strictly formal science is thus axiomatic. But this term can also designate, in opposition to another theory, where an endeavour is made to retain the accustomed meaning of the original notions, those theories where any such attribution is abandoned, where they are seen simply as terms whose significance consists in their use according to some formal convention. In this sense current intuitive geometry is not axiomatic, but Hilbert's is, almost perfectly. This ambiguity is apparent in formulas like the following, which the whole world accepts, but interprets variously: every exact science must tend to an axiomatic form. In the first sense this would imply that it must be set out in a rigorously hypothetico-deductive manner. In the second, we reach this much more seditious conclusion: every pure science consists in the invention of an alogarithm, in itself deprived of all objective significance, and used in such a way that the results produced correspond to those of experience, in a purely symbolic and verbal manner. In other words, a truly abstract theory of phenomena is made up of symbols emptied of sense.' In disagreement with M. Poirier, I do not hold that his first thesis implies the second.

It is possible to ask, on the other hand, if on the side of this development of the axiomatic, that of physico-mathematical science has not been in part the occasion of that epistemological up-set by which the moderns, misunderstanding one of the primary categories of knowledge, tend to integrate, in order to give it a content, mathematics with physics. In return, a just critical appreciation of mathematico-physics as a *scientia media*, in the very degree to which it requires an exact notion of the pure epistemological types so encountered, should restore to mathematics both its content and its superior position.

and which only depends on external perception presupposingly, as does imagination itself. The part played by imagination is explained by the fact that quantity, as the first accident of corporeal substance, precedes (in natural priority) the whole qualitative (energetic and physical) order, and thus the whole sensible order, and is so known by the senses by means of sensible qualities, not without, for all that, a whole synergic education of perception (it is, as it were, a 'commonsensible'). Imagination in the service of the intellect can therefore penetrate into the world of pure quantity, abstractively detached from sensible matter—and that in the very measure in which imagination, although it presupposes the external senses, is free of them (I mean that its objects are not subject to the relative conditions which affect *hic et nunc* those of perception, and which proceed for an actual dependence in regard to external physical circumstances). The intuitive schemas of the imagination—which are in no sense the object itself, but only the symbols or sensible illustrations of the object of mathematics—thus exhibit to us sensibly, but in a way independent of all experimental conditions, both the essences and the properties which in themselves precede the sensible order and are independent of it. And this action of the imagination, without in the smallest degree diminishing the strict and rigorous rationality implied by logical verifications, as the intuitionists seem too often to believe, is indispensable, because the object is not here, as in metaphysics, purely intelligible. The constructive power of imaginative intuition must make manifest *ad sensum* the intrinsic possibility of the entities considered by the mind, above all of those indefinables which are at the beginning of the science, and so assure us that, far from concealing some secret impossibility, these are veritable essences (on whose foundation moreover rational beings capable of ideal existence can in their turn be built up.)

Whatever be these entities constructed or reconstructed by the axiomatic method—which, when they are not directly figurable by intuition, at least indirectly or analogically fall into the field of the imaginable, such as non-euclidian multiplicities, the legitimacy of which became evident in relation to all geometry on the day when, following in the steps of Beltrami, a euclidian translation of them was seen as possible—they exhibit, by this connection with the intuitive sources of

mathematics, in themselves a content, a field of truth and rightful intelligibility—entirely in itself independent (if not in the pre-scientific paths which have led the mind thither) of physical formations and experimental existences. In the same way the confusion of mathematics and logic comes from a fundamental misunderstanding of the nature of logic. A non-reflective science, which does not find, as logic does, its object in the objects of the other sciences in so far as they are dealt with by the mind ('in as much as they are known') has necessarily its own domain of knowable natures, a rightly objective and direct content.

This objective content of mathematical observation, is then, as the ancients saw (but a whole new synthesis requires building upon the foundation of their principles), being under the terms of quantity as such, of quantity taken in itself, with its own 'qualities',[1] the relational structures and the properties of order and measure decipherable in limited and unlimited quantity; all the more so that the incessant conquests of modern mathematics oblige us, as by a series of logical exhaustions, to enlarge, revise and refine many of the notions previously held of these beings, and that, by a form of effort after a total spiritualisation of all mathematical knowledge, number for three centuries has tended to reduce and absorb the irrevocably potential field of content, and on the other to escape, if it were possible, from quantity itself and spatiality in order to extend its empire over the whole transcendental multitude. However this may be, these mathematical beings, as I have already pointed out, turn abstract not only existence, but the very order of existence, so that they can be *indifferently*, and while remaining the legitimate objects of science, *real* (in the philosopher's sense)[2] or *rational*. More, it is precisely in entering in the most decided fashion into the region of *entia rationis* and pure ideality that modern mathematics has made so many admirable discoveries.

[1] See *supra*, chap. i, p. 45, note 1.

[2] It goes without saying that the word *real* is not used here in the sense in which a mathematician distinguishes between real and imaginary numbers. Irrational numbers are real numbers in the mathematical sense of the word—and the philosopher would call both rational, not real beings, like imaginary numbers. Imaginary number is called so because it does not truly correspond with the *notion* of number; it is an analytic expression.

It is thus easy to comprehend how in making a mathematic exegesis of the physically real—which is precisely possible because quantity, which is the first accident of bodies, is grasped by mathematical knowledge at a higher degree of abstraction and immateriality than that of physics[1]—the mathematical physicist can have a mathematician's indifference to the character of *real* or *rational* being in the entities of which he makes use, and can even be led, as we can see among our own contemporaries, to employ in the explication of extra-mental reality mathematical terms essentially inapplicable to any existence outside the mind. In that very degree the universe which he constructs will become unfigurable—in the degree to which mathematical rational beings are employed in its construction, and as these are not directly representable by imaginative intuition like the *entia rationis* of euclidian geometry and the arithmetic of whole numbers.

The fact remains that mathematical rational beings are founded on mathematical real beings, and that the latter are disengaged from the experience of the real world by mathematical abstraction, as they are grasped in the depths of that real quantity which the philosopher considers ontologically. Quantity is there, it is it which definitely, and that in the most radical fashion, bases on the real the entities built up by the physicist in order to refind, starting from the constellations of mathematics, the natural earth; from it he draws his measurements

[1] 'Mathematica dicuntur per abstractionem a naturalibus—naturalia autem se habent per appositionem ad mathematica: superaddunt enim mathematicis naturam sensibilem et motum, a quibus mathematica abstrahunt: et sic patet quod ea quae sunt de ratione mathematicalium salvantur in naturalibus, et non e converso.' (St. Thomas, *De Caelo et Mundo*, iii, 3.) This is why the student of nature can use mathematical principles in his demonstrations: ' Magnitudo addit positionem supra numerum; unde punctus dicitur esse unitas posita. Similiter autem corpus naturale addit materiam sensibilem super magnitudinem mathematicam; et ideo non est inconveniens si naturalis in demonstrationibus utatur principiis mathematicis.' (*Ibid.* i, 3.)

This use of mathematical principles in the knowledge of nature can either remain accidental and represent a borrowing from mathematics by the *naturalis*, or be an essential to the science under consideration, which is then properly a *scientia media*. It is clear that these various degrees of accidental 'mathematisation' must progressively change purely physical science into a *scientia media*. Modern mathematical physics realises the type-form of *scientia media* perfectly. On the other hand, in my opinion the use of mathematics in biology or psychology will never achieve the typical subordination of these disciplines to the rules of mathematical explication.

effectuated by means of his conventional ruler, and thence he sets off to climb the sky: an unceasing to and fro thanks to which mathematical physics incessantly grows.

Finally, although that science is little concerned with ontology as such, it accumulates in its own growth physical facts which, however wrapped up in theories, however difficult they may be to formulate apart from them, have nevertheless their own and independent value: and among the entities which it has constructed, those carry the strongest indications of reality and are least wrapped up in purely rational conditions which are most directly related (*i.e.* have the least theoretic interpositions) to experimental data. Thus the progress of theoretic physics, that is to say, the more speculative part of mathematical physics, which is accomplished by making more and more use of mathematical ideality, should not make us forget the immense treasure of purely physical results, of facts and observable configurations, in brief, of *entia realia*—for all that they are more particularised and less interesting to the philosopher—accumulated by the physics of the laboratory, that is, by the more experimental part of mathematical physics.

ONTOLOGICAL AND EMPIRIOLOGICAL EXPLANATION (AND THE TRANSFORMATIONS OF THE NOTION OF CAUSALITY)

In submitting itself fully to the attractions of mathematical explanations, and in translating itself into those terms, in the great revolution accomplished by Da Vinci, Galileo and Descartes, physics conquered its autonomy with regard to philosophy. More or less completely, more or less rapidly, the other sciences have followed its example. This enfranchisement of the phenomenological sciences has been in progress for three centuries and is still going on. If we wish to characterise the method by which this self-determination has been accomplished, it can be said that side by side with the conceptual dictionary of philosophy, which is ontological, a totally different one, which is of an empiriological order, has been constituted.

Our observation of some material object is the meeting point of two forms of knowledge, the sensible and the intellectual. We are in the presence of a kind of sensory flux stabilised by an idea; in other words,

of an ontological or apprehensible nucleus manifested by an assembly of qualities perceived *hic et nunc*. (For example, I find in the course of a botanical excursion a plant unknown to me. It belongs to some species —and by smell and sight and touch I eagerly seek to discover its characteristic features. I can either ask myself concerning it: what is a living plant? Or: how do I classify this in my herbarium?) It follows from a case such as this that there are two ways in which to resolve our concepts: one which rises towards intelligible being, in which the sensory remains observed by me, but indirectly, and as serving intelligible being: and another, which descends towards the sensible and the observable as such,[1] where doubtless there is no absolute abandonment of the idea of being (without which, indeed, there would be no thought), but where it is subservient to the sensible in itself, and before all to the measurable, and only remains in the mind as an unknown assurance of the constancy of certain sensible determinations and measures, and as allowing for the drawing of stable limits round the object perceived by the senses. This is certainly the way in which concepts are resolved in experimental sciences. I call these two methods respectively the *ontological* (in the widest use of the word),[2] and the *empiriological* or *spatio-temporal*.

It goes without saying that in 'ontological' explanation being continues to be considered (at least in so far as we remain, as in this chapter, within the limits of the first degree of abstraction) in the terms of observable data. But the mind in its consideration of these seeks for their inward nature and intelligible reasons, which is why it comes in following this path to the statement of notions like those of corporeal

[1] Cp. *supra*, chap. i, p. 48.

[2] The use made here of the word 'ontological' is much wider than that of that part of philosophy known as ontology or general metaphysics. It is used to designate a characteristic common to the whole philosophic discipline. I would add, to avoid any appearance of ambiguity, that *ontology* in this extended sense does not by any means monopolise all the claims and demands of the real. These, though manifest in an entirely different way, are certainly no less present in empiriological apprehension; and it would be wholly erroneous to make this a point of opposition between me and M. Emile Meyerson. In its construction of rational beings physics only endeavours to win a better grasp—in accord with its own rightful method of conception and explanation —of observed reality.

substance, quality, operative potency, material or formal cause, etc., all of which, though applying to the world of the observable, do not describe objects which are in themselves representable by the senses or expressible in an image or spatio-temporal scheme. They are not defined by observations or measurements which can be performed in a particular determined way.

In 'empiriological' explanation, on the other hand, ontology is still there, as I pointed out a moment ago, since it is a question of intellectual knowledge, and we do not cease to be reasoning animals by taking to experimental science; in that sense, the scientist, like every other man, remains invincibly ontological, but in this case the ontology is oblique and indirect. The ontological is never under these terms sought for itself, it is only there as a basis for empiric definitions and representation or of physico-mathematical entities. The mind considers the object as at the origin of the registration of certain constants, as a complex describable by its encounter with our senses and our instruments in a certain particular fashion; so that the essential conditions of the *observability* of the object play a determining part in regard to scientific explanation. All the derivative notions introduced by science in order 'to assist description, so that the trees should not conceal the forest', result in its condensation into the measurable and the observable. And if the analysis is conducted in terms which are not in themselves attained by the senses (or, if it is a question of psychology, by introspection, for all experimental psychology is not necessarily behaviourist), these always remain conceived in relation to recordings and imaginary perceptions (for example, factual impossibles, as in the case of the ether), and like hidden observables indirectly attained thanks to the patent observables which require them: so that all the motions employed are strictly held within the order of what has been, could have been or is experienced by the senses.[1] In this sense, and by an abridgement of language, one can say that empiriological explanation has no ontological (*i.e. directly* ontological) value; it only attains the being of things obliquely and as an indirect foundation, without making it known in

[1]It is here that the methods of the natural sciences give a foundation for the Kantian notion of phenomena (the philosophical system on which this notion is involved being cut away).

itself. It works in the natures or essences of the corporeal world, but these are not as such its object.

