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ST. THOMAS AQUINAS, GALILEO, AND EINSTEIN

IT is frequently said of St. Thomas Aquinas that the man has been lost behind the voluminous quantity of his writing. Commenting further on this literary output of the Common Doctor, one could say that his valuable contributions to the development of physical science have been lost in the great mass of his writing on theology and philosophy. In this vein, it might not be amiss to bring out of the shadows cast by Aquinas' more famous works a few specimens of his thought on the subject of scientific knowledge, contributions that, had they been those of a lesser genius, might have been appreciated the more by assessors of the medieval scientific tradition.

To those who are friends and admirers of St. Thomas, no apology is needed for treating the question of his basic theory of physical knowledge. But even should the reader make no commitment whatsoever to Thomism, it could well be profitable to reconsider some of the perennial problems of the universe in the light of Aquinas' conception of physical science. Such a consideration need not be anachronistic. As Burtt has

pointed out in his *Metaphysical Foundations of Modern Science,* every age has its unconscious presuppositions, and these can sometimes be brought to light by setting off current views against those of an earlier period, when prevailing notions were not so commonly entertained.[1] And if every age has its hidden presuppositions, it is also true that every age has its problems—not unconnected, possibly, with these same suppositions. We in America are now very much preoccupied with the study of the physical universe: on the surface, great progress is being made in science and technology, but at the heart of the matter, when scientists ask how much is really known about the world in which we live, there is a gnawing doubt that makes itself increasingly felt about our ability ever to reach any definitive answers. It is on such a problem of the validity of scientific knowledge that Thomas Aquinas may have something worthwhile to offer to the modern mind, and this proposal will therefore be the burden of our study.

St. Thomas Aquinas (1225-1274)

The intellectual atmosphere that Aquinas breathed at the University of Paris in the mid-thirteenth century was not sympathetic to natural science; in fact, it was markedly hostile to the influx of Aristotelian and Arabian thought into Western Europe—an influx that brought with it much of the scientific learning of the ancient world. This attitude of hostility at Paris, however, was not apparent at the other great center of studies in medieval Christendom, Oxford University. There the discovery of Aristotle's logical works, and particularly the translation of the *Posterior Analytics* (with commentary) by Robert Grosseteste, Bishop of Lincoln (1175-1253), had stimulated great interest in a type of mathematical physics which accented studies in optical science.[2] This had resulted in what Baeumker has called a "metaphysics of light," a philosophy immediately put to the service of theology to develop the

[1] E. A. Burtt, (London: 1932), pp. 15-17.

[2] A. C. Crombie, *Robert Grosseteste and the Origins of Experimental Science,* (Oxford: 1953), pp. 91-134.

Christian Platonism of the Oxford school.[3] What is of more importance, however, in this scientific revival at Oxford was its insistence on the role of mathematics in physical proof. In this school a pure mathematical structure was commonly conceived as objectively existing in things, before their physical properties, and giving the only adequate explanation of observed reality. Possibly through Roger Bacon, the influence of Grosseteste's work was gradually felt on the continent, and provoked a decided reaction from the pen of St. Albert the Great (1206-1280), the teacher of St. Thomas Aquinas. Albert himself, unique among the Paris Masters, had been sympathetic to the influx of Aristotelian thought, had done extensive observational and experimental work in biology, meteorology and alchemy, and had reconstructed a physical theory from Aristotle's *Physics* that was opposed to the mathematical realism of the Oxford school.[4] The young Aquinas then built upon Albert's foundations, and elaborated this theory that was primarily physical, but at the same time allowed for a legitimate use of mathematics in obtaining strict physical explanation or proof.[5]

For Aquinas, as for Albert, mathematical structure is not imposed on reality by the mind, but rather is abstracted from reality by a mental process that leaves aside all the irregularities of matter and the flux of movement and time. More basic than this mathematical structure is the physical nature of the reality studied, which is determined to express itself in a certain figure—by which, for example, we can easily recognize a horse, and distinguish it from a cow. The quantitative characteristics that are thus expressive of a type are not themselves mathematical entities, but rather are physical ones,

[3] C. Baeumker, "Der Platonismus im Mittelalter," in Studien und Charakteristiken zur Geschichte der Philosophie insbesondere des Mittelalters, *Beiträge zur Geschichte der Philosophie des Mittelalters,* Bd. 25, 1-2, Münster-i-W.: 1927, p. 160 ff.

[4] J. A. Weisheipl, O.P., "Albertus Magnus and the Oxford Platonists," *Proceedings of the American Catholic Philosophical Association,* Vol. 32 (1958), pp. 124-139.

[5] J. A. Weisheipl, O.P., *The Development of Physical Theory in the Middle Ages,* (London: 1959), pp. 27-62.

although originative sources of the idealized static structure studied by the mathematician. Thus, in Aquinas' view, the insight afforded by mathematics is not deeper—or more "divine," as the Platonists would have it—but actually is more superficial than a physical insight. As a consequence, explanation through mathematics does not explain the physical nature, but it does accurately describe that nature, and it can help in discovering a physical explanation or proof.[6]

The help that mathematics gives to the physicist was conceived by Aquinas as being of two kinds, one which functions at the level of hypothesis to suggest *possible* physical explanations, the other which functions conjointly with physical reasoning to give *conclusive* explanation or proof.[7] An example of the first would be the Thomistic evaluation of Ptolemy's explanation of the motion of the heavens through eccentrics and epicycles. Viewed mathematically, Aquinas noted, the observed appearances of the stars result "either from the motion of the object seen or from the motion of the observer, . . . it makes no difference which is moving."[8] But as a physical explanation he showed considerable reserve towards the Ptolemaic hypotheses, noting that while they do account for the stellar appearances, "we must not say that they are thereby proved to be facts, because perhaps it would be possible to explain the apparent movements of the stars by some other method which men have not yet thought out."[9] His whole treatment of astronomical and meteorological problems, in fact, seems aimed at correcting a naive mathematicism among medieval Aristotelians, for he points out that Aristotle, in dealing with the heavenly spheres, had mistaken a suppositional theory for established fact.[10] He himself is at pains to elaborate the reasons why we cannot have certain judgments about the heavenly bodies;[11] yet, he observes, it is not stupid or neces-

[6] Cf. *In I de Caelo*, lect. 1, n. 2, and lect. 3, n. 6; *In II Phys.*, lect. 3; *Summa Theologiae*, I, q. 1, a. 1, ad 2.

[7] Cf. *Summa Theologiae*, I, q. 32, a. 1, ad 2; *In II Phys.*, lect. 3, n. 9.

[8] *In II de Caelo*, lect. II, n. 2, and lect. 12, n. 4.

[9] *Ibid.*, lect. 17, n. 2. [10] *Ibid.* [11] *Ibid.*, lect. 4, n. 3.

sarily precipitate to venture an explanation, for he holds that a theory or supposition that does not conflict with the facts is far better than no explanation at all.[12]

In addition to this first, or hypothetical use of mathematics in seeking a possible explanation, Aquinas also conceived of mathematics as functioning directly in physical argument to furnish a conclusive explanation or proof.[13] This too can best be illustrated by an example.[14] In discussing the shape of the earth, he notes that the latter can be proved to be a sphere merely by an analysis of measurements made on its surface—essentially a mathematical proof.[15] But he regards as more conclusive for the physicist a proof which arises not simply from a mathematical description of the earth's surface, but which leads to a knowledge of the *physical causes* that make the earth to be a sphere. Thus he observes, " all gravitating bodies . . . approach the earth at the same angle, that is, at a right angle . . . and not in parallel lines." [16] This universal mode of gravitation " is what makes the earth to be spherical by nature," he says, because the spherical shape alone can satisfy the uniform tendency of all parts to a common center of gravity.[17] " If the earth were naturally flat, as some have said," he continues, " then bodies would not gravitate everywhere towards the earth at the same angle." [18] It should be noted in this proof that the physical cause Aquinas assigns need not make the earth a perfect sphere—" irregularities such as mountains and valleys arise," he concedes, although " not of notable dimensions compared with those of the earth," and he attributes them to " some other incidental cause." [19] Thus pure or perfect mathematical shape, for Aquinas, does not exist in physical reality: it is only the human mind, abstracting

[12] *Ibid.*, lect. 7, nn. 4-5; *In I Meteorologicorum*, lect. 11, n. 1.

[13] *In I Post. Anal.*, lect. 25, nn. 5-6.

[14] For other examples, together with some applications to modern science, see my " Some Demonstrations in the Science of Nature," *The Thomist Reader 1957* (Washington, D. C.: 1957), pp. 90-118.

[15] *In II de Caelo*, lect. 28, n. 4.

[16] *Ibid.*, n. 1.

[17] *Ibid* .

[18] *Ibid.*

[19] *Ibid.*

from material irregularities such as mountains and valleys, that can conceive of the earth as a perfect sphere.[20] But the earth does have a natural or physical shape which is approximately spherical, and this shape can reveal to the inquiring mind the physical reason which makes the earth to have this shape in the first place.[21]

Space does not permit even a sketch of the historical consequences of this theory of physical proof developed by Albert and Aquinas. It is indisputable, however, that this theory made clear, at a critical period of medieval thought, the distinction between hypothetical explanation and proven fact, while allowing for a legitimate use of mathematics in both types of reasoning. To this one might add that some recently edited texts can be used to argue to the existence of a "Dominican school" in optical science, beginning with encyclopedic collections of data by Thomas of Cantimpré, Vincent of Beauvais and Albert the Great, developing through the theoretical speculations of Thomas Aquinas, John of Paris and Peter of Alvernia, and culminating in the brilliant experimental researches and physico-mathematical theories of Theodoric of Freiburg.[22] The historical import is not insignificant: in less than a century, this line of thought, quite independent of the Oxford school, furnished the first correct fundamental theory of the rainbow—and this more than three hundred years before the publication of Descartes' *Discours de la Méthode* and *Les Météores*, where basically the same explanation of the rainbow is cited as one of the brilliant achievements of the new Cartesian methodology.[23]

[20] *In II Phys.*, lect. 3, nn. 4-6.

[21] *Summa Theologiae*, p. I, q. 1, a. 1, ad 2; *In I de Caelo*, lect. 3, n. 6.

[22] See my *The Scientific Methodology of Theodoric of Freiburg*, Studia Friburgensia No. 26 (Fribourg: 1959), pp. 132-249. Newly edited texts are contained in Appendix III, pp. 305-376.

[23] The full title of Descartes' work on methodology reads: "Discours de la Méthode pour bien conduire sa raison, et chercher la vérité dans les sciences. Plus la Dioptrique, les Météores, et la Géométrie, qui sont des essais de cette Méthode," (Leyde: 1637). The explicit statement from *Les Météores* is contained in Descartes' *Oeuvres*, ed. C. Adam and P. Tannery (Paris: 1897-1910), Vol. VI, p. 231.

GALILEO GALILEI (1564-1642)

While not belittling the importance of Descartes' influence on modern thought, we may turn now to one of his contemporaries, Galileo Galilei, to whom the accolade is commonly given for having procured the " downfall of Aristotle " and the beginning of a new era in science. Some might quibble on the phrase " downfall of Aristotle " and urge that this was more a downfall of a caricature of Aristotle drawn by third-rate scholastics,[24] but without gainsaying the point, the effect was pretty much as popularly conceived. One of Galileo's admirers, Fr. Paolo Sarpi, registered a not uncommon reaction when he said: " To give us the science of motion God and Nature have joined hands and created the intellect of Galileo." [25] In our own day, the popular image is that of an indefatigable experimenter climbing the leaning tower of Pisa to put the Aristotelians to rout with his measurements of falling bodies.[26] Recent studies point more significantly to the Renaissance reaction to Galileo's *Message of the Stars.* Thus Koyré summarizes:

> Mountains on the moon, new ' planets ' in the sky, new fixed stars in tremendous numbers, things that no human eye had ever seen, and no human mind conceived before. And not only this . . . also the description of an astonishing invention . . . the first scientific instrument, the telescope, which made all these discoveries and enabled Galileo to transcend the limitation imposed by nature—or by God—on human senses and human knowledge.[27]

The experimental work of Galileo might easily—though falsely—be interpreted as the beginning of modern scientific method, with its accent on postulational procedures subsequently verified by experimental proof. Actually Galileo's method was more closely patterned on that of the late Aristo-

[24] Cf. G. de Santillana, *The Crime of Galileo* (Chicago: 1955), pp. 24, 56, 69.