But in this very category of the empiriological two clearly different types of explanation can be distinguished, according as the empiric content (*i.e.* the measurable) receives its form and its laws of explanation from mathematics—then there is the type of 'empirico-mathematical' explication characteristic of mathematico-physical science—or as the empiric content (in this case, the observable in general) implies a form and rule of explanation which is purely experimental—then there is the type of 'empirico-schematic'[1] explication characteristic of the sciences of observation not subjected to, or at least not yet subject to, mathematical terminology. I shall return to this distinction later. At this point I only wish to point out that in the one case as in the other, the empiriological dictionary proper to the phenomenological sciences tends to set itself up in a more and more perfect independence with regard to the ontological terminology of philosophy.[2]

This kind of purification is particularly far advanced in physics. But maybe by the elaboration of new concepts or the re-phrasing of definitions, maybe by a new use, applied *in toto* to sensible verifications, of general concepts (of philosophic or pre-philosophic origin), sciences such as biology or experimental psychology, which can be included—it will be seen in a moment under what conditions and with what reservations—in the empirico-schematic type, tend, yes, they also, to create for themselves a notional vocabulary which is more and more self-determined. Since they abide in a much less precarious continuity with philosophy, it is more difficult for them than for physics to isolate this notional dictionary, to prevent the entry of philosophical concepts which, in this region, give space for pseudo-explanations. Nevertheless they persevere in the endeavour, and we can observe even a preference for the most rudimentary conceptual equipment (like the system of

[1]I mean by this phrase that in this case experience is not thought out or rationalised according to the laws of mathematical conceptualisation, but in accord with the *schemas* which have themselves been experimentally discovered by the reason in phenomena.

[2]This is what an eminent scientist has called 'an assertion of freedom for autonomous development'. (A. S. Eddington, *The Nature of the Physical World*, p. xvii.)

psychological notions employed by the Freudian school)[1] on the one condition that it will assure this independence.

Thus, in a general way, in all empiriological recording, the resolution of concepts is made in an infra-philosophic direction. It is not *what things are in themselves* which is the point of interest; what is important are the possibilities of empiric proof and of mensuration which they represent, and also of connecting together, according to certain stable laws, the data furnished by these means. Every definition must be made, no longer 'by the nearest gender and specific difference', but by observable and highly determined measurable properties, to each of which is assigned in each case the method of recording and of practical verification.

The possibility of observation and measurement thus replaces for such forms of knowledge the essence or quiddity sought for in things by philosophy.

The registration of conditionality (which keeps the mind attached to the sensible and the imaginable)tends in the same way to substitute that of causality, which, when it is pure, causes the mind to progress at once to reasons of being not representable by the senses.

Such, at least, is the *ideal* to which empiriological knowledge leads. In fact its noematic material is far from being homogeneous, and if one makes a cross-section of the procedure a whole series of conceptual strata are visible in the course of one notional function, of very different intelligible density and forms of refraction. Not only, for example, is the existence of natures or stable essences in the corporeal world a postulate of the pre-philosophy of the scientist, but, in the very operations of science, the natural notion supplied by commonsense of these ontological nuclei continues to operate on certain planes, while in others it has been replaced by a scientific notion remodelled according to the possibilities of measurement.

In the same way a scientist will make use at once, on differing planes of conceptualisation, of an ontological notion, furnished in a confused state by commonsense, and incarnated for him in a measurable or observable relation, of the 'cause' as an activity productive of being—and

[1]It should not be forgotten that apart from the value of the method of psychoanalytic investigation, the (empiriological) psychology of Freud is in itself contaminated by a fundamentally erroneous general philosophy.

of a popular empirico-ontological notion (which is in truth intrinsically ambiguous) of the 'cause' as a phenomenon producing another—and of a scientific (philosophical or mechanical) empirico-schematic one of the 'cause' as a phenomenon to which another is connected by a universal necessary concatenation which expresses a world 'law'—and, finally, of a purely empiriological notion of the 'cause' (from which all philosophical content has been withdrawn) as the spatio-temporal condition of a phenomenon or the constellation of observable and measurable determinations with which a phenomenon is bound up, a notion which finds its perfect expression in the formulation of physical connections by means of mathematical relations, such as those which furnish the differential or tensorial calculus. On this plane of conditionality the idea of transitive action, in incessant transmutation among the various masks of causality of which here I have only given a brief abridgement, is completely shredded away into that of phenomenal co-determination.

At the same time science has in this relation, as we see to-day, reached something of a critical point. In the course of its own line of progress it has seen some of its laws take on the form of statistical laws, which thrust causal determinations into the background, others transformed into what are called identical-laws or 'truisms', which explain the behaviour of things by that behaviour itself, where it has become, thanks to some mathematical transmogrifications, a property of the structure of a world built up for that end by the mind (which in particular is what has befallen in the geometrical reshaping of certain sections of physics, such as gravitation).

But, above all, in crossing the threshold of the atomic world, science has discovered that mechanics cannot account for the movements of a particle in a way which is on all occasions entirely defined.

We learn by wave-mechanics that it is impossible to assign a fixed trajectory to a particle associated in a group of waves, this only allows the knowledge of the probability of the presence of that particle in a more or less extended area; and the particle can never have at once a perfectly defined position and perfectly defined energy. The quantum mechanics of Heisenberg and Born, which are in agreement with the wave-mechanics of Louis de Broglie and Schroedinger, but in exhibiting that it is necessary to give to their principles a statistical significance,

and seeing only in the wave a pure mathematical symbol, abandon even the possibility of following the movement of each particle. Science has thus come to the 'principle of indetermination' or the 'relations of incertitude' of Heisenberg; it is only possible to determine the speed of a particle by leaving at that moment its position undetermined, or to determine its position by leaving its speed in indetermination. In order to precisely observe the position of an electron it is necessary to disturb its speed (in lighting it up with a short-length wave, whose quantum is of high energy), and in order to measure its speed exactly it is necessary (in only lighting it with a long-wave length of a low quantum) to render its position uncertain. Finally it is necessary to sacrifice 'the traditional idea which attributed to corpuscles a well-defined position, speed and trajectory': more, we can no longer attribute 'a well-defined energy to the corpuscle, but only speak of the probability by which it manifests itself with such energy'.[1] The series of waves is only, in Heisenberg's phrase, a *'bundle of probabilities.'*

So we see science so far obliged to renounce determinism, precisely in the form in which determinism is 'scientific' and as it means, not that the course of events excludes any contingence, but simply that the laws of nature can—in the given circumstances at a given moment—strictly determine the way in which in the following moment such material phenomena will offer themselves to observation and measurement.[2]

[1]L. de Broglie, *Introduction à l'étude de la méchanique ondulatoire*, Paris, 1930.

[2]It is important to point out here an ambiguity of which the public is too often the victim (and sometimes scientists themselves), and which, rightly speaking, is a gross sophism.

For the scientist the philosophical principle *natura, determinatur ad unum* (see *supra*, chap. i) is translated on the empiriological plane into the formula: 'The initial state of a (material) system, separated from all exterior action, entirely determines its ulterior states;' or again: 'If at a certain moment the state of a universe (hypothetically composed of purely material agents) is known, the state of this universe at any ulterior instant is entirely determined;' which is the very formula of *scientific* determinism.

But in the enunciation of this formula it is, implicitly or explicitly, presupposed that it is a case of purely material systems, of purely material agents and phenomena (in the philosophic sense of the word, *i.e.* whose bearing depends entirely on the natures in interaction) for which the law of causality takes exactly this form. Scientific determinism is thus a *conditional* determinism ('supposing that there are only purely material agents'), which is by no manner of means absolute determinism, which as a *philosophical* doctrine denies the possibility of free will. To draw an argument in favour of philosophical determinism from this formula, and to conclude from it that there cannot be spiritual or free agents, whose behaviour, by the very definition of their freedom, is outside the domain of material science, and whose action, without causing any change in the laws of matter, prevents, by the introduction of a new (non-material) factor the initial state of a system from exactly determining its ulterior ones, is a simple piece of trickery.

In the same way the formula of scientific determinism presupposes that all the conditions of the initial state (or at the moment of observation) are given, from which it follows that the ulterior state is determined. But it in no way says that certain of these conditions cannot be simple positions of fact (depending for example on the intersection of causal lines, or if it is a question of an absolutely initial state, of an arbitrary decision). This is why, as was shown in chapter i, scientific determinism does not exclude contingence in the philosophical sense of the word.

The principle of causality—in the very form of that phenomenal co-determination to which it has been reduced by science—is seen as open to exceptions, riddled with lacunae, robbed of its universal value. A result against which certainly those who abandoned a truly (philosophically) ontological standpoint have no right to protest. With science devoted to pure empiriology and empiriometrics, more and more under the spell of mathematical rational being (we owe thanks to the new physics for the degree to which this has been made evident), it was obvious there could be no other end. But the scientists do not seem prepared to take it so lightly; for it has been the general belief in the principle of causality which was the vital impulse behind research. Like Einstein they hope that 'strict causality' will one day recover its sovereignty in physics.[1] Einstein gave voice to this hope in 1927. Since then micro-physics appears rather to have accentuated its 'indeterminist' tendency.[2] Whatever form it may assume in the future and even if a

[1]It is only with regard to the quantum theory that the differential method of Newton becomes inadequate, and in effect strict causality has broken down. But the last word has not been said. It may be that the spirit of Newton's method may give us the power to re-establish the accord between physical reality and the most characteristic and profound feature of Newton's teaching, strict causality.' (*Nature*, 26th Mar., 1927; 'A Message for the Centenary of Newton.')

[2]In contradiction to Einstein, Dirac considers the possibility of a return to 'strict causality' definitely excluded. 'Since physics is only occupied with observable magnitudes, the classic determinist theory is indefensible. . . . In the quantum theory also, we start from certain numbers and deduce other numbers. Let us seek to penetrate to the physical essence of these two series of numbers. The perturbations which an observer inflicts on a system in order to observe it are directly subject to his control and are the

return should become possible to the methods or only the idea[1] of strict determination, what is important to the philosopher and singularly lights up the nature of empiriological apprehension (and what justifies this digression) is the fact that science has one day come to know a state of mind with regard to causality as characteristic as the one which we are actually observing.

acts of his free will. It is uniquely the numbers which are described by these acts of free will which can be taken as initial numbers for a calculus of the quantum theory. . . .' (Address to the Solvay Congress, 1927.) Thus, by rigorous application of the principle that 'physics is only occupied with observable magnitudes', the physicist is led to recognise the inalienable part which he himself and the 'acts of his free will' take in his calculus of phenomena; it is so because he can only observe by material means, not purely mentally (cp. *infra*, pp. 233-4).

[1]We know that M. Paul Langevin has tried, by re-casting the terms of physical representation, to realise Einstein's hope and surmount the crisis of indeterminism. (Cp. A. George, *L'Œuvre de L. de Broglie et la physique d'aujourd'hui*, Paris, 1931. He refers to an address delivered by Langevin at the Collège de France and to speeches at the Union Rationaliste in 1930, which have not been published at the time of writing.) Langevin points out that the question: is it possible to follow the movement of a particle while determining at each instant its speed and its position? is only possible if the notion of the individual existence of the particle is first of all admitted. But if there is no individual particle, the question of the application of the law of causality to its behaviour is not raised. He thus proposes the sacrifice of corpuscular individuality for the saving of determinism.

This effort of Langevin seems to proceed not only from purely scientific preoccupations, but also from philosophical opinions, which are, in my opinion, not exact: *e.g.* it is, according to him, by an anthropomorphic interpolation that the notion of individuality is applied to the atomic world, 'the portion of matter which we label and pursue is a projection from our individual consciousness,' which results in the denial of any ontological value to the notion of individuality. Again, seeking to save scientific determinism, it is also, it seems, an effort to save the philosophical determinist conception of causality, no distinction having been made between these two. But nothing prevents the supposition that, on the empiriological plane, science will find it in its power to effectively rid itself of the notion of corpuscular individuality as it has rid itself of the notion of absolute time: physical magnitudes being represented in the new dynamics by purely mathematical symbols (*operative factors*), it is quite conceivable that an *ens rationis* can be fashioned, from which individuality is excluded. Meanwhile it must be pointed out that Langevin's solution appears to run against serious difficulties: Louis de Broglie does not seem inclined to agree with it (cp. A. George, *op. cit.*): George remarks that the abandonment of corpuscular individuality is far from easily reconciled with the atomic conceptions which have become fundamental in modern physics, or with numerous experiments concerned with photons and electrons (C. T. R. Wilson's method, Crompton's effect, photo-electric effects, etc.).

The heterogeneity, to return to our theme, of the materials in one notional line brought into action by science is thus sharply apparent. A great field of critical analysis is so opened up which I have only wished to indicate in passing. The essential point is to comprehend the grave error into which we fall when we consider science statically as complete, as 'all of a piece', not only with regard to its extension and its objects of knowledge, where the error is only too clear, but also from the point of view of its internal noetic morphology, its *intension* and its typical forms. At the very point where it detaches itself from the prescientific basis of commonsense in order to build itself up more and more purely as a science its extensive growth is accompanied by a progressive internal formative movement, which brings it into connection with certain determined epistemological types which it has only as yet partially realised in very varying degrees. But if a total and homogeneous realisation of these ideal types must be regarded as an asymptotic limit, what is very remarkable is that, anticipating so to speak future possibilities and before all subject to the exigencies of its ideal form, science only makes a material use, and as if without recognising or qualifying for them, of notions which belong to the less developed strata of conceptualisation. The formulas of scientific intelligibility, above all, pass by the higher stages, the notions which are most typically pure. Thus, in the forms of knowledge with which we shall be occupied presently, in the phenomenological sciences, the formally activating value is attached to the elimination of the ontological and the philosophical for the benefit of a wholly empiriometric or empirico-schematic explanation.

It is comprehensible that, for a mind limited by its habitual preoccupations to intelligibility at this degree, philosophic notions may lose all significance. In a certain sense the experimental sciences have progressed by fighting against the intelligence: for the intellect has a natural tendency to introduce into the conceptual register proper to these sciences significances which belong to another, the philosophical, and which in consequence disturb and retard experimental knowledge as such, by preventing its approximation to its pure type.

Finally it is possible to say that the natural sciences are bound up with ontology in a way which is implicit, obscure, thankless and unavowed, and this for two reasons: first of all in so far as these sciences necessarily

presuppose a philosophy or pre-philosophy, a latent substructure which may be rudimentary, unformulated, or unconscious, but which is none the less real, and which assumes as indubitable postulates the existence of things as distinct from thought and the possibility of attaining them more or less completely by knowledge. Then in so far as science itself exists in *oblique* reference to things as the foundation of the explanatory representations which it elaborates, and by the simple fact that for it all rests on observation and then on the intuition of the senses (whose witness the scientific employment of measuring apparatus and defining instruments dissolves, so to speak, into a multiplicity of points of perception, of graduated readings, but which remains nevertheless always presupposed by these works), does it not implicitly declare, like the intuition of the senses themselves, the existence in the exterior world of hidden ontological structures, which, no more than the senses, can it scrutinise in their own individual being?

But except for this double relation, which is at once implicit and explicit, to the ontological, the natural sciences tend to separate, in their own particular structure, to the farthest degree the observable from the ontological.

THE NEW PHYSICS

I have spoken of physico-mathematical knowledge in general. A marvellous renaissance has to-day taken place in this form of knowledge whose importance cannot be exaggerated. With extraordinary rapidity its fundamental concepts have been revised and re-adjusted, the foundations of Newtonianism have been shaken, and the theoreticians of science attribute, it seems with good reason, to the work of Einstein and Planck a magnitude equal to that of the great initiators of the classical age. Few spectacles could be more beautiful or more moving to the mind than this of physics advancing on the path of its destiny like a great galleon in full sail. Here, for a moment or two, the course of these reflections must pause, not to indulge in any rash forecastings of the future of the theories of the new physics, but to inquire whether its scientific bearing confirms or invalidates the epistemological principles which up to now I have been endeavouring to establish.

From the epistemological standpoint it exhibits first of all an effort to

free our knowledge of nature from the dominion of a number of preconceived mathematical ideas, and, to speak briefly, a reaction of the physicist as such (the theoretical physicist) against the pre-arranged framework imposed on physics by rationalist mechanics, in itself held to be a purely mathematical science. (Mechanics, for all that, might itself become a department of physics, at which any Aristotelian would rejoice, for it is good peripatetic doctrine that motion is in itself a physical, not a mathematical, thing, and what the mathematician retains—the variation of the distances of a point from co-ordinated axes, which is evidently, as Descartes said, 'reciprocal', and which posits no more reality in the point than in the axes, and *vice versa*—is not movement itself, but its effect or its translation into the register of ideal quantity: in itself mathematics makes movement into an abstraction. This is why the mechanistic theory which has been taken as the metaphysical universalisation of mechanics in the classical sense, while claiming to explain all nature in terms of extension and motion, is in reality a jettisoning of the reality of motion, which has become wholly ideal.)

The new physics has renounced the attribution to any of the elements in the scientific picture of nature of an *absolute* character, *i.e.* the possession of certain unvarying quantitative determinations or properties, which appertain to elements of the same kind when they are considered in themselves or their essences by the mathematician, in independence of all physical means of observation and measurement (and which was attributed to them by classical physics because it set up its picture of nature in a framework, not only, as was normal, mathematical in type, but which has been thought out and established in a mode of conception and determination proper to the mathematician as such, not the physicist). It has renounced the absolute dimensions of bodies, an absolute setting out in space as in time, the absolute character of mass, any system of privileged axes, whether it is a question, as in limited relativity of the Galilean systems of reference, uniform in movement with regard to others, or, as in generalised relativity, of systems of reference having no matter what movement with regard to others. Again, it is permissible to regard the quantic theories, and the growing importance given to the discontinuous in these new scientific conceptions, as a revolt by physics against the privileged position accorded by mathematical analysis and

the recourse to differential equations in the exposition of the laws of nature to conditions of continuity.

The reassertions of a form of realism in the physicist as such—that is, of the resolution of the primordial concepts of science in complexes of elements exclusively determined by really or imaginably executable physical measurements—has thus risen up to break an image of the physical world which the classic age had drawn out in accord with the ideal supra-physical privileges of the mathematical universe. The physicist has recovered in the same stroke all the native force of the urge and desire immanent in his habitual occupation, which seek to disclose the secrets and ways of nature, the rightful mystery of the world of bodies (*rerum cognoscere causas*, things have not changed from this point of view since Lucretius and Virgil, and it is with good reason that the decisive progress which has renewed our science of matter is attributed to the intuitive faculty for the physically real amid the most abstract symbols of mathematics).[1] What indeed would be the *primum movens* of any physicist, even if he be the most devoted adherent of positivistic macerations, without such a desire to penetrate to what is? They thus claim to possess mathematics without being possessed, to treat it as a simple language, a mere instrument wherewith to scrutinise nature and matter.

But how do they set to work on this plan? And what are the results in fact? We see the new physics expressly leading to a complete geometrisation. It is in taking the fullest cognisance of this demand, which is inherent in the very nature of modern physics, that it has built itself up and achieved all its victories. But it can only advance along this road by an even more complete renunciation than that of classical physics of all ontological claims, and by multiplying more than ever, and with all the advantages of full advertence, physico-mathematical rational beings.

It has been frequently pointed out—and it is not out of order to fix in passing the meaning of this comment—that Einstein's theory of rela-

[1] 'For him (Einstein) the veil of symbols never conceals the reality. There are many for whom the signifying sign hides the thing signified: Einstein moves at his ease in a world of symbols, but these never disguise for him the physical aspect of things.' (P. Langevin, 'L'Œuvre d'Einstein et l'astronomie', *L'Astronomie*, July 1931.) There is thus in the new physics a Pascal-like tendency, and its greatest success is to finally reconcile this (but at the expense of mechanism and clearly cartesian ideas) with the cartesian tendency to universal mathematicisation.

tivity proceeds in fact from an absolute need and an effort of the widest span to raise science to a high degree of independence with regard to the particular standpoints of the various observers. In this the very spirit and ideal of physical theory has evolved and progressed. In the new synthesis the laws of nature are set out in the same fashion,[1] and magnitude *par excellence*, which is like the sovereign of the physical world—the velocity of light (velocity for which length becomes zero and the material mass infinite)—is measured by the same number for the observers of no matter what system of reference, whatever may be the motion of the systems in question in relation to one another; the image of things in themselves and the connections between happenings varying in consequence. I have already had occasion to mark the importance of the necessary distinction which should be drawn between the laws of nature and the concrete course of events: we can say that if the new physics stamps with relativity the course of events (not with regard to the events themselves produced *hic et nunc*, but in the setting out of their relations in space and time) it is in order to assure at their expense universally absolute form for the laws.

But it is outside things, if I may put it so, and in the formal texture of its deductive system, that physico-mathematical science attains to this most absolutely, to that expansion in the unconditioned to which all spiritual things tend: not in the discovery of the absolute in things themselves, rather, on the contrary, by escaping from the ontological, by renouncing the integration in the scientific picture of nature of the absolute elements recognised in the real by both philosophy and commonsense, and in the replacement of these elements by rational beings elaborated

[1] That is to say that the universe being a multiplicity of four dimensions, and its properties depending on 'co-efficients of a quadratic form of the differentials of four co-ordinates corresponding to an event', the laws of nature are expressed 'by the relations keeping with regard to this quadratic form an unvarying character in any transformation of the sum of the co-ordinates' (E. Picard, *op. cit.*).

On this question of the unvarying form of the laws of nature in the new physics, as on the notion of geometrical explication, the dissymmetry introduced by generalised relativity, from the standpoint of geometricisation itself, in the domain of gravitation and electro-magnetism, see numerous excellent passages in the work already cited by M. R. Poirier (*Essai sur quelques caractères des notions d'espace et de temps*, Paris, 1931). His examination of both the strength and the weakness of relativist theories, is particularly happy.

in accord with the exigencies of the deductive system under construction. The philosopher knows that bodies have absolute dimensions, that there are in the world absolute motions, an absolute time, simultaneities which are absolute for events divided as far as may be in space: *absolute* signifies here entirely determined in itself, independently of any observer: the knowledge of what these are, the discernments of these absolute dimensions, movements, simultaneities (at a distance), time, by the aid of our means of observation and measurement, the philosopher renounces, voluntarily conceding that it is not possible.[1] It is sufficient for him that they can be discerned by pure minds, which know without observing from a given point of space and time. The physicist makes a like renunciation, and with good reason. But for him, he is not a philosopher and is only occupied with what he can measure and in so far as it can be measured, the existence of these absolutes does not count, and in their place he knows only and manipulates relative entities reconstituted by means of measurable determinations: *entia rationis cum fundamento in re.*

Could the distinctive features of the 'realism' of the new physics have led in themselves to any other result? To make 'the whole object of exact science' consist in 'pointer readings and similar indications' and to turn out of physics every notion which is not resolvable into physically effectable measurements, is to free physics from that ideal armature which had descended into its stuff from the heaven of pure mathematics; but it is at the same time to free it, much more radically than ever

[1]On the *relational* character of physics, see the article by R. Dalbiez, *cit. supra*. He recalls the words of Jules Tannery, 'The idea of determination is independent of the possibility of formulating in what this determination consists,' and writes very justly, 'quantity is not identical with relation, and quantitative being is provided by a quantity which is right before any comparison with a scale. . . . We know that bodies have an absolute figure, but we do not know what this figure is. . . . Our physical knowledge only bears on relations. We are certain that objects have absolute dimensions, but we do not know if these absolute dimensions are retained.'