[25] Cited by Burtt, *op. cit.*, p. 74.

[26] But see L. Cooper, Aristotle, *Galileo & the Tower of Pisa* (Ithaca: 1935); also E. A. Moody, "Galileo and Avempace: The Dynamics of the Leaning Tower Experiment," *Journal of the History of Ideas,* 12 (1951), pp. 163-193, 375-422.

[27] A. Koyré, *From the Closed World to the Infinite Universe.* (New York: 1957), p. 90.

telians of the Paduan school,[28] and its most significant aspect was not its insistence on experiment, but rather on the fact that " the book of nature " is written *only* in the language of mathematics.[29] " This book is written in the mathematical language," wrote Galileo, " and the symbols are triangles, circles, and other geometrical figures, without whose help it is impossible to comprehend a single word of it; without which one wanders in vain through a dark labyrinth." [30] Galileo was quite convinced of the absolute truth of the heliocentric theory, maintaining that it was not merely a possible explanation, a " saving of the appearances," as Osiander had indicated in his preface to Copernicus' work,[31] but rather that it expressed a certain truth with which one could even contest traditional interpretations of Sacred Scripture. " Although [a theory that saves the appearances] satisfies an astronomer merely arithmetical," he said, " it does not afford satisfaction or content to the astronomer philosophical." [32] His own metaphysical option, according to Burtt, was for a much refined Platonism that was actually a strict mathematical realism [33]—one could almost call it a revival of the Pythagorean doctrine of twenty centuries previous.[34] Experiments had no probative value for Galileo; they were meant to appeal to the popular mind—those who knew mathematics really had no need of them. But the popular mind also needed convincing, and here Galileo's genius for stirring up trouble came to the fore. His wit and sarcasm in controversy are well known, and on hearing

[28] Cf. J. H. Randall, Jr., " The Development of Scientific Method in the School at Padua," *Journal of the History of Ideas,* 1 (1940), pp. 177-206; P. R. Wiener, " The Tradition Behind Galileo's Methodology," *Osiris,* 1 (1936), p. 733 ff.

[29] See, for example, J. Collins, *A History of Modern European Philosophy,* (Milwaukee: 1954), pp. 79-81.

[30] Galileo, *Il Saggiatore* (Florence: 1842), p. 171.

[31] For a detailed examination of the relations between Copernicus and Galileo, see P. Conway, O.P., " Aristotle, Copernicus and Galileo," *The New Scholasticism* 23 (1949), pp. 38-61, 129-146.

[32] Galileo, *Dialogue on the Great World Systems,* Third Day, ed. G. de Santillana, pp. 349-350.

[33] Burtt, *op. cit.,* pp. 82, 84; cf. A. Koyré, " Galileo and Plato," *Journal of the History of Ideas,* 4 (1943), pp. 400-428.

[34] Cf. G. de Santillana, *The Crime of Galileo,* p. 69.

this brief excerpt from a letter, one can imagine the hot arguments he provoked. He writes:

Oh, my dear Kepler, how I wish that we could have one hearty laugh together! Here at Padua is the principal professor of philosophy, whom I have repeatedly and urgently requested to look at the moon and planets through my telescope, which he pertinaciously refuses to do. Why are you not here? What shouts of laughter we should have at this glorious folly! And to hear the professor of philosophy at Pisa laboring before the Grand Duke with logical arguments, as if with magical incantations, to charm the new planets out of the sky! [35]

In sober fact, Galileo Galilei never did prove that the earth went around the sun, and not vice versa. Conclusive proof of the type Aquinas would have sanctioned, such as is found now, for instance, in our astronomy textbooks, had to wait two more centuries for the contributions of Foucault and Bessel.[36] Galileo's real "crime" had nothing to do with revealed religion: it consisted merely in this, that he saw proof too easily, and thus obscured (in his own mind, at least) the distinction between hypothetical explanation and proven fact already well known to Aquinas. Yet there was much that was good in his work—he had offered new evidence that should have been taken into account by the philosophers of his day. As de Santillana remarks, "Had there been in Rome, at the time of the first crisis of 1616, a youthful Aquinas . . . instead of an aged Bellarmine," history might have been written differently.[37] But "there was no Aquinas," [38] and well known is the unfortunate stand taken by those who were in Rome, to bring about what history will always regard as a tragic ending in a most unsatisfactory case.

[35] Letter to Kepler, 1610; cited by Burtt, *op. cit.*, p. 77.

[36] Cf. A. C. Crombie, "Galileo's 'Dialogues Concerning the Two Principal Systems of the World,'" *Dominican Studies*, 3 (1950), pp. 105-138.

[37] *The Crime of Galileo*, p. ix.

[38] *Ibid.*

Albert Einstein (1879-1955)

Crombie has suggested that the great genius of Albert Einstein, working three centuries after Galileo to elaborate the theory of relativity, consisted in his breaking away from the spell under which the great Italian had put mathematical physics from its inception. " Einstein was able to advance the theory of relativity," Crombie writes, " because he acted on the principle that the object of physical science is to ' save the appearances ' by mathematical abstractions postulated *for no other purpose* than to ' save the appearances.' " [39] Einstein seems to have had little hope of penetrating to the reality behind his equations, and there can be little doubt that recent revolutions in physics, traceable in large measure to Einstein, show a decided break with the Galilean concept of proof. In fact, with Einstein ends the naive optimism of a classical physics that saw the book of nature written in the language of mathematics.[40] Proficiency in mathematics, it is true, enabled this modern scientist to achieve brilliant successes in theoretical physics, but the more he worked, the more he doubted the exact correspondence of pure mathematics to physical reality. " As far as the laws of mathematics refer to reality," he says, " they are not certain; and as far as they are certain, they do not refer to reality." [41] In fact, Einstein would go even further; for him, fundamental principles cannot be " abstracted " from sensory experience—they are " free inventions of the human intellect." [42] Far from subscribing to the strict mathematical realism of Galileo, he oscillates between positivism and idealism, while ever leaving a provisional cast to his conclusions.[43] " Our notions of physical reality can never

[39] A. C. Crombie, *Augustine to Galileo,* (London: 1952), p. 328 (italics added).

[40] In writing this, we are aware that Niels Bohr and the Copenhagen school are even more radical in their renunciation of classical physics than Einstein, but the latter's position is sufficiently representative for our purposes.

[41] *Geometrie und Erfahrung,* cited in *Albert Einstein, Philosopher-Scientist,* Library of Living Philosophers, Vol. VII, (Evanston: 1949), p. 380.

[42] *Herbert Spencer Lecture,* 1933 cited *ibid.,* p. 273.

[43] Cf. P. G. Frank, " Einstein, Mach and Logical Positivism," *ibid.,* pp. 269-286;

be final," he states. " We must always be ready to change those notions . . . in order to do justice to perceived facts in the most logically perfect way." [44]

Compared to the physical views of Aquinas and Galileo, those of Einstein stand in proper relief. Seven centuries ago, Aquinas saw the possibility of a mathematical physics that could provide both provisional explanation and conclusive proof, although he had no illusions about the difficulties involved in unveiling the ultimate secrets of the physical universe.[45] Three centuries ago, flushed with his dramatic conquest over the popular mind, Galileo saw proof too easily in the mathematics he had learned to read in the book of nature; in his view, conclusive proof was quickly had—all one need do was study his new science of motion, and the Ptolemaic-Copernican controversy would perforce come to an end. In our own day, Einstein went to the other extreme, for where Galileo saw proof as too easy, he saw it as too difficult—hence an essential relativism in his physical theory which permits no final answers about the physical universe. Aquinas would look for the evidence of Bessel and Foucault to decide the Copernican controversy; Galileo would say that the mathematical simplicity of his laws had already decided it; Einstein would say that his general theory of relativity had made it forever undecidable.[46]

The Problem

This brings us to the problem that is vexing modern science, to the solution of which the physical theory of Aquinas might be able to register a contribution. In the popular mind, science

V. F. Lenzen, " Einstein's Theory of Knowledge," *ibid.*, pp. 355-384; H. Margenau, " Einstein's Conception of Reality," *ibid.*, pp. 243-268.

[44] " Clerk Maxwell's Influence on the Idea of Physical Reality," cited *ibid.*, p. 248.

[45] Cf. *In I Meteorologicorum*, lect. 1, n. 9.

[46] " The struggle, so violent in the early days of science, between the views of Ptolemy and Copernicus would then be quite meaningless. Either CS [coordinate system] could be used with equal justification. The two sentences, ' the sun is at rest and the earth moves,' or ' the sun moves and the earth is at rest,' would simply mean two different conventions concerning two different CS."—A. Einstein and L. Infeld, *The Evolution of Physics*, (New York: 1942), p. 224.

is making great strides forward, finding out new truths everyday that undermine traditional philosophies and even religious beliefs, supplying definitive answers to questions that have plagued men's minds since the dawn of civilization. But within the scientific fraternity itself, there is no such optimism—at least not so far as the question of conclusive proof is concerned. "*Proof*," writes Eddington, "is an idol before whom the pure mathematician tortures himself. In physics we are generally content to sacrifice before the lesser shrine of *plausibility*." [47] Relativity and quantum theories are now the standards against which scientific achievement is measured. One is not surprised that some now hold that whether the earth goes around the sun or vice versa depends strictly on one's point of view, and cannot be proved one way or another. Not long ago, a methodologist told the writer that it was merely a *theory* that the earth is round! Today the whole world is talking of "molecules" and "atoms" and "electrons" and "cosmic rays"; even high-school children can tell us of "evolving galaxies" and the "expanding universe." Has science proved that such things exist? Or are they merely "free inventions of the human mind"? Is the hard core of scientific fact softer than we think? Or is it possibly even an empty shell?

Einstein, we may presume, would want to disabuse the modern mind of its confidence in the permanent achievements of science. Galileo, no doubt, would be tremendously surprised at the state of affairs that has arisen in the science that he fathered, but one may surmise that he would still champion the absolute power of mathematics to give certain truth. Aquinas, we can be sure, would temper the optimism of Galileo, but—realist that he was—he would also temper the pessimism of Einstein by bridging the gap between science and common sense. While denying that mathematics is the skeleton key that opens *all* the doors of knowledge, he would say that it has a proper role to play in physical research, that it can lead to conclusive physical proof, that some final answers can be given about the world in which we live.

[47] A. S. Eddington, *The Nature of the Physical World*, (New York, 1928), p. 337.

Three divergent answers to a perennial question about the physical universe. Which is correct? While recognizing that the latter question would be regarded as unanswerable (if not meaningless, in Wittgenstein's sense) by some philosophers of science, and while conceding that the extreme polarity between the positions of Galileo and Einstein is more by way of suggestion than by way of explicit commitment in the writings of these scientists, we should like to propose a somewhat novel evaluation of the three possible alternatives. It is this, namely, that Aquinas' answer—the teaching of the analytical school to the contrary—is still the one implicitly subscribed to by the practicing scientist, and that the essential contribution of Einstein is to cancel out the excessive mathematical realism of Galileo, while still leaving open the possibility of a type of physical certainty and proof as conceived by Thomas Aquinas.

A Thomistic Proposal

The justification for this view may perhaps be seen if we analyze the scientific evidence commonly adduced to prove (1) that the earth rotates on its axis, and (2) that its shape is approximately that of an oblate spheroid. In the interests of rigor, and to facilitate discussion of the central issue, we shall frame both arguments in the form of a syllogism, then answer an objection that is commonly encountered against each argument, and with that draw some inferences about the current status of physical proof in modern science.

The first argument may be stated as follows:

A body on which a freely swinging pendulum deviates at the rate of one revolution per twenty four hours at the poles, decreasing according to the sine of the latitude to zero deviation at the equator *is* rotating on its polar axis once every twenty-four hours.

But the earth *is* a body on which a freely swinging pendulum deviates at the rate of one revolution per twenty-four hours at the poles, decreasing according to the sine of the latitude to zero deviation at the equator.

Therefore the earth *is* rotating on its polar axis once every twenty-four hours.

The second argument then reads:

A body on which a freely swinging pendulum of fixed length has periods of oscillation which increase slightly with increasing latitude from the equator to both poles *is* an oblate spheroid slightly flattened at the poles.

But the earth *is* a body on which a freely swinging pendulum of fixed length has periods of oscillation which increase slightly with increasing latitude from the equator to both poles.

Therefore the earth *is* an oblate spheroid slightly flattened at the poles (and here we add parenthetically—although this does not follow logically—the flattening being caused by the centrifugal force of its daily rotation).

Here, then, are two demonstrations which conclude to some predication about the earth, namely, (1) that it is an oblate spheroid, and (2) that it rotates on its axis of symmetry once every twenty-four hours, both arguments using as the middle term some aspect of the behavior of a pendulum on the earth's surface, which is discovered to be *caused* by the shape and rotation of the earth itself.

Some will object against the second argument—the one concluding to the shape of the earth—that this was regarded as valid in the pre-Einstein period, when it was thought that Euclidean geometry was uniquely applicable to the physical universe. But in the present day, when non-Euclidean geometries have proved to be remarkably fruitful in explaining physical phenomena, one cannot say *for sure* that the earth is a sphere or an oblate spheroid; in another geometry it might be another mathematical figure, and thus the argument no longer truly demonstrates.

To this objection we answer that, if relativity theory has shown anything, it has shown that the geometry used by the physicist to describe the shape of the earth is basically immaterial. For dimensions as small as those of the earth, it is of no physical importance whatsoever whether the geometry is Euclidean, or Riemannian, or Lobatchewskian. But the very objection reveals one thing that is quite important, namely, that the objector is a mathematical realist who conceives pure mathematical form as objectively existing in, and determining,

the universe to a particular geometry. As has been shown earlier, this is not the Thomistic concept: physical quantity is much too irregular, it is much too perturbed by physical factors—such as matter and motion and time, and their means of measurement—to yield pure geometrical form, except through a process of mathematical abstraction. Thus, when the physicist says that the earth is an oblate spheroid, just as he prescinds from the mountains and valleys and other physical irregularities, so he prescinds from the slight differences associated with alternative *pure* geometries, to say something that is physically meaningful about the shape of the earth.

The first argument also seems to be vulnerable—this time to an objection drawn from the general theory of relativity. We have argued that it is possible to *demonstrate* that the earth is actually rotating on its axis once every twenty-four hours. Now Einstein, and before him the great German physicist, Ernst Mach—who undoubtedly gave inspiration to Einstein's new theories—have held that it is impossible to detect an *absolute* rotation in the universe. Thus they would argue that the cause assigned above for the deviation of the pendulum on the earth's surface (or for the bulge at the equator) need not be the rotation of the earth: the same effect can be correlated mathematically with the apparent motion of the " fixed " stars, and thus one cannot be absolutely sure that the earth's rotation is causing the pendulum phenomena or the bulge at the center, since these *might be* caused by other forces connected with the diurnal motion of the stars.[48]

A Thomistic answer to this difficulty is suggested by that of the English astronomer and commentator on general relativity theory, Sir A. S. Eddington, who writes in this connection:

I doubt whether anyone will persuade himself that the stars have anything to do with the phenomenon. We do not believe that if the heavenly bodies were all annihilated it would upset the gyrocompass. In any case, precise calculation shows that the centrifugal

[48] For a fuller statement of this position, see H. Reichenbach, *Modern Philosophy of Science*, (New York: 1959), p. 12.

force could not be produced by the motion of the stars, so far as they are known.[49]

As for the search for some unknown force that *might* explain the phenomenon, Eddington becomes more caustic:

> As we go further into space to look for a cause, the centrifugal force becomes greater and greater, so that the more we defer the debt the heavier the payment demanded in the end. Our present theory is like the debtor who does not mind how big an obligation accumulates, satisfied that he can always put off the payment. It chases the cause away to infinity, content that the laws of nature . . . are satisfied all the way.[50]

In this matter, Thomas Aquinas, we may be reasonably sure, would be content with a physical explanation of the motion of the pendulum or of the bulge at the equator in terms of known causes, and would be quite unhappy with an explanation, or a methodology, that would remove a hypothetical cause to infinity. As to the mathematical correlation with the fixed stars mentioned by Mach and Einstein, this would not disturb him: he would say, as has already been pointed out, that *mathematically* it makes no difference whether either one, the earth or the fixed stars, is conceived as moving. But once he saw the physical evidence available today to show that the plane of oscillation of a pendulum is independent of the motion of its support and is determined uniquely by its point of suspension, the center of gravity of its bob and the center of gravity of the local region, or once he convinced himself that there are centrifugal forces connected with every rotation that *we* initiate, he would look no further for a causal explanation in the remote depths of space to account for the deviation of a pendulum on the earth's surface, or for the observed bulge in the earth's contour at the equator. He would conclude, as do most modern scientists, that these are caused by the rotation of the earth, and that the earth therefore is actually spinning on its axis.[51]

[49] *Space, Time and Gravitation* (Cambridge: 1920), p. 153.

[50] *Ibid.*

[51] This argument can be stated more technically by referring the motion of the pendulum to the local inertial axes of the Copernican coordinate system. Thus

This conclusion, it should be noted, does not commit the Thomist to the Newtonian conception of a subsistent absolute space (or absolute time) in which such spinning motion is executed. The notion of absolute space is again an extreme of mathematical realism which attributes static, extra-mental existence to an extension that has been abstracted by the mind from bodies in motion. Space, for St. Thomas, does not exist apart from *bodies* that are extended and in motion; itself based on the relation of distance between bodies, it is rather a relative thing, not an absolute. More properly it is a mathematical concept that abstracts from matter and motion, and as such is conceived statically by us. This need not, therefore, be interpreted to mean that it also exists statically outside the mind as an independent subsistent reality.[52]

A similar observation might be made about the existence of privileged frames of reference or inertial systems which correspond, in the language of relativity, to the absolute space of Newton. Motions within the solar system—or in any local region, for that matter—can be investigated without referring them, in a larger context, to the motions of other systems. The difficulty arises only when space (or the space-time continuum) is hypostasized to be a subsistent background, sometimes conceived physically as an " aether," against which the frames of reference of various systems are actually moving. Operating with such a supposition, the question can be raised as to which system is " really " at rest, or what is the privileged frame of reference in terms of which " absolute " motion and rest in the universe can be detected. It is to the merit of Einstein that his theories of relativity make clear how such a question, if raised, is unanswerable in terms of the data available to the physicist

our analysis accords with the view of Whittaker, recently taken up by Polanyi: " Sir Edmund Whittaker ('Obituary Notice on Einstein,' *Biogr. Mem. Roy. Soc.*, 1955, p. 48) points out that, contrary to widespread opinion, the physical significance of Copernicanism is not impaired by relativity. For the Copernican axes are inertial, while the Ptolemaic are not, and the earth rotates with respect to the local inertial axes."—M. Polanyi, *Personal Knowledge*, (Chicago: 1958), p. 147, fn. 1.

[52] Cf. J. A. Weisheipl, O. P. " Space and Gravitation," *The New Scholasticism*, 29 (1955), pp. 175-223.

in any system. The Thomistic position would rather seem to be that the question should not be asked in the first place, because of the uncritical supposition on which it is based.

Physical Proof

It is interesting that the view of St. Thomas that has been urged in this paper, namely, that there can be some "final answers" in physical science, is once again finding support from scientists. Heisenberg, for example, who seemed to shake traditional thought to its foundations when he enunciated his "principle of uncertainty," has written in a recent work:

> With respect to the finality of the results, we must remind the reader that in the realm of the exact sciences there have always been *final solutions* for certain limited domains of experience. Thus, for instance, the questions posed by Newton's concept of mechanics found an answer *valid for all time* in Newton's law and in its mathematical consequences. . . . In the exact sciences the word 'final' obviously means that there are always self-contained, mathematically representable, systems of concepts and laws applicable to certain realms of experience, in which realms *they are always valid for the entire cosmos and cannot be changed or improved.* Obviously, however, we cannot expect these concepts and laws to be suitable for the subsequent description of new realms of experience.[53]

With this, we think St. Thomas would heartily agree. In a very real sense, in physical research one never knows what the morrow will bring, but the scientist can know that if he does his work well, and does not read into his results more than the evidence warrants, he can gain *new* knowledge without thereby destroying the science he has previously acquired.

This view, we would maintain, is the one implicitly held by the practicing scientist.[54] Yet there remains the difficulty,

[53] W. Heisenberg, *The Physicist's Conception of Nature,* (London: 1958—translation by A. J. Pomerans of *Das Naturbils der heutigen Physik,* Hamburg: 1955), pp. 26-27 (italics added).

[54] It has also been stated explicitly by Oppenheimer, in his third Reich lecture, as reported by Hall: "In its [science's] progress since 1800 the later discoveries have always embraced the earlier: Newton was not proved wrong by Einstein, nor Lavoisier by Rutherford. The formulation of a scientific proposition may be

continually raised by logical empiricists, that such a position—no matter how commonly it may be accepted—is still naive and *a priori*, that it does not make sufficient allowance for future discoveries, and in effect represents a nineteenth-century attitude of mind which is unprepared for revolutionary developments that may further advance scientific thought. They would argue that to maintain *anything* as certain or final is to close the mind to new knowledge, that the very *possibility* of someone's making a new discovery forces the scientist to be hesitant about ever saying the "last word," or to despair even of proposing a "final answer" in the area of his investigations.

Aquinas' concept of physical proof, surprisingly enough, is not vulnerable to this objection, and in fact might even be said to have anticipated difficulties of this type that await anyone who would claim too facile a "final explanation" of physical phenomena. For one thing, St. Thomas insisted that the logical procedure that most characterizes physical science is not *a priori*, but is rather *a posteriori*, based on a patient study of the world of nature, not starting with any preconceived knowledge of essences, but rather arguing from effect to cause solely on the basis of observed facts.[55] In this matter, he was insistent that a basic and irreconcilable difference exists between the canons for physical proof and those for mathematical proof. He was aware that the mathematician could have *absolute* certitude, and that the very abstractness and necessity of his subject matter permit him to proceed *a priori* and with the most exacting standards of proof. The certitude he ascribed to physical science, on the other hand, was somewhat circum-

modified, and limitations to its applicability recognized, without affecting its propriety in the context to which it was originally found appropriate. We do not need sledge-hammers to crack nuts; we do not need the Principle of Indeterminacy in calculating the future position of the moon: 'the old knowledge, as the very means of coming upon the new, must in its old realm be left intact; only when we have left that realm can it be transcended' (J. R. Oppenheimer)."—A. R. Hall, *The Scientific Revolution,* 1500-1800: *The Formation of the Modern Scientific Attitude,* (Boston: 1954), p. xiii.

[55] Cf. *In II de Anima,* lect. 3, n. 245; for a full treatment, see M. A. Glutz, C.P., *The Manner of Demonstrating in Natural Philosophy,* (River Forest, Ill.: 1956), pp. 84-102.

scribed: he referred to it as a "*supositional* certitude," and gave detailed instructions for attaining it when working with the contingent or non-necessary matter of the physical world.[56] His methodological precisions need not concern us here, but certainly one of its suppositions was entirely consistent with Heisenberg's *proviso*, namely, that results are valid *only* for the realm of experience from which they are derived. Thomas, as a matter of fact, would go even further than Heisenberg, and maintain that, even within this realm, final explanations can only be expected, and are only valid, for events that happen "regularly or for the most part," for these alone are sufficient to manifest some type of dependence on the antecedents which produce them, and thus induce a causal necessity into the proof.[57]

Implicit in Aquinas' treatment is also allowance for the acquisition of new knowledge, either by way of refinement within an existing realm of experience, or by revolutionary extension to completely new realms, and both without jeopardizing explanations that have already been conclusively established in science. An example of the first type is the proof already discussed for the sphericity of the earth. Thomas argues that the earth is approximately a sphere because this shape is caused by the uniform action of the gravitational forces of its components; at the same time, he admits that other causes are at work that further modify this shape from that of a perfect sphere. In his day, science had not advanced sufficiently to detect the earth's rotation or the resultant bulge at the equator; yet this advance in knowledge does not nullify his reasoning or his basic explanation. Modern science holds that the earth is an oblate spheroid, and assigns this modification of the spherical shape to rotational forces which are *superadded* to the gravitational forces, but which do not *replace* them. And both Aquinas and the modern scientist would pre-

[56] *In II Post Anal.*, lect. 7, nn. 2-3; *In II Phys.*, lect. 15, nn. 2, 5 and 6.

[57] The details of such a methodology, as applied to the late medieval theory of the rainbow, will be found in my *The Scientific Methodology of Theodoric of Freiburg*, pp. 237-245.

sumably be open-minded to the discovery of further irregularities in the observed shape of the earth's surface, which might be traceable to yet unknown causes still awaiting our investigation, but would not force us to re-open our minds again to the possibility that the earth is flat.