The ancients were well aware of the distinction drawn by J. Tannery, and which is connected with the distinction between the *quid est* and the *quia est*. If they did not make it with regard to the numbers of nature and the dimensions of bodies, they did apropos of the angels and their differentiations (at once specific and individual): 'Novimus, inquam, differentiam esse in illis, sed quae sint illae, latet' (Cajetan, *In de Ente et Essentia*, c. 6, q. 14).

before, from all ontological notions, and every mode of ontological conceptualisation (whether it is a question of the naïve ontology of daily observation or of that of philosophy).

The process to which the vocabulary of physics has been subjected by the theory of relativity is very significant from this point of view. When we listen to a discourse by M. Einstein on simultaneity it is striking to hear him constantly returning to the question: what does the word 'simultaneous' signify for me as a physicist? And he always responds, in accord with that methodological theme whose fundamental importance I have stressed: Give me a definition which will tell me by what collection of concretely realisable measures I can in each case verify what two events do or do not deserve to be called simultaneous: then alone I shall have a definition of simultaneity usable by a physicist and valuable in his eyes.[1]

There can, therefore, be no question here of the essence of simultaneity, what it is in itself. Time, simultaneity, space, are concepts entirely re-modelled and stripped of any philosophical colour; they take on for the physicist a purely empiriometric significance to which it would imply a great deal of simple-headedness to apply any directly ontological value: and physics has thus achieved the completest possible enfranchisement from philosophy. In the same stroke it tends to achieve an equal deliverance from commonsense: not only from that common imagery which was in question at the beginning of the previous chapter, but from the philosophy implicit in common observation, the natural principles and data of the intelligence, except in what is concerned with the principles of mathematical interpretation, and the

[1]'The vocabulary of the physicist comprises a number of words such as length, angle, velocity, force, potential, current, etc., which we call 'physical quantities'. It is now recognised as essential that these should be *defined* according to the way in which we actually recognise them when confronted with them, and not according to the metaphysical significance which we may have anticipated for them. In the old textbooks mass was defined as 'quantity of matter'; but when it came to an actual determination of mass, an experimental method was prescribed which had no bearing on this definition. The belief that the quantity determined by the accepted method of measurement represented the quantity of matter in the object was merely a pious opinion. At the present day there is no sense in which the quantity of matter in a pound of lead can be said to be equal to the quantity in a pound of sugar. Einstein's theory makes a clean sweep of these pious opinions, and insists that each physical quantity should be defined as the result of certain operations of measurement and calculation.' (A. S. Eddington, *op. cit.*, p. 255.)

ontological postulates implied by its laws of observation: a legitimate deliverance from the moment it is accompanied by an equally wide renunciation of ontology.

It follows from these considerations that the idea of discovering the nature of matter and of corporeal things in itself must appear to the new physics, even more decidedly and to a higher degree than to all the physics of yesterday and before, a pure archaism. 'The scientist of to-day cannot indicate the *essence* of the real. It is this that primarily distinguishes his attitude from that of his materialist predecessor and, even more, from that of the mediaeval physicist: he does not even claim to attain to the being of the real, which, on the contrary, he sees as enveloped in profound mystery.'[1] It is remarkable that the quantum theories, in the very act of stressing the unfigurable character of the universe of science, render still more profound the rupture between that universe and knowledge of an ontological type. To-day the scientist reflecting on his work is only aware of a world of symbols. 'We have suffered, and we still suffer, from expectations that electrons and quanta must be in some fundamental respects like materials or forces familiar in the workshop—that all we have to do is to imagine the usual kind of thing on an infinitely smaller scale. It must be our aim to avoid such prejudgments which are surely illogical; and since we must cease to employ familiar concepts, symbols have become the only possible alternative. . . . If, then, only pointer readings or their equivalents are put into the machine of scientific calculation, how can we grind out anything but pointer readings. . . . Whenever we state the properties of a body in terms of physical quantities we are imparting knowledge as to the response of various metrical indicators to its presence and *nothing more*. After all, knowledge of this kind is fairly comprehensive. A knowledge of the response of all kinds of objects—weighing-machines and other indicators—would determine completely its relation to its environment, leaving only its unget-atable nature undetermined. . . . The Victorian physicist felt that he knew just what he was talking about when he used such terms as *matter* and *atoms*. Atoms were tiny billiard balls, a crisp statement that was supposed to tell you all about their nature. . . . But now we realise that science has nothing to say as to the intrinsic nature of the atom. It is, like

[1] E. Meyerson, 'Le Physicien et le réel' (*Le Mois*, June 1931).

everything else in physics, a schedule of pointer readings. . . . Scientific investigation does not lead to knowledge of the intrinsic nature of things. . . . The external world of physics has thus become a world of shadows.'[1]

Prof. Eddington in this seems to forget that not only do the measurements collected by our instruments from nature give us something real (which may resemble a 'shadow' with regard to our familiar universe), nevertheless the philosopher knows that there are very many differing forms in which an aspect of things existing in themselves may appear to us, but also that the first degree or stage of conceptualisation, often very elaborated, when we disengage from these measurements a description of the observable behaviour of things, also sets us in the presence of realities—I say, observable and measurable and taken precisely in that sense,—introduces us into a world of facts, of observable causations,[2] of

[1] A. S. Eddington, *op. cit.*, pp. 249, 252, 257, 259, 303, and xvi. (The italics are his.) Let me also cite the following highly characteristic passage: '*Something unknown is doing we don't know what*—that is what our theory amounts to. There is the same indefiniteness as to the nature of the activity and of what it is that is acting. And yet from so unpromising a beginning we really do get somewhere. We bring into order a host of apparently unrelated phenomena; we make predictions and our predictions come off. The reason—the sole reason—for this progress is that our description is not limited to unknown agents executing unknown activities, but *numbers* are scattered freely in the descriptions. To contemplate electrons circulating in the atom carries us no further, but by contemplating eight circulating electrons in one atom and seven circulating electrons in another we begin to realise the difference between oxygen and nitrogen.

'Out of the numbers proceeds the harmony of natural law which it is the aim of science to disclose. We can grasp the tune but not the player.' (*Ibid.* p. 291-2.)

[2] A causation is not *observable* as such or even in the degree to which it relates to the intelligible, nevertheless I have used the word here to designate causations which result from observation, most of all those resulting from graduated readings, if not immediately, at least proximately; thus the experience of the Puys de Dome proves very nearly, if not immediately, that atmospheric pressure is the cause of the elevation of liquids in barometric tubes. Thus, again, the—hypothetic—fact of the disassociation of molecules in ions being the cause of electrolic phenomena results (in a much less proximate way) from observation. This example can serve as a transition to that other kind of causations which could be called *theoretic*, and which only *distantly* result from observation, by means of a whole physico-mathematical edifice which can only be verified by experiment at its points of incidence with the real. It is to these theoretic causations that the causal explications elaborated by physical theory in that second degree or stage of conceptualisation that is in question here have reference, *e.g.* the Einsteinian theory of gravitation where the presence of matter is the cause of an incurvation of space.

observable structures which the theoretical physicist tends to hold simply as matter offered to his constructive genius, but which the physicist of the laboratory is not disposed to allow to be misunderstood as already making an authentic part of physical science itself. These facts can be established more or less certainly, more or less hypothetically, they can imply in one degree or another an ideal achievement of the real by the reason,[1] they none the less result from the order of real being. Notions such as that of the constitution of gas by individual molecules in endless agitation, or of the reticular structure of crystals, and a crowd of other similar ones, must be held for something other than symbols, exactly in so far as they are translations of the measurable and the observable, and before theoretic effort, in the endeavour to penetrate their significance and discover, in a complete explication, what they tell us, gives us to understand that in the last analysis we can only know symbolically what they say. But it is precisely this second degree and second stage[2] of scientific conceptualisation that Prof. Eddington has in mind; and there it would indeed be foolhardy to reject his evidence.

The two characteristics which we have discovered in the new physics seem at the first glance contradictory: on the one hand a mental urge towards the physical in itself and the mysteries of its behaviour, a will to physical realism: on the other, the construction of a world of symbols and a more decided recourse than ever before to geometrical and mathematical rational being. This contradiction is purely apparent. The paradox is explained by what has been said above concerning physico-mathematical science in general, and gives us the best possible illustration of the theory of *scientiae mediae*. In its opposition to Newtonianism the new physics recalls to our minds the fact that physico-mathematical knowledge is primarily physical; and, at the same time, the degree to which it reaches beyond Newton manifests even more strikingly its formally mathematical character. The physicist regards mathematics as simply supplying an instrument and a language: but neither a *simple*

[1] See *supra*, p. 164.

[2] It goes without saying that in speaking of these two *stages* or periods there is no question of two successive phases: the two are constantly united in the course of the elaboration of physico-mathematical apprehension, and it is only by abstraction that they can be treated as separate.

language nor a *simple* instrument. This language supplies the laws of analysis, conceptualisation and explication, which give his science its proper scientific form. I said that he wished to know the nature of things and their physical causes: did I say that he wished to know either that nature or these causes *in themselves*? Rather I said that he renounced the knowledge *in themselves* of the nature of things and their physical causes (reduced to their essential meaning the formulas which I have quoted from Prof. Eddington can signify nothing else): but did I say that he renounced the knowledge of them absolutely and in every way? The urge which drives him towards the physically real can only attain to the real in its measurable aspects, in its measurable structure as such: by turning it into mathematical terms and finally by constructing something else in its place. The physicist wishes to penetrate the secrets of matter; but the very type of the science with which he is connected interdicts his attainment of the nature of matter in itself; he attains to it in its observable and measurable determinations, which are real by that very fact, which are for him the succedanea of its essence; and he scrutinises and penetrates it thereby in the very degree to which he transmutes it into mathematical symbols.

Let us say that his form of knowledge is not knowledge of the real (the given real) by the real (a more profound reality), but of the real by the mathematical preter-real. It is a knowledge of the physically real which becomes symbolic in as much as its mathematical regulation obliges it to attempt a complete explication, where will be formulated in wholly quantitative terms that of which the forms and the formation come from a world of qualities; or rather, if it is permissible to use here an old platonic word, which is perhaps more expressive than the modern 'symbol',[1] it is—at least with regard to that second

[1] By the scientists themselves the word, symbol, is reserved for a much more particular use: they will say, for example, that 'the associated wave' of wave mechanics is a pure mathematical symbol, 'a simple symbolic representation of probability'—since any imaginable spatio-temporal representation, any physical image, of this wave is in itself impossible, in other words, since it cannot be defined as the immediate object of a certain series of physically measuring operations, at least theoretically effectuable. It is useless to observe that the philosopher (or the scientist when he uses epistemological language) understands the word, symbol, in a much wider sense. It is in this wider sense that it must be taken here.

stage of conceptualisation of which I spoke a moment ago—a knowledge of the physically real by means of myths,[1] that is, verified myths, *i.e.* which accord with the measurable 'appearances' and which 'save' them: a science at once *experimental and mytho-poetic* of the physically real.

This is what gives to theoretical physics in its most inspired discoveries such a striking resemblance to artistic creation. But—and this is the marvel—this is a question of a speculative art, of an art *for the purpose of knowledge*, where the imagination is only fruitful in submitting to the constraints of a world of rigorous determinations, of laws established with the strictest exactitude. I have already pointed out, in a previous chapter,[2] that Plato saw very clearly the rightful method of mathematical knowledge. He also saw, and with an equal penetration, that the creation of scientific myths—the noblest form of rational beings founded *in re*—is a necessary consequence of that method. The myths of the *Timaeus* may have grown old, but it is in no avowal of impotence or any flight into poetry that *Timaeus* makes use of myths, it is by virtue of an admirable intuition of the proper conditions of physico-mathematical knowledge and of what we call the exact sciences, when, ceasing to be purely mathematical, they seek to explain the world of experience. Aristotle was occupied with something else, which Plato did not see: he was founding the philosophy of sensible nature, and for that he had to oppose platonic metaphysics and the theory of ideas. But though he certainly recognised the existence of *scientiae mediae*, and though he himself constructed, in the theory of the homo-centric spheres, a physico-mathematical myth of the first magnitude, he accorded, it seems, a full ontological value to these spheres, a reality not only fundamental (with regard to their foundation on the nature of things) but formal and entire (in their formality, their thinkable construction itself). Because of the prevalence in him of the standpoint of the natural philosopher he did not see as clearly as Plato did the necessary part played by ideality in the

[1] I do not mean to say that all the physicist's entities are 'myths'. I use this word to designate the *entia rationis* which he utilises, above all those of which he makes use at the end of his theoretic elaboration and reconstruction of the real, exactly at the point of his farthest penetration into the secrets of matter.