With regard to revolutionary knowledge applicable to completely new realms of experience, we can only surmise how Aquinas would proceed because of the very rudimentary state of science in his day. A not too far-fetched example may perhaps be taken from his generalization, derived from empirical data, that material objects tend in a straight line towards a center of gravity, elaborated mathematically by Newton, over four centuries later, into the law of universal gravitational attraction. It is possible, on the basis of this generalization, to say that *all matter* is ponderable or massive, a statement not inconsistent with the definition frequently found in science textbooks to the effect that matter is whatever has mass and occupies space. Yet such a definition does not close the physicist's mind to other possibilities: in theoretical cosmology, for instance, he will speculate about " antigravitation " as accounting for the recession of galaxies, while in fundamental particle theory he will speak of " anti-matter " (or anti-terrestial matter) as having properties radically different from the matter we observe macroscopically. The very fact that he assigns new terms to such entities is evidence that he regards the phenomena on which their existence is based as constituting, in Heisenberg's phrase, a " new realm of experience," about which he can freely speculate, and for which he can even seek hyper-generalizations, without relinquishing a single theorem in classical mechanics. And St. Thomas' willingness to countenance such a procedure is at least implicit in his recognition that celestial matter might be radically different from terrestial matter, while allowing for some common features and a diversity in the laws applicable to each—although there is no doubt that he was mistaken on many details clarified by subsequent investigators.

It would thus seem that the essentially philosophical sug-

gestion of Einstein, taken up by logical positivists, to the effect that " our notions of physical reality can never be final," performs too radical a surgery on the corpus of scientific knowledge. Some surgery was undoubtedly necessary after nineteenth-century excesses in mechanism had pushed to further extremes the mathematical realism sponsored by Galileo in the seventeenth century. But scientific agnosticism is also an extreme, and it can do more harm in the long run than an over-acclerated mathematical or mechanist development, for it eliminates the very possibility of organic growth within science itself. Heisenberg's reaction is thus an encouraging one: it stresses the continuity of science, the assimilation of the new to the old, while insisting on a rigorous methodology that would not over-assert the objective value of mathematical theorizing in recent science. To those who appreciate the essential contribution of Albert and Thomas to medieval science, the parallel between their correctives to the mathematicism of Grosseteste and Heisenberg's emendations to the idealism of Einstein is as interesting as it is unexpected.

Einstein does have a message for the modern mind, and it is this, namely, that the mathematical realism of a Galileo, or the space-time absolutism of a Newton, are antiquated notions that can no longer function fruitfully for the modern scientist. We propose that the same cannot be said for the theory of physical proof proposed seven centuries ago by St. Thomas Aquinas.

WILLIAM A. WALLACE, O.P.

Dominican House of Philosophy,
Dover, Mass.

HYLOMORPHISM, GRAVITY AND 'TERTIARY' MATTER

TO investigate the reasons for the divorce between the physical sciences and philosophy would demand an article in itself, but no one can deny the fact that such a divorce exists. Yet without sound philosophical principles, the physical sciences remain—as it were—suspended in the air, since by their very nature they cannot penetrate beyond phenomena, leaving their ultra-phenomenal foundations uninvestigated.

This limitation of the physical sciences seems to be recognised by scientists today. Sir James Jeans, for instance, says ," The essential fact is simply that all the pictures which science now draws of nature . . . are mathematical pictures. Most scientists would agree that they are nothing more than pictures—fictions if you like, if by fiction you mean that science is not yet in contact with ultimate reality. Many would hold that, from the broad philosophical standpoint, the outstanding achievement of twentieth century physics is not the theory of relativity with its welding together of space and time . . . it is the general recognition that we are not yet in contact with ultimate reality. . . . In brief, a mathematical formula can never tell us *what a thing is*, but only how it behaves." [1]

Yet what philosophy the modern scientist possesses is too often of the post-Cartesian and Kantian brand for it to be able to provide a reliable account of the ultimate realities underlying his own science. On the other hand, scholastic philosophy should be capable of providing the principles for which there is such crying need, with its more than two thousand years of tested thought and the acknowledgment given to it by the Church as the handmaid of her theology. And if there

[1] *The Mysterious Universe*, pp. 127 & 142. (Italics added).

is one scholastic principle perhaps more than any other that can provide an explanation of the facts coming to light in the physical sciences, it is hylomorphism, which has an almost indefinite capacity for this.

Hylomorphism, the system of form and matter, is first and foremost a philosophy of material substance, yet at the same time it presents us with a picture of the universe as a vast hierarchy of specific natures. For by form is meant that which gives the specific nature, and for this reason it is the first principle of limit by which the infinite Being of God is reflected in this or that finite likeness. Each angelic nature is a pure form, each one specifically unique, yet all of them together reflecting in what appears to be a quasi-infinite number of finite ways the infinite Being of God, like a vast spectrum whose colors collectively reflect the sun's colorless light.

What the scholastic means by matter is an altogether distinct principle of limit. This does not limit God's likeness to this or that specific nature in creation, but limits a specific nature already existent to this or that numerical individual. This is why in material natures, and in these alone, many numerically distinct individuals can share one and the same specific nature. These material species or grades of being are no more than the few lowest grades in creation's quasi-infinite hierarchy—sentient, vegetant, mineral, subatomic, and perhaps others still undiscovered; but it is with these only that we are now concerned. For common to all these grades of matter is the universal phenomenon of gravity, holding the material cosmos together against its centrifugal forces and resultant chaos. It is a phenomenon, the nature of which as yet has not received an adequate explanation, yet one which can perhaps be explained on the philosophical level by hylomorphic principles.

The distinction made by Jeans between what a thing is (its essence) and its behavior is an important one, because, if we venture to suggest here within the philosophical sphere what may be the ultimate nature of gravity, we have no quarrel with other explanations of it in the sphere of mathematics, such as Einstein's crumpling of the space-time continuum. The

reason is the theory of Einstein's seeks no more than to say how gravity behaves within the sphere of quantity, extensive and successive, and leaves it to philosophy to say what its ultimate nature is. Since the time of Newton it has been recognized that every particle in the universe attracts or tends towards every other particle with a force which is directly proportional to the product of their masses and inversely proportional to the square of their distance apart. But, once again, this only states how gravity behaves; it does not even begin to tell us what it is in itself.

That gravity is a phenomenon which differs from all others is generally recognized. To quote Jeans again, " Gravitation has always stood apart from the other phenomena of physics, and has seemed to be of an entirely different nature." [2] All other properties—chemical, electrical, magnetic and radioactive—differ according to the specific nature of the matter involved; gravity remains the same whatever the species of the matter may be. It varies only according to the mass and distance apart of the bodies concerned.

Writing in 1894 Fitzgerald held that " Gravity is probably due to a change in the structure of the ether, produced by the presence of matter." [3] He had in mind that structural ether of the 19th century physicist which the negative result of the Michelson-Morley experiment has proved to be non-existent. Yet he scented the truth even if from afar. Gravity consists in a tension between visible and ponderable matter and something still more ultimate in the grade of being. Later on, we will restate this assertion of Fitzgerald in terms suitable to our thesis. In place of this structural ether we will content ourselves with sheer empty space, something which could not possibly have supplied an ether wind such as Michelson was looking for. Except for the radiations passing through it and which in themselves are not part of it, space appears to be sheer

[2] *Ibid.*, p. 94.
[3] *Scientific Writings*, p. 313.

passive extension devoid of light, temperature or any other quality known to us.[4]

Inter-stellar space is often regarded as being " immaterial," and admittedly it is not matter in the same sense as ponderable and visible matter. It has also been regarded as an abstraction. Yet astronomical space is so extensive that radiation of higher frequency than light is reaching the new radio telescopes after travelling from distant galaxies for several thousand million years [5] at the rate of approximately 186,000 miles every second of its journey—rather an extensive abstraction, one would think! Again, in view of the fact that the amount of space actually filled by bodies is almost infinitesimally small, the mind must indeed be inventive, one may say almost Kantian, to manfacture anything so vast from the extension abstracted from something so small. Such a view was far more tenable in the days when the Ptolemaic geocentric system of the universe was held with the sun and stars forming a tidy little model round the earth and space was only slightly larger than the bodies it contained. But now, when we know that relatively speaking space is almost empty and the area occupied by bodies almost insignificant, the supposed abstraction begins to appear fantastic, so much so that it seems to be an altogether arbitrary assumption to suppose, as some have done, that if all bodies in space were removed the space which contained them would cease to have any reality.

Therefore to suppose it to be essential to space that it be *actually* the container of bodies is arbitrary and therefore misleading. Space has the *aptitude* to be the container of visible and ponderable bodies, and more than that cannot be said. Genesis tells us that the earth was " void and empty." Philosophical scrutiny seems to indicate here an objective reality and, at the same time, the absence of bodies contained by the void; else it would not be empty. It might be rather a good

[4] It would seem to have a single basic and universally homogeneous quality, but of this later.

[5] Lovell, *The Individual and the Universe*, p. 106. (B. B. C. Reith Lectures, 1958).

idea, in these days of space travel, that we should decide whether space is really there or not.

Let us first consider space in relation to visible and ponderable bodies as the *physicist* sees it, since he is concerned with phenomena only and not with ultimate and ultra-phenomenal realities. By considering phenomena first we may thereby arrive at a deeper knowledge of the ultimate nature which gives rise to them. And in the first place it will help us to remember that as the result of the discoveries of the twentieth century physics the law of the conservation of mass has become identified with the conservation of energy. For, as the physicist sees matter today, there is nothing but centres of energy in a vast expanse of space.

That the energy of a photon of light or other electro-magnetic radiation is of the same physical nature as the energies within the substantial molecule is made evident by so common a feature as the absorption of radiant energy by an extra-nuclear electron which, as the result of this added energy, jumps away from the nucleus to a wider energy level. In this way radiation becomes part of a substantial molecule. Conversely, if an extra-nuclear electron emits a quantum of energy, the energy belonging to a material substance is converted into radiation. Moreover, electron and radiant energy betray their common nature by both producing diffraction patterns when passed through a crystal.

Jeans significantly calls radiation 'unbottled' energy, and the intra-atomic electrons and protons 'bottled.' We are therefore happily clear of the incomprehensible 'solid' nut of matter, and have to deal solely with active energies and passive space. At once we recognise in this an affinity with hylomorphism, since energy units, whether inside or outside the atom, are active principles, determining passive matter to be such and such, which is precisely what the hylomorphist means by 'form,' whether substantial or accidental; while the passive reality of space is (apart from its inevitable determination by some substantial form) what he means by primary matter and extensive quantity, that which is determinable by form.

Therefore the sole difference between empty space and visible matter, radiation included, as the physicist sees it, is a difference between the absence or presence of energy in a space which in itself remains entirely passive. He views space as permeating all visible bodies without exception. So far as phenomena are concerned, therefore, space is universal, while relatively minute areas of it are 'informed' with systems of atomic energies. The radical difference, then, between space and all species of visible bodies as viewed by the physicist is that, while space permeates all of them, none of these visible bodies permeates another. Space is a continuum, bodies are discrete.

The metaphysician, on the other hand, is concerned with the ultra-phenomenal realities which account for the substantial unity of these systems of extended energies, and already Jeans, using popular language, has gone a long way when he distinguishes between 'bottled' and 'unbottled' energies. The energies of any substance are 'bottled' by the ultra-phenomenal essence which is complete in each of them, as well as in every part of the extensive quantity which belongs to the atomic or molecular substance.

From the fact that space is evidently different from visible and ponderable matter, it in no way follows that it is not matter of some kind so as to satisfy the philosophical definition of matter as the principle of individuation, which is, so far as we can see, the only reason why matter exists at all. Neither visibility nor ponderability is included in the metaphysical definition of matter, which consists in its being a purely passive principle receptive of substantial form which it limits to being numerically this or that individual form, in conjunction with which it constitutes a numerically individual substance of a specific nature given by the form, which substance is the active cause of its own extensive quantity and whatever qualities it may possess. In order to deny that space is a material substance of some kind, it would be necessary to demonstrate that this definition cannot apply to it.

Moreover, space is an extended substance. To deny this is

to reject the universal evidence of the senses, a process which leads to skepticism. For, although the senses by themselves are unable to know the real nature of extension, it is within their province to say whether extension (whatever its nature) is or is not present. But according to scholastic principles extension is an attribute of quantity, and quantity is the most basic of all the accidents of material substance. Therefore, extension is itself a property of material substance, and for this reason must, it seems, indicate the presence of matter of some kind.

We may note in passing that if it be objected that, as an extended substance, space would demand some further container beyond itself and so on without end, the most convincing reply seems to be that just as the curvature of one- and two-dimensional extension eliminates one- and two-dimensional boundaries, so the analogous curvature of three-dimensional space eliminates all three-dimensional boundaries, while leaving space as finite as before. If there be no boundaries there can be no container, and wherever we might be in the universe we could never approach its edge since there exists no edge to approach. This curvature of three-dimensional space evidently implies the beginning of a fourth dimension as the curvature of a straight line implies the beginning of a second dimension. With regard to this, Father Mark de Munnynck, O. P., late professor of philosophy at the University of Fribourg, in the course of his article "Space" in the *Catholic Encyclopaedia*, says "The intellect in its analysis goes beyond the data offered to it by sense, and it is forced to conclude that space of more than three dimensions implies no contradiction."

It is not often that Locke can be quoted with approval, but, notwithstanding his ambiguity, he seems to have hit on a truth when he proposes that space be regarded as a substance, provided that the word substance be understood differently from its common meaning. It is accepted as having three different meanings when used of God, of spirits and of material bodies; perhaps, it may be used in a fourth sense when applied to

space.[6] In short, the word substance when used of God, of spirits, of visible bodies and of space is in every case analogous, not univocal.

Analogy of proportion consists in some identical reality existing in different grades of being. In the present case the identical reality is existence *in se*, inseity, while the different grades are the divine and, among created grades, those of pure spirit, of visible and of invisible matter. Within the grade of visible matter the metaphysician recognizes specific differences among sub-atomic, mineral, living and sentient matter; but the difference between invisible matter or space and visible or ponderable matter of any kind is of an altogether different order. For, as we have said, space is universal, whereas all visible bodies are local; moreover space appears to be wholly passive, whereas all visible bodies, in addition to their passive extension, are systems of active energies. It is this fundamental difference between space and all species of visible and ponderable matter, together with the fact that space must be matter of some kind, which places it in a material category all its own.

This, it seems, can only mean substituting a three-fold division of matter in place of the two-fold division so far held. *Primary matter* remains as it was, the purely passive principle of material essence. *Secondary matter* is the universal passive, imponderable and invisible, yet substantial foundation to the material universe, which until now we have spoken of as space. '*Tertiary matter*' includes all visible, ponderable matter from the subatomic grade upwards.[7]

We can now proceed to examine the difference between 'secondary' and 'tertiary' matter from a philosophical standpoint. As primary matter is the potential base of both sec-

[6] *Essay concerning Human Understanding*, Bk. II, ch. 13.

[7] The use of the term 'tertiary' matter has the disadvantage that a certain confusion may arise when secondary matter is referred to by different writers. But the alternative of, for instance, using the names Secondary A and Secondary B matter is so ponderous that the disadvantage of employing it seems to outweigh the other. It is simple to speak of light as tertiary energy passing through secondary matter, but positively unwieldy to speak of Secondary B energy travelling in Secondary A matter.

ondary and tertiary matter, so secondary matter is the actually existing base of all tertiary matter.[8] Whatever we may suppose to have been the origin of tertiary energies or 'forms,' we may regard them as supervening upon secondary matter. Genesis I, 2-3, says "And the earth was void and empty and darkness was upon the face of the deep. . . . And God said: Be light made. And light was made." The cosmological reality underlying the literary account of the bible could be proposed in this manner: the void, empty and dark, as secondary matter, light as tertiary form.

S. Thomas, as we know, held '*materia quantitate signata*' as the principle of numerical individuation and multiplicity within the same specific nature. But *materia quantitate signata* is an abstraction; it can only have actual existence when the primary matter is determined by a substantial form. What *materia quantitate signata* is in the abstract, secondary (as distinct from tertiary) matter is in the concrete, that is to say, primary matter determined by the lowest of all possible substantial forms, producing quantity wholly homogeneous throughout its extent, consisting of potential parts and therefore indefinitely divisible into actual parts all of the same species. Thus determined by its secondary substantial form, secondary matter becomes an actually existing substance commensurate with the material universe, and the *concrete* principle of numerical individuation and of multiplicity within the same species.

To picture the formation of tertiary out of secondary matter by the superimposition of tertiary substantial forms, we may borrow analogies from the accidental order. Sir Oliver Lodge, for instance, likened the various kinds of ponderable matter to vortices in the ether or knots in a piece of string. It is quite evident that the knot, although made out of the string (or the vortex out of the ether), is nevertheless something new over and above the string. What is new is the 'form' of the knot

[8] What we have said of space applies to secondary matter, that if endowed with three-dimensional curvature it will be finite yet without boundaries of any kind.

(in this case an accidental form only). There are, moreover, many kinds of knots, all of which can be successively made and remade; and one knot differs from another by the different 'forms' that have been imposed upon the string. Or again, if we impress a seal bearing some coat of arms upon a homogeneous sheet of wax an indefinite number of times, that which was originally mere wax becomes a number of impresses bearing a specific character. These analogies can now be translated into the substantial order.

A tertiary substantial form—call it a substantial energy if you will—takes possession an indefinite number of times of potential parts of secondary matter, making of them actual parts whose measure of extension is proper to the species of the tertiary form—there is, for instance, a large difference between the extension specific to a molecule of hydrogen and of uranium. It raises these extended parts *up from* the specific level of secondary matter to the specific level of tertiary matter, to become the passive extended volumes of a multitude of tertiary substances.

But in doing this the numerical identity of each extended part of secondary matter that is assumed is changed—a change of identity such as takes place in every substantial transformation. The tertiary substantial forms give new determinations to the primary matter underlying what until this moment have been potential parts of secondary matter only, and which hitherto have been informed by the substantial form of secondary matter. They determine this primary matter to the specific nature of tertiary matter and are in turn individuated by it to be numerically this and that form, thus producing distinct *tertiary substances* which, as the active causes of their accidents,[9] produce extensive quantities which are numerically new although physically identical with those potential parts of secondary matter which they have replaced. *To the physicist* the extended volumes of these tertiary substances are indis-

[9] Cf. *Summa Theologica*, I, q. 77, a. 6, ad 2: *causa quodammodo activa.*

tinguishable from what they replace, but *to the philosopher* they are numerically new extensions.

For it must be realized that change in numerical identity is taking place deep down at the root of material being every time a substantial change occurs. To the physicist or chemist this may seem quite unreal, because this change in identity may involve no change in physical quality and is in the ultra-phenomenal sphere. For instance, have the free atoms of hydrogen and oxygen which go to make a molecule of water maintained their identity within the molecule? The chemist may say of course they have, since such a question does not enter into the scope of his science. But the philosopher, who is deeply concerned with it, insists that they have changed their numerical identity even if their physical condition is the same as before, since if it were otherwise the molecule would not be a single substance but a mere federation of substantial atoms.

They are no longer independent substances of hydrogen and oxygen, each one informed by its own substantial form; they are now integral parts of a single substantial molecule of water, and so are informed by its single molecular form. Like all integral parts produced by a new substance resulting from a chemical change, they are numerically new. As S. Thomas says, "All accidents share the fate of the form," [10] and this is true both when the old form returns to potency and when the new one becomes actual. The original substances of hydrogen and oxygen have not persisted through the change; they have been replaced.

Such questions do not come within the purview of chemist or physicist, but they are commonplaces in philosophy. These are deep waters, but the trained hylomorphist will follow our meaning.

It should be observed at this point that when a chemical reaction takes place between tertiary substances with consequent substantial change, the old tertiary substantial forms, say of sodium and chlorine, educe a specifically new substan-

[10] *De pluralitate formarum*: Difficultates ex philosophia ad 5.

tial form, in this case that of the compound. But in doing this *they do not stop short at* the substantial form of secondary matter since this is no longer existent within their matter, but *penetrate right down to* primary matter on exactly the same principle as is held by those who admit primary and secondary matter only. The tertiary substantial forms contain the secondary form virtually according to the principle of the gradation of forms by which a specifically higher form, for instance man's rational soul, can itself do all that lower forms, namely sentient, vegetant and mineral can do. If substantial change did not reach right down to primary matter, the secondary base would remain numerically identical throughout all changes, which is precisely the error of hylosystemism.

That which originally was secondary extension, then, has become subject to the superior authority of tertiary substantial forms, and so is *held up above* its former specific level. Meanwhile secondary matter remains the most passive matter capable of actual existence, and *this passivity involves the tendency to remain just what it is and no more.* On the other hand, tertiary substantial forms or energies are active; their tendency is to *prevent* the secondary matter which they have assumed from " remaining just what it is " as secondary matter and to hold it up in the tertiary level. There exists, therefore, universally a passive tendency for the extended volumes of tertiary substances to return to the state of secondary matter from which they are ultimately derived.

Fitzgerald's axiom quoted above may then be restated thus: " Gravity is probably due to a tension in secondary matter produced by the presence of tertiary matter." A piece of elastic receives just such tension when stretched by some active agent; then, as soon as released, it returns passively to its original state. This tension in secondary matter is due to the *active tertiary up-pull* which corresponds to the active stretching of the elastic. The tendency of the extended volumes of tertiary substances to return to secondary matter is a purely passive tendency; they do not ' pull ' down against the active up-pull

of the tertiary energies (and in this the comparison of elastic fails us, since its return to what it originally was is probably not altogether passive). It is simply that, being purely passive, they yield to the active up-pull of the tertiary substantial energies to the extent that these hold them and cease to be subject to this up-pull to the extent that the tertiary substantial energies leave them free.

It must be realized clearly that secondary matter is a single substance integrated by its extensive quantity which we call space, and that like all substances it is *complete in every part of its extensive quantity*. This means that the substance of secondary matter is *omnipresent* throughout its extension, that is to say in every part of space. From this it follows that the tendency of the extended volumes of tertiary substances to return to secondary matter is not towards this or that part of the extension of secondary matter, but *towards the omnipresent substance itself*. And since this single substance of secondary matter is omnipresent to all the extended volumes of tertiary susbtances throughout the entire universe, there is no question of the force of gravity being spacially transmitted as all other forces are, not even at a velocity far exceeding light. There is no transmission whatever, precisely because that to which all tertiary substances tend to return is omnipresent to them all.

The tertiary energies which hold the extended volumes of tertiary substances above the specific level of secondary matter are, as we have said, *substantial* energies or forms. Therefore the essential character of gravity lies in the substantial order and at the ultra-phenomenal level; yet this tension between tertiary substantial energies and the substance of secondary matter manifests itself in the accidental or phenomenal order. Substance cannot act except through its accidents, therefore the tension caused by the tertiary *substantial* energies is translated into the *accidental* order in a visible and spatial manner.

Two or more things which tend to identity with one object which is omnipresent to them all, tend to identity with each

other; and such a tendency when translated into the accidental and quantitative order must be spatial. Since, therefore, this tendency is common to all tertiary substances whatsoever throughout the universe, it follows that all tertiary bodies tend spacially towards each other, which is what is meant by gravity. If this mutual approach could reach completion as it would

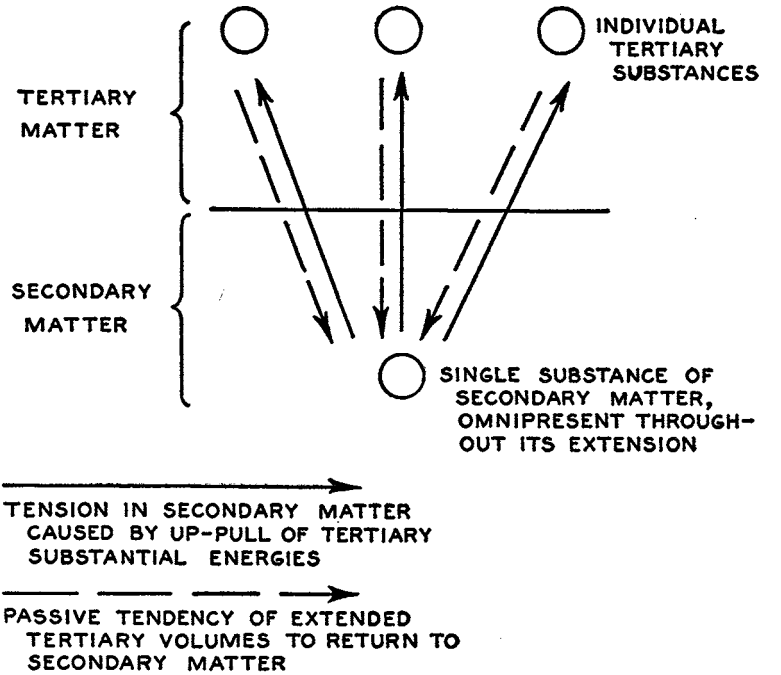


FIG. 1.

do if the tertiary substantial energies released their hold on their extended volumes, coalescence as secondary matter would take place; but as long as the tertiary substantial energies retain their hold upon their extended volumes, the nearest approach to coalescence is contiguity, and more often than not, even this is made impossible by contrary forces. Beyond this contiguity the process cannot go, because the presence of the tertiary substantial energies ensures the full complement of quantity and of accidental energies, and so of solidity and resistance.