[2] Cp. chap. i, p. 78 (note).

mathematical knowledge of natural phenomena in the very degree to which it is an exact science.

Suppose that a scientist, shut up in a ground-glass bell, in which he received by radio the scientific information on which he worked, learnt one day of the existence of a certain machine capable of projecting its own weight to a height three-hundred times greater than its own. He would have difficulty in even approximating to the idea of this machine, unknown in itself, as a sort of catapult constructed in accord with given data; whose image he would make more precise and correct in the degree to which he was supplied with new information. If he learnt that this machine presented the features of what men call memory, *i.e.* modified in the degree to which it functioned its way of functioning and of responding to stimuli, which was not the case with the instrument he had himself reconstructed, he would perhaps resolve the difficulty by endowing the space occupied by it with some new dimension, according to which the past of this machine was conserved and modified in some invisible way its structure. We others, who walk about in streets and lodge in inns, are able to know that this machine in question is called—a flea. The scientist could not know this, but the construction which he incessantly remodelled (from top to bottom in the stress of hours of 'crisis') would present at each instant the sum of all the measurable properties enclosed in the flea and actually known by it; and it is clear that in creating such an imaginary yet real model, exact and rigorous in all its determinations, he could continually learn, but by means of myths and symbols, more and deeper perceptions of the nature of the flea. It would be inexact to say that he did not know this nature. Only he does not know it ontologically or *in itself*.

Let the simplicity of this metaphor be excused. It only translates into terms of the senses the way in which symbolism and realism are indissolubly united in the more highly conceptual part of theoretic physics. It would be erroneous to sever and oppose them. In this particular region they compose the warp and the woof of one stuff. It is by the creation of its most daring myths that physical theory most profoundly scrutinises—in its own way, which is not that of philosophy—material reality. It is by connaturalising the intellect with material reality—not grasped in itself—that it constructs on the latter and in its place a

universe of symbols or verified myths. The closer it presses to physical reality the more it constructs these rational beings far removed from our common experience; as in the finite world of Einstein, where exactly by going away from a point it is finally rejoined, the further it transports us from the nature of the atom or the electron considered in itself the nearer it comes to this nature.

Let me hasten to add that physical theory is not symbolic as *such*; it is, as I pointed out above, *indifferent* in its use of real entities held in the measurable behaviour of things or of symbols and rational beings founded on this same measurable behaviour: and, in fact, we realise that to-day it is becoming more symbolic in the degree to which its conceptualisation rises higher, and the explanation which it elaborates becomes at once more universal and more pure (with regard to its epistemological type). The epistemological complexity of the *scientiae mediae* may disturb the taste for simplification and easy classification to which philosophers sometimes cede; but indeed they must take it as it is.

Indeed the interpretation proposed here of physical theory is more realist than that of some philosophical physicists, notably Prof. Eddington's, not only because I have insisted particularly on the epistemological importance of those real entities, either simple observable data or conceptualisations more or less approximate to these, which also make part of physics and which the new theory brings into operation, but also because, while recognising all the inevitable ideality imported by the geometrisation of physics, it also affirms even there its value as a knowledge of the real, knowing as I do as a philosopher that the existence of corporeal substances and their nature is not attained in itself, but that nevertheless it attains to them in the substitutes which it has elaborated to that end and which are founded on these natures, and which serve best when least claim is made for a progress through them to the ontological articulations of reality. Indeed if Prof. Eddington seems to lean towards a form of idealism or a pure symbolism in his reflections on physics (since he seems to hold sensory perception already itself symbolic, which implies a complete metaphysic), he is assuredly much more of a realist when he speaks as a working physicist.

Has he not said himself: 'The physicist, so long as he thinks as a physicist, has a definite belief in a real world outside him. For instance, he

believes that atoms and molecules really exist; they are not mere inventions that enable him to grasp certain laws of chemical combination. . . .'[1] In truth there is no mental attitude more contrary to idealism than that of the scientist who, face to face with nature, at once urgently seeks the inexhaustible ontological riches with which it is charged and abandons the idea of penetrating to them by any other means than those which he knows are necessarily inadequate. He has 'the sense of finding himself confronted by an enigma at once wonderful and perturbing. He contemplates it with an almost fearful respect, which is, perhaps, not without a certain resemblance to the feelings of a believer before the mysteries of his faith.'[2]

A DIGRESSION ON THE QUESTION OF 'REAL SPACE'

There is no clearer word than the word reality, which means *that which is*. But its use implies the drawing of many distinctions, and a critical consideration which is frequently difficult. Let me try, in order to apply in a particular instance these considerations of the new physics, to examine the question of 'real space'. What is meant when it is asked whether real space is euclidian or non-euclidian, or whether the space postulated by Einstein's theory of gravitation is or is not real, or when it is said that, thanks to the new physics, one of whose particular characteristics is to carry to a higher degree than any attained heretofore the identification of geometry and physics, that nevertheless 'we are approaching drawing the distinction between geometric and physical space'?[3] This distinction, I hold, is fundamental, but it is highly necessary to understand its veracious meaning.

The word *real* has not the same meaning for the philosopher, the mathematician and the physicist. If we do not keep this diversity in mind the question I have asked turns up nothing but a tangle of ambiguities.

For geometry a space is 'real' which is capable of mathematical existence, *i.e.* which does not imply internal contradictions, and which

[1] A. S. Eddington, *Space, Time and Gravitation*, 1920, p. 180.

[2] E. Meyerson, *art. cit.*, *Le Mois*, June 1931.

[3] W. Vernadsky, 'L'Etude de la vie et la nouvelle physique,' *Revue générale des sciences*, Dec. 1930.

rightly corresponds to the mathematical notion of space, *i.e.* which rightly constitutes a system of objects of thought verifying geometrical axioms; and it is obvious that from this point of view, in virtue of what might be called the circumincision of various geometrical systems—these being mutually 'translatable' and inclusive, so that non-euclidian geometries contain the euclidian as a particular instance, and nevertheless can themselves be constructed by means of euclidian materials[1]—all these geometries, and all the still more 'general' geometries which could be invented, are equally true, and their spaces are therefore equally 'real'. Euclidian space holds no particularly privileged position in any way, except that the constructibility of euclidian entities by imaginative intuition is the fundamental guarantee for the notional coherence (absence of internal contradiction) of both euclidian and non-euclidian geometric entities (since the latter can always be 'translated' into a euclidian multiplicity), in other words, of the compatibility of both euclidian and non-euclidian axioms.[2]

For the physicist a space is 'real' when the geometry to which it corresponds permits of the construction of a physico-mathematical universe which coherently and completely symbolises physical phenomena, and where all our graduated readings find themselves 'explained'. And it is obvious that from this point of view no space of any kind holds any sort of privileged position. For a long period euclidian space sufficed for

[1]F. Gonseth, *Les Fondements des mathématiques*, p. 15. In a general way it is possible to enclose a non-euclidian multiplicity of n dimensions in a euclidian space of $\frac{n(n+1)}{2}$ dimensions. 'On various occasions,' Gonseth adds, 'I have stressed the fact that non-euclidian geometries can be realised by euclidian means. The conclusion can therefore be drawn that these geometries have a province of inferior, one could say *interior*, validity to that of Euclid. On the other hand we have seen that the latter is a borderline case between hyperbolic and elliptic geometry: and now it seems to cover a limited field of validity. To make the paradox more apparent, euclidian geometry could easily be constructed out of materials taken from that of Lobatchevsky, for instance. . . . The paradox is perfectly symmetrical: any two of our geometries can each in turn appear to be contained in the other or to contain it.' Thus 'every affirmation of a non-euclidian geometry is also an affirmation of Euclid's'. He gives (p. 37) a euclidian instance with a non-archimedean proof.

[2]So persists, even for modern mathematics, and must be understood the methodological necessity formulated by St. Thomas: 'In mathematicis ad imaginationem, et non ad sensum, debemus deduci.' See *supra*, chap. i, p. 67.

the interpreters of physics: in order to construct a satisfying image of observable phenomena, they postulated, as common observation suggested, euclidian geometric properties, and attributed to factors of another (physical) order all properties not so foreseen. To-day physics has abandoned this division, and for the interpretations of a synthesis where geometry and physics may be as far as possible amalgamated in proportion to the degree to which they sever in nature, it has recourse to spherical or elliptic spaces. It is these that physics holds 'real' in the sense I have just explained, and to-morrow there may well be others.

But it is neither from the standpoint of the physicist nor of the mathematician that I see the problem. For me the question is to know what is real space in the philosophical meaning of the word, *i.e.* as a 'real' entity in opposition to a 'rational' one, and as designating an object of thought capable of an extramental existence, not certainly in the way it exists in thought, but rather as an assembly of features objective in themselves which integrate its notion or definition. Taking into account the peculiar conditions of mathematical beings and the rational condition (ideal purification) which always effects their very definition, we can say that a mathematical entity is real (in the philosophical sense of the word) when it can exist outside the mind—not doubtless under the conditions proper to mathematical abstraction (nature knows no point without extension or line without density, nor abstract number; the point, the line, the whole number are, for all that, real beings)—but in so far as its definition makes visible in a pure state or in its ideal perfection some characteristic (resulting from accidental quantity) which exists or can exist in the world of bodies. In order to be thus an *ens reale* such an entity does not cease to be mathematical, although it can only enter into actual and sensible existence by losing its mathematical purity. Taken as existing in the thing it is a feature of the latter which can only be scientifically known when detached by mathematical abstraction, which leaves on one side all properties relevant to the activity of bodies, their movement, qualitative diversity, sensible characteristics, to keep only what subsists after the emptying out of the physical.

Let it be added that the various geometrical entities (Euclidian, Riemannian, etc.), although they may be mutually 'translatable', so that all these systems are equally true, nevertheless cannot be all equally *real* in

the philosophical sense of the word. The right hand of the elliptic plane, for instance, and the figure which corresponds to it in the euclidian instance are not different expressions of one thing (in the order of the mathematical 'preter-real' there is no other 'thing' than the object of thought itself constructed according to such and such a system of axioms), they are intrinsically different entities,[1] belonging to intrinsically different worlds, which analogically correspond to one another. To affirm the reality of one kind of space is thus at the same time to affirm, not the reality, but the unreality of all the others—of which no entity can be thought of in the latter.

How then are we to know if a mathematical being—and in particular this system of geometric entities which is called a space—is or is not real in the philosophical sense? Mathematic intelligibility in itself can tell us nothing, for it is as much concerned with rational as with real beings. Neither can the verifications of our senses or our measuring instruments tell us more, since with them we quit the mathematical for the physical order, and they presuppose a mathematical model or armature which serves for a 'point of condensation',[2] a plan which was taken into account in the construction of our instruments, and in connection with which we correct and interpret the sum of the measurements affected,

[1]The expression euclidian or non-euclidian 'presupposes successively a recording and a metric organisation of multiplicity, which are independent. The epithet when given to space is only a way of exhibiting by abstraction the conventional properties of figures. There is thus not the least contradiction between the various geometries, for *they apply to different objects*' (R. Poirier, *op. cit.*). Although he holds the standpoint of a, to me, erroneous philosophy (he is a disciple of Bertrand Russell), Jean Nicod has some useful remarks on a similar point (*La Géométrie dans le monde sensible*, Paris, 1924, pp. 27-8).