Since all tertiary matter, whether subatomic, mineral or living, is constantly tending to return to secondary matter, and since secondary matter is substantially one, the unifying power of gravity permeates the entire universe. It is by gravity that all tertiary matter is held together as an organic whole, and this organic unity in the tertiary sphere is rooted in the substantial unity of secondary matter.

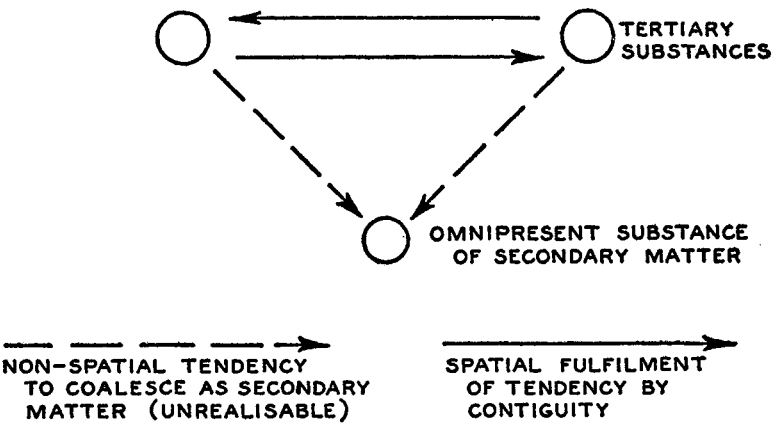


FIG. 2.

From the fact that gravitational pull consists in the tension caused by the up-pull of tertiary substantial energies it can be understood more easily how the law of the conservation of mass has been absorbed into the law of the conservation of energy; that is to say the mass or weight of bodies, which is the measure of their gravitational pull, is the measure of the amount of tertiary (phenomenal) energy in bodies.

It need come as no surprise, therefore, that even radiant energy is subject to gravitational pull. This was proved by the work of two expeditions in May 1919, one to Brazil, the other to the Principe Islands, West Africa, both chosen for the clarity of their atmosphere. Light coming from a certain star was found to bend towards the sun several degrees out of a direct line of star to earth; it was drawn towards the sun by the latter's gravitational pull.

Now all electro-magnetic radiation travels at 300,000 kms. a second which appears to be the specific velocity of secondary matter, due, it may be suggested, to its possessing some single basic quality which is universal throughout its extent and so homogeneous. And since quanta of radiant energy (as distinct from even free electrons which vary in velocity and never quite reach that of light) always possess this constant velocity, it seems that, unlike free electrons, they do not consist of tertiary substances but of *tertiary accidental forms* inhering in successive parts of secondary matter as they travel through it, and therefore ' unbottled ' energy.

This is to say these radiant energies have their origins in tertiary substances, as for instance when an electron jumps to an energy level closer to the atomic nucleus and emits a quantum; but as radiation they are travelling in secondary matter. If this be the case, it seems that even an accidental tertiary energy or form can raise the extension of secondary matter which it is informing at any moment during its passage *accidentally* above its secondary level, i. e. without this extension ceasing to be secondary extension. This accidental raising of successive parts of secondary matter up to the tertiary level is surely what we mean when we say that radiation successively ' charges ' the medium through which it travels. This charge is itself a quantum of tertiary energy.

In other words the passage of radiant energy through space means that secondary matter is being interfered with by an accidental tertiary energy which has invaded it from the sphere of tertiary matter. Therefore so long as successive parts of the extension of secondary matter are charged by tertiary radiant energy, they are raised up by it *accidentally above their secondary level to the tertiary level* so that, although they do not become tertiary substances, they nevertheless bring about a similar tension in the secondary matter and so have the same tendency to coalesce with tertiary substances—in this case with the sun.

This leads to a consideration of the nature of all motion

through space, whether it be that of electro-magnetic radiation or even of a substantial object like a rocket. This seems sufficiently connected with our present subject to be considered here, and is one of the mysteries of science upon which hylomorphic principles perhaps can throw light.

First consider a wave travelling across the surface of the sea. Although it appears to be travelling forwards, the actual movement of the water consists in a succession of vertical movements. The initial energy raises a certain volume of water vertically to a height indicative of the intensity of the energy. At the moment when this initial energy is expended it educes from the potency of its matter, the water, a *numerically new energy* which raises the next volume of water to exactly the height of the first, while the initial energy falls back into potency. The second energy does the same as the first, and so on with the rest. Thus it is that the wave in one sense moves forward, because it is in reality a continuous succession of numerically distinct waves or vertical impulses.

Therefore it is possible to distinguish between the *specific* energy belonging to every vertical impulse, and the *numerical* identity of each successive vertical impulse. The former is the 'form' which, in this case as in all others, determines the specific energy or nature; the latter is the 'matter' which individuates the specific form to this or that numerically individual wave. And, as in all such cases, the specific nature (or energy), like the universal idea, is complete in every individual, so that the former is one and the latter multiple, nor is this in any way altered by the fact that the process of eduction of each new impulse is not discrete but an infinitely divisible continuum; it is taking place unbrokenly, so that there are throughout *one* specific energy and a potentially infinite number of individual impulses.

The case of all electro-magnetic waves is analogous, being the same as the above in that there is one specific energy throughout, the 'form,' and an indefinite multiplicity of successive individual impulses, the 'matter,' the former being com-

plete in every one of the latter. But it differs in that the impulses are in secondary, and no longer in tertiary matter. These impulses consist in charges of specific intensity given to the secondary matter and indicated by their frequency or wave-length; and, analogously to the waves in water, the initial charge reaches its maximum, educes a numerically new charge, and itself returns to potency; and so on with each successive charge. And this process, as before, is a continuum.

When therefore the physicists tell us rather mysteriously that radiation is a quantum or corpuscle of waves, perhaps what is meant is that a *single* wave or impulse or charge—all mean the same thing—*is itself the quantum*, which remains specifically the same throughout but is indefinitely repeated as numerically new impulses. *One* specific impulse is indefinitely repeated, and this *one* specific intensity is in *every* individual impulse. It is the specific impulse which constitutes the quantum, which latter does not consist of waves (in the plural), but of *one* wave indefinitely repeated.

Finally, consider a substantial material object travelling indefinitely through space where there is nothing at all to counteract and so change its velocity. For all motion *per se* is perpetual motion, and only ceases to be so by reason of counteracting energies. There is then this problem, that the motion of a rocket sent out clear of all gravitational pull so as to go on for ever in space has *a finite impulse* to start it, yet the energy it expends as age succeeds age becomes increasingly greater and, one may say, *eventually quasi-infinite*. How can a finite impulse of definite specific value give rise to the expenditure of quasi-infinite energy, since no effect can exceed its cause? M. Maritain has realized this difficulty when he says " It may, for instance, be questioned whether the law of inertia, as formulated since Galileo and Descartes, can be reconciled with the axiom of philosophy: *quidquid movetur ab alio movetur*.[11]

This problem, it seems, can be explained by the same hylo-

[11] *An Introduction to Philosophy*, p. 111. Cf. *Approaches to God*, p. 24(d).

morphic principle as in the cases just considered. The initial impulse of specific intensity X is imparted to the rocket; this initial impulse X educes from the potency of the matter of the rocket a *specifically identical but numerically new* impulse X^1, while X returns to potency. In the same way X^1 educes X^2, itself returning to potency. And this process continues *ad infinitum* as a continuous eduction of numerically new energies specifically identical with the original impulse.

Thus it is that the specific value of the original impulse remains the same throughout a journey which, theoretically at least, goes on for ever; and the continued journey of the rocket does not increase the original energy, precisely because this original specific energy is being constantly renewed and returning to potency. This problem can only be explained by distinguishing between form and matter, the former giving the specific degree of energy, the latter its numerical individuation indefinitely repeated. It is one more example, it seems, how universally applicable throughout the material universe hylomorphic principles are, and how they hold the key to otherwise insoluble enigmas in science.

There remains one last apparently baffling problem for which we do not pretend to possess a fully adequate solution, but perhaps the distinction between secondary and tertiary matter may provide the basic answer. It may be demonstrated thus far, which in turn may perhaps prepare the way for someone else to work it out to completion. The problem is the apparent contradiction between the absolute velocity of light and the special principle of relativity.

The principle of relativity runs as follows: "We can only speak of the mutual motion of bodies; we cannot attach any meaning to absolute motion because it cannot be verified." From this it follows that everything takes place within a closed system which is in uniform rectilinear motion exactly as though it were stationary.

For instance, two cyclists ride at exactly the same speed from the center of a ship's deck, one towards the bow, the

other sternwards. In obedience to the principle of relativity their speed *as measured from the ship* is identical; but *if measured from the shore* one cyclist will be travelling with the speed $X + V$, the other with that of $X - V$, where X = velocity of cyclist along the deck, and V = speed of ship.

The same will hold true if we replace the velocity of the cyclists with that of sound sent out by a pistol fired amidships. We would expect the same to be true of light sent out from a moving star when measured from the earth, i. e. that the velocity of the light would be found to be $X + V$ in the direction of the star's movement, and $X - V$ in the opposite direction, where X = velocity of light and V = speed of star. Yet such is not the case. The velocity of light is entirely unaffected by the speed of its source; it is absolute, and remains 300,000 km. a second under all conditions.

Accepting this fact of light's absolute velocity, then, it might be expected that after, say, ten years of travelling out from the moving star the light would be nearer to the star in the direction of its motion, and further from it in the opposite direction; yet in fact it will be equidistant. We would expect *either* the principle of relativity to hold true *or* that of the absolute velocity of light, but *not both simultaneusly* since this seems to involve a direct contradiction. Yet it is maintained that both are simultaneously verified beyond question.

Einstein explained this apparent contradiction by saying that the simultaneity of two events is relative to the conditions under which it is measured, and this may be true mathematically where quantitative values alone are involved. But this cannot explain the *ultimate* nature of the apparent contradiction; no ultimate truth can be relative.

In looking for an ultimate explanation in the ultra-phenomenal plane, let us start by restating the principle of relativity quoted above in terms of tertiary and secondary matter. It will run thus: " The motion of one tertiary body cannot be detected by any means whatever except by reference to another tertiary body. If there is no other tertiary body

with which its motion can be related, it is in every way as though it were stationary. *The motion of a tertiary body cannot be detected by its relation to secondary matter.*" For instance, we cannot tell the earth's motion in relation to space, but only in relation to sun and stars.

With this in mind, consider two stars, A and B, moving towards each other (Fig. 3). Then, taking the case of star A, if b is the point reached by light from A travelling towards the star B after ten years, and if b′ is the point reached by light from A in the opposite direction, also after ten years; and if A′ is the position of the star travelling towards B after ten years—then the absolute velocity of light in both directions (the first principle) would lead us to suppose that A′ — b would be a shorter distance than A′ — b′. Yet this is not so, because

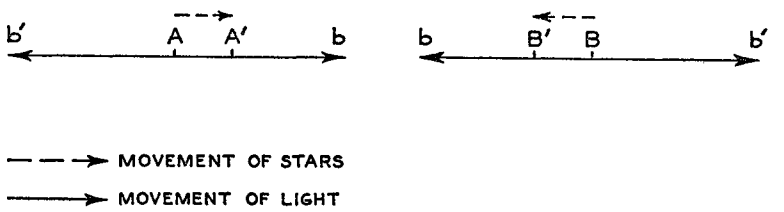


FIG. 3.

the principle of relativity (the second principle) demands that A — b and A — b′ should be identical with A′ — b and A′ — b′, i. e. that everything should happen as though the star were stationary. And all that we have said of star A is true in the same way of star B.