[2]F. Gonseth, *op. cit.* Without doubt the space we perceive, with our crude perceptions, appears as euclidian; in other words, the physical measurements made by us, by the scale of our senses, in the region which we occupy, are most easily and satisfactorily interpreted on the euclidian plan. But the conclusions drawn from physical measurements can only have, as such, an approximate value, and physics could make use of as many non-euclidian types of space in its symbolic constructions as it wished, from the moment that it chose those at a tangent from the euclidian. 'One can always find a hyperbolic instance such that its metrics may be, in such of its parts as one would wish, as little different as should be required from the euclidian' (*ibid. op. cit.*). It follows that 'it is impossible to prove experimentally that space is euclidian', or non-euclidian, because in fact 'experimental science knows nothing of space, only the phenomena which it connects together' (*ibid.*).

by assigning the part played by accessory variations due to various physical circumstances.

Only two ways are open to this search for a criterion. We can analyse the genesis of our notions, in order to see if the entity in question, while not including any internal contradiction or incompatibility in its constituents (in which case it could not have mathematical existence) does not imply a condition incompatible with existence outside the mind (thus a logical entity, such as the Predicate or the Copula, is certainly not intrinsically contradictory, but it would be a contradiction to suppose its existence apart from the mind). Or we can consider a condition which a philosopher knows applies to the reality of mathematical entities (he knows, in effect, that for these entities to exist outside the mind implies sensible existence, which is repugnant to the state of being constructed in imaginative intuition freely and purely representing to itself what is quantitative without any *a fortiori* possibility of its positing in sensible existence): the condition of direct intuitive constructibility.

Now, among the systems of geometric entities which are called Euclidian, Riemannian, etc., space, the three-dimensional euclidian space alone is directly constructible in intuition, the others only satisfying the posited condition by the intermediation of this space.[1] The

[1]'All the attempts which have been made to win an intuitive representation of the non-euclidian geometries—by Einstein, for instance, in his pamphlet on geometry and experience—go exactly to show that these geometries can only be rendered imaginable by reduction to euclidian geometry. I only wish that, as Prof. Eddington suggests, 'to perceive non-euclidian space' I only had 'to look at the reflection of this room in a polished door-knob and imagine myself one of the actors in what I see going on there'. (*Space, Time and Gravitation*, p. 14.) 'The image of my room in the door-knob is a due euclidian model traced on a certain determined surface of euclidian space.' (J. Maritain, *Réflexions sur l'intelligence*, p. 257.)

'Shall we say the explanation of gravitation by the curvature of space-time has an exceptional intuitive value? Evidently not; this space-time is doubly unrepresentable. First because of time, which is joined to space in a purely allegorical way; then because the curvature of a multiplicity has only an intuitive sense if we immerse it in a space of a higher order. All that we can do is to represent to ourselves a surface in euclidian space. If we wish to go farther, we are obliged to have recourse to the image of a metric established on a euclidian multiplicity, to return to a Caylian standpoint. This is what M. Einstein does at the end of his little book where he tries to make his ideas clear to the ungeometrical reader. Practically, we shall imagine foreshortened measurements, clocks which run slow for no perceptible physical cause. The geometrically rational will present itself as a physical irrationality.' (R. Poirier, *op. cit.*)

plan of the thermic universe invented by Poincaré, and in which we should have adopted from the beginning Lobatchevsky's geometry, the highly simplified successions of sensation imagined by Jean Nicod, which would endow a fictive subject with the idea of the most diverse geometries, confirm by a kind of counter-proof this privilege of euclidian space. In order to present as natural to a thinking subject another geometry than that of Euclid we have to imagine a universe which in itself is a rational being as chimerical as an *animal rationale alatum*. Finally, if we are assured by intuition, as has been already pointed out, that the euclidian entities (and in consequence the others) are free of internal contradiction, it is because intuition began with the assurance that in excluding the others the former are well able to exist outside the mind, in the nature of things.

On the other hand, it is possible to show that if it is possible to pass from the non-euclidian spaces to euclidian space, and inversely, by mathematical transformations, it is because in fact the non-euclidian geometries presuppose the notions of euclidian geometry, not certainly in their proper structure and logical development, but as a foundation for the logical coherence of the entities which they construct and as the psychological basis of conceptualisation. The process of generalisation which finds its fulcrum in euclidian geometry results indeed, not in more extended *generic* concepts of which the euclidian, non-euclidian, non-archimedian, etc., concepts would be the determinations, but in *analogical concepts* which include the one as the others, and of which the euclidian concepts represent the analogised principle. From this point of view we must needs say with Hamelin 'at bottom, non-euclidian geometry is not self-sufficient',[1] and that the non-euclidian, non-archimedian, etc., entities have the foundation of their logical existence in the euclidian. The non-euclidian spaces can then without the least intrinsic contradiction be the object of consideration by the mind, but there

[1]O. Hamelin, *Essai sur les éléments principaux de la représentation*, 2nd edit. Hamelin insists on this point on the condition of homogeneity required for the comparison of figures (an argument which is only viable if the irreducibility of geometry to arithmetic is presupposed and at the same time the impossibility of separating geometry from its intuitive origins). It is also in the name of the homogeneity of space that Whitehead, from an entirely different standpoint, seeks to maintain the euclidian character of the geometrical structure of our universe.

would be a contradiction in supposing their existence outside the mind, and thereby suppressing, for their benefit, the existence of the foundation on which the notion of them is based.

Either way we are thus led to admit, despite the use which astronomy makes of them, that these non-euclidian spaces are rational beings; and that the *geometric* properties of existing bodies, those properties which the mind recognises in the elimination of all the physical, are those which characterise euclidian space. For philosophy it is euclidian space which appears as an *ens geometricum reale*.[1]

But by the words, real space, a totally different thing can be understood, as describing space in so far as it is occupied by existences and physical actions, and which is made up of the physical, not geometrical, properties of bodies, their activities and their causality, like a network of tensions of heterogeneous qualitative intensities. This is space no longer considered mathematically or geometrically, but 'physically'; it is a qualified space, and the determinations which it admits are due to *what there is in* space, to what fills it.[2] The philosopher thus distinguishes—and for him it is a capital distinction—between physical and geometrical space; and he can forecast that, in this extended sense, as *physical* space, that real space is not euclidian (neither homogeneous nor

[1]For the natural philosophy elaborated by the scholastics (as also, though in a very different sense, for the new physics) this real geometrical space is finite; effectively existent space is co-extensive with the scale of the world. Infinite geometric space is a rational being ('imaginary space').

[2]It is apparently in this sense that Pierre Curie 'has at bottom envisaged symmetry as a *condition of space*, *i.e.* as the structure of physical space (W. Vernadsky, *op. cit.*), and one can also say with Vernadsky that 'vital space is a symmetry which is particular and unique in nature'.

The metric properties of bodies, in so far as they are physically measurable, result from physically real space. Thus it is perfectly true that 'only the union of the geometrical and the physical is susceptible of empiric verification' (H. Weyl, *Espace, temps et matière*), and without thereby abandoning the reality (which is not experimentally verifiable) of euclidian space, the philosopher can add, in another sense than that of the physicist, that the metric structure, in the degree to which it is physically measurable, is not given *a priori* in a rigid way, but 'constitutes a *condition field* of physical reality, which is found in causal dependence on the condition of the matter. . . . Like the snail, matter constructs and forms for itself this house which is its own'. (*Ibid. Mathematische Analyse de Raumproblemes*, Berlin, 1934; quoted from Meyerson, *La Déduction relativiste*, p. 93.)

isotropic), since euclidian space is precisely that (purely mathematical) one which the mind considers after the elimination of all physical content.

It is most important to realise that in speaking so the philosopher—by the very fact that he opposes the physical and geometrical as two irreducible orders—looks on things in a way wholly different from that of the new physics. Faithful to the essential spirit of modern science the latter tends, however far from this end it remains, to absorb itself in geometry. Thereby it has abandoned the absolute discrimination between the physical and the geometrical equally with the search for physical causes in themselves or in their qualitative reality. The mark of genius in Einstein is that he has bent, in order to advance freely along this road, geometry itself to the needs of physics,[1] and conceived of a space whose *geometric* properties are able to account for all the phenomena of gravitation.[2] The continuum of the thus extended universe so becomes non-euclidian and four-dimensional, where time and space are no longer independently measured, but form an indissoluble complex. The geometrical properties of so conceived space-time are themselves modified by the matter which occupies it (*i.e.* by what is able to disturb the measuring instruments of our exploration: clocks, graded rules, light rays, compasses, electroscopes, etc.); and the movement of the stars is produced in following the natural tracks which are the geodesic curves of this space-time, a curvature which the presence of a material mass further crinkles in, the planets so turning in a sort of funnel due to the incurvature of space in the neighbourhood of the sun.

Newtonian physicists have accused this synthesis raised on an immense assembly of measurements culled from nature, and confirmed by numerous verified previsions, of being 'a made-up affair'. They have lamented the abandonment of the search for the physical forces which should explain natural phenomena. As cartesian physicists saw an avowal of impotence in the substitution of attraction from a distance for rotatory movements, they in their turn see a similar avowal in the

[1] 'The metric field depends on the material realities which fill the universe.' (H. Weyl, *Espace, temps et matière.*)

[2] 'Gravitation will appear as an emanation of the metric field.' (*Ibid.*) It is thus that 'geometry, mechanics and physics form . . . an indissoluble theoretic unity which we must keep before our eyes *en bloc*'. (*Ibid.*)

substitution of geometrical curvature for mechanical force. They forget that modern physics entered on such a path from its birth: it is in avowing, not certainly explicitly (for in the beginning it believed itself to be a philosophy of nature), its impotence with regard to physical causes considered in themselves or in their essence, that it began the composition of a mathematical myth of the physical world which liberated for it the secrets of this world in the form of enigmas. The 'forces' of classical physics appear from this point of view like a precarious compromise between the 'causes' of philosophy and the purely empiriometric entities of a science of evolved phenomena, and it must be said that the new physics has accomplished a step of major importance in the progress towards the scientific conception of the universe in exhibiting at once radically and explicitly this renunciation by physico-mathematical knowledge of the search for physical causes taken in themselves, and its profound tendency to emancipate itself completely from philosophy.

But this liberation from philosophy must not itself be taken for a philosophy! There are two ways in which it is possible to interpret the conceptions of the new physics philosophically. The one is to transport them literally, just as they are, on to the philosophical plane, thus filling the mind with metaphysical confusion; the other is, in order to understand their bearing, for the mind to detach the noetic value in them. In the one case it will be said—not only, which would be wholly legitimate in the vocabulary and from the point of view of the physicist as it has been defined above,—but in a philosophical sense, that the space postulated by the new physics is *geometrically real*, and exhibits the *geometrically real* properties of the corporeal world, which would result (in the degree to which the new physics achieves or will achieve the explication of the universe by the geometric properties of the space invented for that end) in the justification in itself of a purely geometrical exegesis. To distinguish physical and geometric space from one another would then be to distinguish one geometric from another geometric space,[1] to distinguish the properties of *geometrically* real space when occupied by

[1] In this sense it is not so much a distinction as a fusion which is in question. As E. Meyerson has pointed out, 'the confusion between physical and mathematical space—it is almost useless to endeavour to explain that the term confusion is used in no condemnatory sense—constitutes a marked peculiarity of recent conceptions and clearly distinguishes them from their forerunners.' (*La Déduction relativiste*, p. 93.)

matter from the same *geometrically* real space when void of matter (mass or energy, quantity of motion, pressures. . . .),[1] and only occupied by something of the kind of that 'immaterial' ether beyond which we have not got.[2] At the same time, geometry itself, its proper object being misunderstood, like its epistemological independence and its higher rank of abstraction, would be regarded, in so far as it is not an empty 'pure' form, as an 'experimental science',[3] which would only hold, as an objective content which makes it 'true', the physical entities and mensurations thanks to which the mind chooses as 'real space', among the various formal spaces which it is pleased to imagine, the one which agrees best with the widest and most perfect geometrisation of physics.

[1]It would also be to distinguish *geometrically real space* (empty of matter or other encumbrances) and the diverse spaces abstractly conceivable by pure geometry.

[2]See *infra*, p. 224, note 2.