Light has travelled out from A—as also from B—in all directions at the same velocity, and after ten years it will be *at equal distance* from the star in all directions. *Yet* all the time the light has been travelling (a) in one direction *with* the star (in the star's forward direction), and (b) in the other direction *away from* the star. How can we account for this apparent contradiction? Only by accepting the radical distinction between secondary and tertiary matter. The motion of the two stars towards each other consists of two tertiary

motions, each of which is *relative to* another *tertiary* body (i. e., to each other). But *remove* either of these stars so that only *one* tertiary body remains, and *this relative motion is non-existent.* For *each star taken singly* is devoid of verifiable motion, i. e., it behaves as though it were stationary, because in each one singly the law holds good that " the motion of a tertiary body cannot be detected by its relation to secondary matter."

Therefore light emitted from each star *taken singly obeys both laws,* of relativity and of the absolute velocity of light. *The super-imposition of a tertiary relation* between the two stars does nothing to change the *intrinsic* nature of the apparent immobility of each star taken singly in its relation to secondary matter, that is to say its *absolute* motion; the tertiary relation between the stars A and B *follows upon* these two absolute motions, and is *extrinsic* to them.

Therefore: (1) the *motion of light* and the undetectable *absolute motion* of each star, although themselves tertiary energies, are *in secondary matter,* while (2) the *relation* between the motions of the stars A and B is *in tertiary matter;* and owing to (1) and (2) being *in radically distinct grades of being,* (1) remains *wholly unaffected* by the subsequent imposition of (2). It is precisely because the motion of light is in *secondary* matter that it does not vary with the speed of its source as sound does, since sound is normally the vibration of air molecules and so is in tertiary matter.

How then can we account for the diminution of distance between the two stars? Instead of regarding the stars A and B as " moving through space " (since in relation to space or secondary matter they both appear stationary), it may help to look upon this diminution of distance as a ' leakage of secondary matter ' between A and B. For instance, a crevice in the rock which forms the floor of a lake will cause water from both sides to flow uniformly towards it, till it flows down through it. If there are two corks on the surface of the water on each side of the crevice these will be carried by the move-

ment of the water towards each other so that the distance between them diminishes. *Yet each will remain stationary with reference to the general mass of water which surrounds it,* i. e., neither cork moves *through* the water but only *with* it.

If each of these corks is set vibrating so as to send out concentric ripples representing the emission of light from each star, these ripple-circles will *travel with the corks as a single whole* and so remain equidistant from their sources of vibration just as though the water were at rest. The two sets of concentric ripples, each with its vibrating centre, would behave as though there were no converging movement of the water; *yet* the distance between the two sets of ripples would decrease until both met at the crevice.

We are not suggesting there is literally a 'leakage' of secondary matter between the stars A and B, but this illustration may help us to understand, however inadequately, how *a tertiary relation of distance can change without any change taking place in the absolute motion* of the stars and of the light *in secondary matter.* And this can only be possible on the principle that secondary and tertiary matter are radically distinct levels of material being. Moreover, the velocity of light is absolute because it is the velocity *proper to the species of secondary matter,* due, it may be supposed to some homogeneous quality characteristic of it, and so is, as Einstein held, a fundamental law of the material universe.

Some day, it may be hoped, a mind trained in both physics and philosophy will succeed in discovering what the reality is which we have illustrated as the 'leakage of secondary matter.'

What the origin of tertiary energies may have been is quite another question. If we accept the principle held by S. Gregory of Nyssa and S. Augustine that the active potencies of all visible bodies were in the primeval matter as it came from God's creative hand, it might well be that at the initial creation there was nothing more than a pin point of secondary matter in which were rooted all these active potencies. For it is a sound principle of scholastic philosophy that God will work

through created causes to produce any effect that does not demand actually infinite power. What then were these potencies in primeval secondary matter but potential tertiary energies? If, moreover, the universe really is expanding and has expanded from a primeval pin point, then it seems the active power to produce the full extension of secondary matter —since this extension is no more than an accident—may also have been among these primeval potencies.

If, finally, we accept patristic, not to mention thomistic, tradition voiced by S. Gregory the Great when he says "*Nothing* takes place in this visible world without the agency of the invisible creature," we may perhaps say that all subsequent development of the material universe, from secondary to tertiary matter and throughout the successive levels of tertiary matter, has taken place through created causality both angelic and material, the former directing but never replacing the latter, under the sustaining power of God's concurrence.

BRUNO WEBB, O. S. B.

Pluscarden Priory,
Elgin, Moray,
Scotland.

THE NATURE AND LIMITS OF LOGIC

LOGIC, as logic, does not investigate its own nature. Epistemology does this for logic. However, there is no one for whom the epistemological knowledge of the nature and scope of logic is more significant than for the man who happens to be a logician. Yet it is clear from an examination of our treatises and textbooks in logic that the men who author them disagree, sometimes rather significantly, on the epistemological character of logic. In the face of sometimes contradictory opinions about the nature of logic, it is clear that some of our logicians rather thoroughly misevaluate the significance of logic. Because logic is universally and necessarily propaedeutic to any scientific effort, it is not surprising that this misunderstanding on the nature of logic has serious consequences for all the academic disciplines. It is easy to allow more to logic than logic deserves, and the history of philosophy yields more than one example of over-extended logicism. It is easy too, in reaction to this, to allow less to logic than logic deserves. Thus some would make of logic a highly restricted instrument of the intellect for a very limited area of scientific discourse. In truth, logic is not a universal science embracing all other sciences (or any other science) either as integral or as subjective parts, and yet it remains universally an instrument of the reason for all scientific discourse. The intention of this paper is to initiate an investigation into the nature of logic which will make these points clear. This study will not be exhaustive, and yet it will be developed in the light of those distinctions in terms of which any exhaustive study should be made. This paper is at best a preliminary work, yet it is determinately in conflict with many current notions about the nature and limits of logic.

The occasion for this paper is the widespread disagreement on the nature and importance of logic. The immediate inspira-

tion for it is a footnote suggested by the translators of *The Material Logic of John of St. Thomas.*[1] The footnote arises in the context of a discussion on the speculative, but "*useful,*" character of logic. In the footnote the translators broaden the discussion and suggest "that the ideal noetic treatment (of logic) would correlate these four frequently made distinctions and divisions within logic: science and art, doctrinal and in use, formal and material, and dialectical and judicative or demonstrative." In our opinion, these *are* the fundamental distinctions in terms of which logic must be epistemologically understood. This paper will attempt to meet the challenge implicit in the footnote just quoted. It will be an attempt to correlate these distinctions in order to lay at least the groundwork of an adequate investigation into the nature of logic.

Logic is both an art and a science. It is a strange kind of art, and it is a unique type of science. It is an art without being practical, and it is a science which is speculative, despite the fact that its value lies only in its use. And it is one discipline which is simultaneously both an art and a science. It seems that almost every textbook in logic distinguishes between the art of logic and the science of logic. But not all of them agree precisely on the character of logic as an art and logic as a science. To begin with, some would allow logic to be treated *either* as a science or as an art, despite the fact that logic is indivisibly art and science. Further, in most

[1] *The Material Logic of John of St. Thomas,* translated by Yves R. Simon, John J. Glanville, and G. Donald Hollenhorst (Chicago, 1955), pp. 593-594, note 35. Although it is this particular footnote which has proximately inspired this essay, we readily and gratefully acknowledge a larger debt both to John of St. Thomas and to his translators. Perhaps the most helpful primary source for this study has been John's analysis of the nature of logic in the first two questions of the second part of his *Ars Logica.* Certainly nothing could have been more constructively provocative than the notes appended to their translation of this part of the *Ars Logica* by Professors Simon, Glanville, and Hollenhorst. We are especially indebted to Professor Simon in many ways for an incalculable share of what has gone into this paper. At the same time our indebtedness to Aristotle, St. Albert, and St. Thomas is evident throughout the study. It should be noted that many of the points developed in this paper have been treated in a chapter on the nature of logic in a textbook in logic written by us soon to be published by Bruce Publishing Company.

textbooks in logic, distinctions are made between speculative and practical disciplines, between formal and material logic, between doctrinal logic and "useful" logic, and between general logical procedure and particular scientific methodology. These distinctions are frequently confused with the distinction between logic as a science and logic as an art. The science of logic is said by some to be speculative and the art of logic to be practical. Formal logic is characterized as scientific, and material logic as artistic. The science of logic is spoken of as doctrinal, and the art is said to be useful. The science of logic is described as general, and the art of logic is identified with its particular application in the other sciences. As a matter of fact, the distinction between the art of logic and its science is neither identical with nor even coincidental with any of these other distinctions. Each of the several distinctions has its place in the epistemology of logic, but no two of them have the same place. To begin to see that this is so, let us consider precisely what it is for logic to be an art and for logic to be a science.

Reflection upon the method of the logician in logic reveals the scientific character of the discipline.[2] The simple fact is that the logician in the pursuit of logic proceeds in the demonstrative mode. Thus it is clear that logic is a science. But, of course, this is not enough. We are concerned not so much with the fact that logic is a science as we are with the reason why this must be so. The form of anything is ultimately determined by its end. To see not only that logic is a science, but why it must be so, we need only consider its end. As a matter of fact, in the light of its end, logic is seen first of all to be an art. It is only after seeing what logic is as an art, that we see what it is as a science, and why it is such. The end of logic is properly the end of an art, but it is an end which cannot be achieved save that the art of logic be simultaneously a science.

It is the nature of the human intellect to be a reason. For

[2] When we speak here of the *scientific* character of logic, we use the term "scientific" in the strict sense to mean demonstrative. When we speak elsewhere of logic as a universal instrument for *science*, we use the term "science" in a broader sense, for in a proportionately different fashion logic governs the development of both demonstrative and dialectical discourse.

man the intellectual life is a developing thing. It is evident in our experience that all intellectual discipline comes from pre-existing knowledge.[3] The human mind is characteristically discursive. The end of the discursive act is knowledge, but the discursive act is itself productive or constructive. The price of learning for the human intellect is the construction within itself of rationally sound divisions, definitions, and argumentations. The reason is, by nature, generally determined to the constructive end of discourse. However, the reason is not so inflexibly determined in this regard that each and every one of its discursive constructions is guaranteed by nature to be sound. The reason can divide and define badly; it can go astray in argumentation. In itself the reason is a potency which stands in need of a habit to overcome its native indeterminacy and ready it for the discursive act. The intellectual virtue which perfects the reason for discourse is logic. Because the discursive act is characteristically productive or constructive, logic must be an art. Because the works to be produced through the art of logic are fashioned within the mind itself, logic is a liberal art and, as we shall note again very shortly, a perfection of the speculative rather than the practical intellect.

A work of art is created by the artist, but the truth of his artistic judgment is measured by the good of the work to be produced. The productive effort of the artist must comply with a determinate set of rules according to which the form of the work to be produced is to be imposed upon the matter. The end of the artifact determines its matter and form, just as the final cause of a work in nature determines its intrinsic causes. For example, given the purpose of a house it is clear that only some materials are suited to its production. It is also clear that the ways in which these materials can be put together are accordingly limited. Art requires on the side of the matter to be set in order that there be some lack of determination, some

[3] No point is more fundamental for an appreciation of the need for logic. Thus Aristotle opens his *Posterior Analytics* with the statement: "All instruction given or received by way of argument proceeds from pre-existent knowledge." (*The Basic Works of Aristotle,* edited by Richard McKeon [New York, 1941] p. 100.)

indifference to form, so that the matter is able to take on an artificial form. Further, art requires on the side of the form that the matter be organized in a certain and determinate way so that the determinate end of the artifact may be achieved.[4] It is not enough that there be matter able to be artificially determined. It is also required that the artist be somehow in possession of certain and determinate rules according to which the determination is to be given the matter. This is the reason why logic must be both an art and a science. The objects which are presented to the intellect in knowledge are presented in such a way that they are able to be ordered in reference to one another in the constructive activity of discourse. But they can be ordered well only if they are ordered according to the determinate rules of logical procedure. Further, these rules of logical procedure must themselves be scientifically grasped, if logic is to be adequate to its end as a science. Of course, it must be shown that anything less than a scientific understanding of the rules of logical procedure fails to suffice for the art of logic. But once this is done, it should be clear that the art of logic is achieved precisely in the scientific grasp of logical rules. This is to say that logic can be the art it is, only if it is simultaneously a science.