[3]A. S. Eddington, *The Nature of the Physical World*, pp. 161-2. Cp. A. Einstein, *La Géométrie et l'expérience*, Paris, 1921; and my *Réflexions sur l'intelligence*, p. 255. M. Hermann Weyl equally thinks that 'the existence of geometry as distinct from physics is definitely compromised' (*Espace, temps et matière*, p. 292). As Roland Dalbiez has written (*art. cit.* pp. 152-3), 'The metaphysician can only see in this a sign of the old empiricist and nominalist mood which only recognises the truth of existential propositions. That is the gist of the matter. Whether or no, in the hypothesis that no bodies existed, it would be still possible to speak of geometric truth? In all philosophies which go beyond pure empiricism, mathematical propositions do not require, in order to be true, the existence of material objects, which does not for all that imply that the knowledge of them is acquirable independently of sensible experience. Mathematical truths are of a purely essential order; when we formulate mathematically a physical law one must pass over from the existential to the essential order.'

Is it necessary to point out that the etymology of words is a mediocre means for teaching us concerning the things which they signify, and though geometry is etymologically a surveying measurement, geometry is only built up as a science when it is known as something essentially different from any survey? The new scholastic methods of the 'concrete' teaching of geometry have without doubt pedagogical advantages as methods of *initiation*, because they take hold of the child just where he is, not yet on the threshold of geometry, in order to raise him stage by stage to the science itself and its proper degree of abstraction; but if they are taken as methods of geometrical *knowledge* in itself they represent a retrogression to a pre-pythagorean childhood. It must be admitted, moreover, that this question as to the nature of geometry does not seem very clearly answered by the theoreticians of the new physics, who slip over it more rapidly in the degree to which it is thorny. They have not yet elucidated how, if geometry is 'rightly speaking an experimental science', it can nevertheless and with advantage 'have an unfettered development as a pure mathematical subject' (Eddington, *op. cit.*, p. 162).

Under the pretext that space is a network of distances (but which geometry ideally and deductively 'measures') the assumption would be made of having given geometry an object (geometry as a 'natural science') in this network of distances materially and empirically measured by physical apparatus.

In the other case it is recognised that the space of the new physics ('void' or encumbered with matter) is a physico-mathematical rational being expressly constructed to save known appearances, and which will only be modified in the degree to which errors may be found as existing between the construction already built up by the reason and the new data of experiment.[1] This rational being is seen to be in the nature of a *geometric symbol* of *physically real space* (taking 'physical' space in the sense given to it by the philosopher spoken of above), the geometric or metageometric symbol that best translates the reality of those physical interactivities whose ontological scrutiny has been abandoned for their better mathematical analysis. The double irreducibility (a form of value which is sacred for the intelligence) of the physical (considered ontologically in its essence) to the mathematical and of the geometrical to the mathematical is thus safeguarded, and it is understood that the geometrisation of physics can only be accomplished by introducing a mathematically transmuted physics into the heart of geometry itself, which has a so much richer crop of rational beings, departs so much more decidedly from real *geometric* being, that it is asked in addition to absorb it in its symbols and to mathematicise *physically* real being.

The same considerations, *mutatis mutandis*, apply to the mathematicisation of the physically real in the quantum theory, though worked in another way than that of the theory of relativity; in particular, to the structure which the new physics attributes to the atom, or rather to the way in which for several years it has changed the said structure from day to day. It seems as though science tended to endow this structure—which has so become unrepresentable and at the same time detached from any ontological meaning—with a purely abstract mathematical

[1]'. . . This question of the deviation of light leaves the way open for an evolution of the theory (of generalised relativity): explanations of gravitation by non-Riemannian geometry can be developed, and it is possible that in consequence these new geometries will enable us to achieve the synthesis of electro-magnetism, and in consequence, of physics and gravitation.' (P. Langevin, *L'Œuvre d'Einstein et l'astronomie*, *art. cit.*, p. 294.)

equivalent, a more and more fictive, a more and more perfect symbol of the real nature, which is unknown in itself, of some existent thing to which the determining name of *atom* corresponds, so that it may know this nature more and more profoundly, but more and more enigmatically, or indeed meta-phorically, in the degree to which it builds up the myth—the rational being founded *in re*—which takes its place.

II. THE PHILOSOPHY OF NATURE

According to a phrase of Prof. Eddington's, the physicist of to-day, who knows that 'our knowledge of the objects treated in physics consists solely of readings of pointers and other indicators', and who also knows that 'this schedule of pointer readings' is 'attached to some unknown background', is much less tempted to believe than 'the Victorian physicist' that nothing is true except what can be reconstructed by an engineer[1] or that physics is all-sufficient. Rather he is led to believe 'that a just appreciation of the physical world as it is understood to-day carried with it a feeling of open-mindedness towards a wider significance transcending scientific measurement',[2] although he feels all too ill-equipped to discover for himself whither this feeling should lead.

This is true not only for physics but of empiriological knowledge in general. It is clear that in its essence such knowledge remains insufficiently explanatory, and with it the mind cannot be content. The philosophical or pre-philosophical substrata which the scientist himself cannot transcend are a clear indication of this. Some knowledge of being itself is needed, of corporeal, sensible and mobile being, of the being immanent in these natural realities in which the phenomenological sciences find their end and their verification, the basis of all their conceptual constructions, over which they give us practical power. Such

[1] A. S. Eddington, *op. cit.*, pp. 258–9. 'The physicist now regards his own external world in a way which I can only describe as more mystical, though not less exact and practical, than that which prevailed some years ago, when it was taken for granted that nothing could be true unless an engineer could make a model of it. There was a time when the whole combination of self and environment which makes up experience seemed likely to pass under the dominion of a physics much more iron-bound than it is now. That overweening phase, when it was almost necessary to ask the permission of physics to call one's soul one's own, is past.' (*Ibid.* p. 344.)

[2] *Ibid.* p. xviii.

knowledge must evidently have another object and other characteristics, build itself up on another noetic plan than what in our modern phraseology is called science; its office should be neither the continuation of science on the same plane (in that direction, as M. Bergson once said, 'Beyond science there is only ignorance'), nor the decoration of the results of science with noble and vague meditations. Though its rules of explanation are not those of science in the modern sense of the word they should certainly merit the name of science in the qualitatively deeper and more authentic sense which was known to the ancients, and which creates its possibility. For the natural sciences do not only lead the mind to desire this—in themselves, in their witness that nature is knowable and that nevertheless they themselves can only know in an essentially unsatisfying way, they testify that a form of knowledge is possible, where the intelligence, actualising the mysterious intelligibility of things at a deeper level, discovers in these sciences the being towards which they aspire as their natural object: always on condition that the mind can resign itself to the necessary curtailment and ascesis, and understand that in order to grasp a little of the being of things it must renounce the will to utilise this more noble knowledge, which is yet quantitatively poorer, for any speculative or practical exploitation of the riches of phenomena.

This is a form of knowledge which, even in one connection only, and in a given order (in the order of sensible nature) is a wisdom, a thing of 'fruition', not of 'usage'. And all wisdom must, in one way or another, 'pass through the eye of a needle'.

It was in the quest for such philosophical comprehension that the knowledge of the natural world began. But it has taken long for it to learn the spirit of poverty. The misfortune of the philosophy of nature among the ancients was that it believed it was a science of phenomena. Let us also call by its proper name, the philosophy of nature, the form of philosophical apprehension I am here seeking to define: but let us understand that it must needs lay aside all pretensions to cross the frontiers of its essence and conquer the world. It we are going to refer ourselves to the philosophy of nature which in my opinion is most securely based, and which has the privilege of being in continuity with the most pure metaphysic, the philosophy of nature as conceived according to the prin-

ciples of Aristotle and St. Thomas, let us be equally well aware that it is indispensable (and not half so difficult as is ordinarily imagined) to separate those principles from the applications and illustrations for long connected with the scientific conceptions of the ancient world; and clearly see that this knowledge of wisdom, this philosophy of being essentially subject to change, is completely free in itself from any connection with an astronomy and a physics forever gone to ruins.

But what concerns us here are the epistemological characteristics and conditions of the philosophy of nature. It is in intelligible being itself, however obfuscated it may be by sensible matter, that such a form of knowledge resolves its concepts; it results from a type of ontological explication open to the natural motions of the speculative intellect. It is not with empiric conditions, but with reasons of being and causes in the true sense of the word that it is connected; it is the essence of things that it seeks to discover. Proceeding, like all philosophy, according to an analytico-synthetic method, it depends on experience much more closely than does metaphysics and must be able to submit its judgments to the verification of the senses; but it is a deductive apprehension, assigning reasons and intelligible necessities in the degree to which it is assured of the intrinsic constituents or the 'quiddity' of its objects. It is by this, for example, that it is able to instruct us concerning the nature of continuity and number, of quantity, space, motion and time, of corporeal substance, transitive action, vegetative and sensitive life, concerning the soul and its operative powers, etc., and also to consider the ontological disposition of this universe, *i.e.* as Aristotle does at the end of the *Physics*, its relation to the First Cause, and the adjustment between the necessary, the contingent and the fortuitous in the course of its events.

If we wish to define the philosophy of nature, we must say that it is a form of knowledge which has as its object, in all the things of corporeal nature, mobile being as such, and the ontological principles which give the reason for its mutability. It was Aristotle who founded this science, Aristotle who showed that an ontology of the sensible world is possible, not so far as it is sensible, but in so far as it is the world of *changing being*, and that it implies in its structure intelligible invariants dependent on specifying forms.

While metaphysics embraces the whole domain of intelligibility not

as such immersed in the sensible, physics in Aristotle's meaning of the word embraces the whole domain of the intelligible which is so immersed. In the conception of the ancients all the sciences of the material world make part of this form of knowledge, a mark of a singular optimism and a most candid philosophic imperialism. With their minds first of all fixed on philosophy, they had a tendency to absorb all the other natural sciences into it. In certain spheres, nevertheless, these sciences had already come to the knowledge of their own proper methods and autonomy, but they regarded these as a special case of *scientiae mediae*, envisaged as the mathematical treatment of questions of natural philosophy. And in the degree to which otherwise the philosophy of nature filled the place of a scientific systematisation of the detail of phenomena this too often gave rise to explications of an extreme analytical insufficiency, which was often only verbal.

As I have had occasion to point out in a previous chapter, it is very important not to forget that, as St. Thomas often says,[1] the essence of sensible things remains in general hidden from us, by reason of the

[1]Cp. *In Sent. II*, dist. 35, q. 1, a. 2, ad. 3: 'Sicut aliquando utimur non veris differentiis loco verarum, propter earum occultationem, ut in *I Post.*, text. 35, dicitur, ita etiam loco veri generis potest poni aliquid per quod genus magis innotescat.' *De Veritate*, 4, 1 and 8 (quoted *infra*, p. 252, n.). *Contra Gent.*, i, 3: 'Rerum sensibilium plurimas proprietates ignoramus, earumque proprietatum, quas sensu apprehendimus, rationem perfecte in pluribus invenire non possumus.' *In Metaph.*, book vii, lect. 12: 'Quandoque aliquis dividens . . . dividat per ea quae sunt secundum accidens, propter hoc quod non potest invenire proprias et per se differentias. Aliquando enim necessitas cogit ut utamur, loco per se differentiarum, differentiis per accidens, in quantum sunt signa quaedam differentiarum essentialium nobis ignotarum.' See *infra*, p. 255 (note 1).

'Here on earth,' writes R. Garrigou-Lagrange, 'man is the sole being whose specific difference belongs to the purely intelligible and not the sensible world: which is what allows us to deduce his different properties. Lower beings only become truly intelligible in their transcendental (or common to all beings) and generic features.

'We know, for example, that mercury is a corporeal substance, a liquid metal, but we do not know by that its specific differentiation. We only have, when it becomes necessary to make precise these generic notions, an empiric, descriptive definition, which does not stretch to making *intelligible* the properties of this body. We content ourselves with saying that mercury is a liquid metal at an ordinary temperature, silver white, soluble at 40 degrees, which boils at 360 degrees, very dense; its salts are very potent antiseptics, but also very toxic. We can state the facts but we cannot state their *why*. It is the same for the plant or the animal: who can assign the specific differences of a species so that one could deduce the properties? If it is a question of man on the

matter in which it is included. It is only in the mathematical order that we can consider a world of essences as discoverable, which is why it is the most dictatorial and sumptuous form of human science. In the physical order it is indeed possible to reach certain essential and specific determinations concerning man and the things of man (his powers, habits, etc.), but below man, at most times, the element of resistance to intelligibility which belongs to matter, which renders corporeal natures opaque to us, and knowledgeable by signs rather than by properties in the ontological sense of the word, causes the essences to remain hidden from us *in their specific nature*. It follows from this that the philosophy of nature cannot reach to the ultimate specific diversities of bodily nature. And this implies a grave restriction of the philosophic optimism of the ancients.

When it is a question of the distinction between certain very widely extended spheres—living and not living bodies, animals and vegetables, men and irrational animals—the philosophy of nature is well able to grasp the essential differences. There we are in a region accessible by the philosopher, we achieve truly philosophical certitudes, in the very order of typological discrimination. In other words, we know that there is an essential difference between vegetable irritability and animal sensibility; we know that the immanent activity by which the living organism builds itself up, sensation, intellection, reveal quidditative principles which enable us to enter into the inward structure of the beings under consideration. We know that the body as such is built up by two complimentary ontological principles, the one purely potential and determinable, the other specific and determining, which we call the 'prime matter' and the 'substantial form'.

But the philosophy of nature must remain content with certitudes of such a high degree of universality. It must leave all questions of the diversities and specific particularities of the world of bodies, all the detail of the workings of sensible nature, in the hands of that knowledge which Leibnitz called 'symbolic' or 'blind', and which here I have suggested calling empiriological. That knowledge can enter into the fullest

contrary, among all the features common to all men—rationality, liberty, morality, sociability, speech, religion, etc.—one, rationality, appears like the *raison d'être* of all the others. . . . All these features can be rendered intelligible, *i.e.* knitted up with being, by the intermediation of rationality.' (*Le Sens commun, la philosophie de l'être et les formules dogmatiques*, 3rd edit.)

detail: it is the essence that escapes it. If it is a question of deciphering the multiplicities of becoming, the interactions which make up the splendidly multiform and close-knit play of nature, the philosophy of nature can doubtless have, indirectly, a heuristic value, in the stimulations which it is able to exercise in the minds of scientists (above all in the case of those sciences which I have called empirico-schematic). But in itself and in its own proper field it makes no such claims. There is no other science of the phenomena of nature than the empiriological, and that science is not a philosophy.

It must here be stressed that apprehension is only perfect when we can know things, not only in a more or less indistinct fashion, leaving off at generic determinations, but in descending to the most ultimate specific determinations. If metaphysics is a perfect apprehension (I shall return to this point later), it is because its specific object (being as such drawn from things by *abstractio formalis*) is not a genus but a transcendental, which taken as such, is at the ultimate degree of logical determination.

What then is the case with the philosophy of nature? Its object is not the *ens in quantum ens*, the object of the metaphysician.

Neither are the specific natures of the world of bodies, as we have just seen, its object. These natures *would be* the specifying object of the natural sciences, if these sciences could, as they cannot, attain to it; they stop at an empiriological knowledge. For all that the philosophy of nature, no more than metaphysics, does not only bear on simple generic determinations. In reality it considers corporeal and mobile things from the standpoint of the transcendental being with which they are saturated. In this way it shares in some degree in the light of metaphysics, as our souls also share in a way in the nature of pure spirits. The specific object of the philosophy of nature is, in corporeal natures taken as such, the ontological mutability and the formalities by which the mind can discern a difference of being (corporality, quantity, movement, life, animality, etc.): which is sufficient to assure to it its distinction from and autonomy with regard to the experimental sciences.

But, on the other hand, sensible or mobile being is not complete in itself; only has the integrity of its determination in specific natures. The experimental science of nature and the philosophy of nature are two distinct forms of knowledge, but each incomplete, ruled by different laws

of procedure, the one above all of the intelligible, the other above all of the sensible, and which result, well or ill, in self-completion. It is by this that they both belong to the same degree of abstraction, although, from another point of view, as we have seen, the philosophy of nature may be essentially different from the natural sciences.[1]

I could gladly compare the relation of the philosophy of nature with the sciences of nature with that of the rational soul with its body. In itself the former is independent of the state of development of both the latter and their hypotheses. It rests on 'philosophic facts' which are much more simple and fundamental than 'scientific facts'.

Nevertheless, to insist too exclusively on this independence, as the philosopher is often inclined to do, is to risk losing sight of the intimate and substantial union which should rule over these two sections of the knowledge of the sensible world. For three centuries, during which the natural sciences have been subject to the fascination of a mechanistic metaphysics, the authentic philosophy of nature has been in the

[1]This difference must be regarded as essential and specific, if it is true that it is the degree of immaterialisation of the object constituting the *terminus ad quem* of the abstractive operation and shown by the *mode of definition* which brings in the specific differentiations among the sciences belonging to the same generic degree of abstraction (cp. *supra*, chap. i, p. 45, n.). It is clear that empiriological definition, by its resolution in the observable as such, is essentially different from that of the ontological type, with its resolution in intelligible being. The difference between the philosophy of nature and the phenomenological sciences, whether empiriometric or empirico-schematic, is thus much more marked than that between arithmetic and geometry, which are, for the scholastic, two specifically distinct sciences.

John of St. Thomas thus distinguishes between natural philosophy and medicine. ('quae licet utraque abstrahat a materia singulari, tamen magis concernit materiam corpus ut sanandum quam corpus mobile ut sic', log. ii, P. q. 27, a. 1: cp. *Phil. Nat.*, i, P. q. 1, a. 2). And if St. Thomas seems to put the philosophy and the sciences of nature in one specific class, where the diverse differences of concretion in the object only differentiate in so far as they are more or less (cp. *Com. in de Sensu et Sensata*, lect. 1), it is precisely because in his epoch the natural sciences, except in certain fields already subject to mathematicisation like astronomy and optics, had not yet conquered their methodological autonomy, and still constructed their definitions on the model of natural philosophy.

The soul and the body constitute a complete substantial whole *ratione speciei*, and thereby the comparison of the relation of the philosophy of nature to the natural sciences to that between the soul and the body is defective: it is from the point of view of the integrity of the reality which is to be made known by both the philosophy of nature and the sciences that this comparison has its value.

condition of a disembodied soul. It has so undergone a purification from many defects; to-day it has come once more in contact with experimental science. This contact is both natural and necessary.

If the philosophical facts on which natural philosophy is based (*e.g.* there is a real specific diversity in the world of bodies; there are substantial mutations; living organisms are endowed with an activity which returns upon itself, etc.), if these philosophical facts can be established as starting from common observation (subject to a philosophical criticism), nevertheless it is proper that in relation to the self-development of the positive sciences they should be illuminated also from the standpoint of scientific facts, in so far as the latter can be disengaged from theories. In themselves, scientific facts are incapable of producing any philosophical decision, but the rightful penetration of these objects and their philosophical principles, like the light of the active intellect striking on phantasmata, can release in them the philosophical content with which they are pregnant.[1] Permanent as are its essential determinations, natural philosophy must thus also bow to the law by which things grow old and are renewed, of fading and transformation, imposed on the fleshly garment which it receives from the experimental sciences, and thanks to which its material supply of facts accumulates so marvellously; while it also must free itself from certain (not philosophical, but general or 'vulgar') representations, which have been taken for pre-scientific interpretations, implied by the familiar world of the senses.[2]

[1]Cp. the views so wisely stressed by the regretted P. Geny in his article, 'Metafisica ed esperienza nella cosmologia,' *Gregorianum*, 1920, vol. i.

[2]Thus many of the ideas held by the natural philosophy of the ancients with regard to the continuity of matter since the invention of the microscope have needed and will still require to be submitted to a serious revision, where it is a question of bodies exhibiting only the appearance or the real character of substantial individuality. The question presents itself of knowing whether the substantial unity of the individual body (*e.g.* such and such a molecule of gas, or some living organism) necessarily requires, as the ancients believed, continuity by extension—in other words, whether the substantial form cannot inform a whole made up of discontinuous parts, which may be contiguous (like, for example, plasms of the blood and the arterial surround) or may be, in the atomic scale, separated by intra-atomic or intra-molecular interspaces (in cases where, in contradiction to Gredt's hypothesis, these interspaces are not in themselves informed by the substantial form of the individual whole). For my part, I regard such a structural discontinuity as compatible with the substantial unity of the individual whole, and am of opinion that the thomist theory of individualisation by the *materia*

The doctrine of hylomorphism, for example, is as true to-day as it was in the time of Aristotle; it is its vocabulary and its exemplifications which have worn out, not its substance; only the four elements of the old world have been replaced by the ninety-two elements of Mendeljeff's table, which correspond to very different scientific notions. We have a much closer knowledge of this tribe of elements than the chemists of a hundred years ago; and it seems more than possible that they all derive from the hydrogenic atom by a series of changes which a philosopher must needs regard as substantial mutations. Radio-active phenomena furnish us with proofs of such changes *de natura* in the world of bodies; not doubtless in itself a pure and simple scientific verification (it is for philosophy, not science, to establish a fact whose formulation implies the notions of substance, nature, species, etc., metaphysically understood), but an indication or 'sign' empiriologically remarkable which the philosopher acting with prudence can disengage as such. The existence of the micro-structure of matter is a definitely established fact (which leaves open the rightly ontological question of the essence of matter).[1] If science incessantly revises and renews its conceptions of spatio-temporal organisation and the properties of the atom, it is by affirming in so far the existence of the so-named primitive complex. And indeed this assembly of empiriological forms of knowledge agrees rather with the ontology of Aristotle than with that of Democritus or of

signata quantitate is thus verified without any special difficulty: the transcendental relation between matter and quantity needing to be understood, in this case, as a transcendental relation to a constellation of positions.

On the other hand, it is apparent that 'organisation' must not be regarded as the privilege of living matter. The atom also is 'organised'—but without the *progressive* equilibrium and *self-perfecting* activity (*actio immanens*) characteristic of life.

[1]Although indeed the present state of micro-physical theories and the epistemological structure of physico-mathematical knowledge are in high contradiction to any such hope, I do not imagine it is impossible that some day the configuration of matter, the disposition and distribution of its parts in space—not only the demicells, molecules, ions or atoms, into which the mind discomposes a material mass of large dimensions, but the constituting parts of the atom itself—may become the object of a knowledge from which all symbolism will have been eliminated. Even supposing that such a knowledge of the *configuration* of matter were perfect, it would always leave open the question of its *essence*. The configuration of a body may be a compound of electrons and atoms, but the essence is a substantial compound of potency and act.

Descartes (and I might add, doubtless much better than the experimental conceptions in favour with the alchemists of the Middle Ages).

SOME COMPLEMENTARY ELUCIDATIONS

But how is this possible? Prof. Eddington, with his vivid descriptive imagery, declares that a body is 'a world-tube of four dimensions, separated from the rest of space-time by a more or less sharp limit'. This is far enough away from the world of Aristotle!

From Aristotle's scientific ideas, yes: but what we are considering is his philosophy. Whether an elephant be an isolated world-tube with four dimensions or a block of flesh and blood composed of four elements and the four primary qualities, in one case as in the other there is no resemblance between the idea, which is expressible in an image or in a spatio-temporal scheme, and at least *reductively*[1] figurable, which science or common sense has of this animal and the *essentially* unfigurable and purely ontological conception which belongs to the philosopher in his first statement of the principles which constitute the substance of the same elephant.

Primary matter and substantial form belong to another noematic universe than this block or this tube; the theory of hylomorphism is favoured by neither the one nor the other, for it is based on another foundation than these images. Whether it be a three-dimensional block or a four-dimensional tube, the elephant must needs perform that operation, which the man in the street and the scientist call by the same name though seeing it under very diverse terms, which is known as 'eating': and it must needs end by that phenomenon which both call 'dying'. And the philosopher, who knows that the elephant in question is an individual 'substance', 'a thing in itself', specifically different from the vegetable substances which it assimilates by nutrition and the

[1]Such an idea can be (cp. chap. i, p. 59) *unfigurable by default* as a result of the conditions of the observability of the object, it can also, in consequence of the mathematicisation of the physical, be only representable to the physical imagination metaphorically, or even be only representable (yet more indirectly and analogically) to the mathematical imagination, as is the case with the waves of wave-mechanics. It does not cease thereby to belong to the order of the imaginable or the figurable, in the same way that the point is without extension while yet *reductively* belonging to the order of extension.