The end of the art of logic is quite clearly sound discourse. Thus the end of logic must be principally the most perfect instance of discourse. This is, of course, the syllogism productive of science, which is the demonstration. The art of logic must be adequate to demonstration or it is less than it must be as an art. Demonstrated knowledge or science can be characterized as perfect knowledge.[5] But perfect knowledge must be reflexively self-assured. Discourse is less than perfect, and

[4] Cf. John of St. Thomas, *Ars Logica*, p. II, q. I, a. 2 (Reiser): "Unde duo requiruntur ad artem: Primo ex parte materiae dirigibilis et formabilis, quod non sit omnino determinata, sed habeat aliquam indifferentiam, alioquin non erit capax regulationis et artis, sicut actus videndi et audiendi non sunt arte dirigibiles. Secundo requiritur ex parte formae, quae se habet ut regula dirigens, quod regulatio fiat per certas ac determinatas vias, alioquin si non sint certa et determinata media, sed contingentia, non per artem, sed prudentiam diriguntur. . . ."

[5] Cf. St. Thomas, In I *Post. Anal.*, l. 4, n. 5 (Leonine-Spiazzi): "Circa quod considerandum est quod *scire* aliquid est perfecte cognoscere ipsum. . . ."

hence less than scientific, for any intellect unable reflexively to defend its rational development. No work of art is completely arbitrary, and this is especially true of rational discourse, which is sound only when it conforms to the rules which determine its constructions. No one can handle himself adequately in the discursive act, especially on the level of scientific discourse, unless he can reflexively defend himself in terms of these rules. Further, no one can adequately defend himself in terms of these rules unless he understands the necessity that imposes them upon his discourse. If a logical principle is axiomatically self-evident, its necessity can be seen by way of inductive analysis. If it is less than axiomatic, its necessity can be seen only by resolving it deductively into a logical principle which is self-evident. Most of the rules of logical procedure are not self-evident, and so they must be resolved into principles which are self-evident. For example, the several rules for the validity of the categorical syllogism (such as the rules which prohibit an unextended middle term or an overextended term in the conclusion) are particular rules of logical procedure which must be shown to be necessary insofar as they follow necessarily from the self-evident principles of triple identity and the separating third. Or again, the rule which states that subcontraries cannot be false together can be seen to be necessary only when it is resolved into the self-evident principle of contradiction. Thus it is that the rules of logical procedure, which must be possessed by the logician, can be possessed in a mode adequate to the end of logic, only if they are demonstratively resolved into the first principles of logical procedure. Hence, the rules without which logic is not an art can be adequately possessed only when they are known scientifically, so that if logic is to be the art of sound discourse, it must be at one and the same time the science of logical rules.

Before pursuing this investigation, a practical observation can be made. We remarked earlier that not everyone accepts the thesis that logic is indivisibly art and science. Some suggest that it is possible to consider the art of logic quite independently of its science and attempt to teach at least the elementary

course in logic exclusively as an art. However, this procedure involves a grasp and application of the rules of logic without a reflexive assurance of their necessity, making logic less than an adequate instrument at least for perfect or scientific discourse. The only alternative to a scientific grasp of logical canons is an uncritical acceptance which gives promise of no more than mechanical application. Many a student has described his logic course as consisting in two things: the sheer memorization of rules and the mechanical application of these rules. This complaint may be justified, if the logic teacher has attempted to separate the art of logic from its science.

An art perfects the reason for making, and a science perfects the reason for knowing. As an art logic directs the reason in the production of such works as divisions, definitions, and argumentations. As a science it consists in a demonstrative knowledge of logical rules. Does this last point square with the common teaching that the proper subject matter of logic is the second intention? As a matter of fact, these statements square perfectly with one another precisely because they represent the same point. The rules of logical procedure can be identified with the logical relationships which exist between objects in the mind and which govern the ordering of these objects in discourse. As we shall note, logical rules are nothing but canonical statements of logical relationships. These logical relationships are what are spoken of as second intentions. Thus, since logic demonstrates the rules of logical procedure, it can be spoken of as the science of second intentions.

What is the nature of a second intention? To understand this we must make several distinctions.[6] First of all, a nature or essence can be understood simply according to its proper meaning. This is to consider the nature as such, that is, to take it absolutely. Taken in this way, a nature or essence is understood without reference to its act of existing. However,

[6] The classic treatment of these distinctions is given in St. Thomas, *De Ente et Essentia,* c. III. St. Thomas discusses the nature of the second intention in several passages, including: *In IV Met.,* l. 4, n. 574; *In I Eth,* l. 1, n. 1; *De Pot.* q. VII, a. 9 and 11; *Summa Theol.* I, q. 13, a. 7.

natures taken absolutely are open to a twofold act of existing. They can exist as individualized in concretely real things in a primary existence outside the mind, or they can exist in the state of abstraction, as objects known, in a secondary existence in the mind. In other words, they are open to a subjective existence in the real and an objective existence in the intellect. Nothing belongs to a nature absolutely taken which does not fall within the definition of that nature. However, appropriately different accidents do accompany the nature in its subjective and objective states. In itself *man* is animal and rational, but in its concrete existence in Peter, it may also be white, hungry, and running. The attributes that follow upon the subjective existence the nature has in the real can be called individuating characteristics. In the direct act of simple apprehension the intellect knows the nature without simultaneously knowing any of the individuating characteristics without which it can never exist outside the mind. In a reflex appreciation of the nature in its abstract status as an object, the intellect understands it to be determinately related to other objects. In this reflex act the intellect actually brings these objective relationships into existence as relations of the reason belonging to an object precisely as an object. Thus, in its objective existence in the mind, nature abstracts from individuating characteristics, but takes on in their place other attributes which are essentially relations of the reason. In the state of abstraction as an object, *man* is neither white, hungry, nor running, but in this state, *man* may be subject of a proposition or minor term in a syllogism. The relations of the reason which accrue to an object precisely as known are the second intentions studied by the logician. They are spoken of as *second intentions* because they accrue in the mind to what is directly known or *first intended* by the intellect in direct intellection. They are spoken of as *second* intentions, too, because they are relations belonging to the nature known in the *second* existence the nature has in the intellect as an object.[7] As an object of

[7] The clearest description of the second intention we know of is given by John of St. Thomas in *Ars Logica*, p. II, q. II, a. 2: "Vocatur vero secunda intentio

direct intellection, *man* is a first intention and not precisely the concern of the logician as logician. What it is to be a man is properly the concern of the psychologist or the anthropologist. The logician is properly concerned only with the logical relationships which can accrue in the mind to *man,* and to any other first intention. The logician does not attempt to define *man;* he defines *subject of a proposition, minor term in a syllogism,* and the like, for these are the second intentions which comprise the subject matter of logic.

We have made the point that because of its end, the art of logic must be simultaneously the science of logical rules. We have also suggested that this is the same as to say that the art of logic is at once the science of second intentions. The reason for this is that there is an identity between logical rules and second intentions. We have defended this by saying that logical rules are nothing but canonical statements of

ista secundum differentiam a prima, quasi dicatur secundus status seu conditio obiecti. Potest enim obiectum considerari in duplici statu: *Primo,* secundum quod est in se, sive quantum ad existentiam sive quantum ad quidditatem. *Secundo,* ut est in apprehensione, et status iste essendi in cognitione est secundus respectu status essendi in se, qui est primus, quia sicut cognoscibilitas sequitur ad entitatem, ita esse cognitum est post illud esse, quod habet in se. Illae ergo affectiones seu formalitates, quae conveniunt rei prout in se, vocantur primae intentiones, quae conveniunt rei prout cognita, vocantur secundae. Et quia pertinet ad Logicam dirigere res, secundum quod sunt in apprehensione, ideo per se considerat Logica intentiones secundas, quae conveniunt rebus ut cognitis."

It is significant to note that we have spoken of first and second intentions from the objective point of view. We have said that the object of the direct act of intellection is the first intention and that the relation of reason known and imposed in the reflex act of the intellect considering its object precisely as known is the second intention. From the psychological (or even epistemological) point of view the direct act of the intellect is sometimes itself called the first intention, and the reflex act the second intention. The science of logic has for its object the second intention objectively, rather than psychologically, understood. It is also important to note that the second intention as we have understood it is a relation of the reason accruing to a nature known. It cannot be identified with that nature. In this sense it is more like a predicamental relation than a transcendental relation. The intention of species is not "built into" the object *man* after the fashion of a transcendental relation. If it were, any attempt to know human nature as something real would be futile. *Man* would only be a being of reason. The intention of species is distinct from *man* and is taken on by the object *man.* The object itself remains a first intention and is, as an object, subject to the second intention of species. *Man* remains essentially real and is only denominatively species.

second intentions. Perhaps this last point stands in need of further explanation. What do we mean when we say this? The point is a simple one. We know *how* logically to handle an object which is possessed of a given logical relation or second intention precisely insofar as we know *what* that second intention is. Thus the rules according to which we must order objects in logical discourse simply state, in the form of rules or canons, the natures of the various second intentions. Logical rules are nothing more or less than regulative expressions stating the demands of second intentions for rational discourse. Illustrations come easily. For example, to know *what* definition and division are, is to know *how* to define and divide terms. The rules of legitimate definition and division simply state the demands of the intentions of definition and division. Similarly, to know *what* a syllogism is, is to know *how* to deduce a conclusion from premises; and this is to know the rules of deduction. To know *what* a demonstration is, is to know *how* to use a syllogism as a strict proof, that is, to know the rules of scientific argumentation. Whenever it engages in discourse, the reason must order its objects according to the demands of the logical relations or second intentions which belong to these objects as known. Without a reflexive understanding of these second intentions the reason may go astray in its attempts at discourse, and it most certainly will not be able adequately to defend itself. Clearly, then, the scientific grasp of the rules of logical procedure, demanded by the end of the art of logic, is identically the scientific understanding of second intentions. Logic is simultaneously the art of rational discourse and the science of second intentions.

Logic is, paradoxically, a real science but not a science of the real. It is a real science in the sense that it is genuinely a science, that is, genuinely scientific in its method. We have seen that logic is scientific in its method precisely insofar as it establishes the particular rules of logical procedure by resolving them into self-evident principles in the order of logic. However, even though logic is a real science, it is not a science of the real. Logic does have an object concerning which it

proceeds scientifically. This object is not a real being but only a being of reason. Second intentions are at best accidents of reason. They are relations which accrue to natures taken precisely as objects. They exist only with an existence conferred by the mind. Thus, they are not in the strict sense real. Because it is contradictory to think of them possessing anything but an objective existence, they are beings of reason. Although they are not real beings, second intentions are, in no sense, wholly arbitrary. They may not be real, but they are founded upon what is real. Consider, for example, the second intention of predicate. The relation of predicate is a being of reason. It comes into existence only insofar as one object *is understood to be related* to another as its predicate. No nature in the real is a predicate of any other. However, no nature in the mind can be understood to be a predicate for another unless something in the real determinately grounds the relation in the mind. In the proposition *Peter is white, white* is related to *Peter* as predicate only because in the real, whiteness is an accident inhering in Peter's substance. This foundation in the real, enjoyed by second intentions, enables them legitimately to qualify as a genuine science despite their status as beings of reason.[8]

Sciences are either practical or speculative, useful or of value quite apart from their actual use. Ordinarily we think of practical sciences as useful and speculative sciences as of value quite apart from use. However, logic is a speculative science which is at the same time useful.[9] A science is practical when it finds its value in something *other than knowledge*. Logic is not of this character. The logician investigates second intentions only because a knowledge of them enables him to reason well. The end of the science of logic is sound discourse. This is an end entirely within the sphere of knowledge, for discourse is nothing unless it be productive of knowledge. Thus logic is a

[8] Cf., *ibid.*, p. II, q. I, a. 3, where John of St. Thomas defends the scientific character of logic in the face of the difficulty expressed in the proposition: "Ens rationis non potest esse obiectum scientiae primo et per se."

[9] Cf. Richard J. Connell, "Some Notes on Whether Logic is a Speculative or Practical Science," *The New Scholasticism*, XXX (1956), pp. 198-205.

speculative rather than a practical science. However, logic differs from most speculative sciences. Ordinarily the worth of a speculative science is found in the knowledge of the subject matter precisely of the science in question. For example, metaphysics is of value because being is worth knowing for its own sake. But logic is different. The logician studies second intentions, not because it is good to know about second intentions for their own sake, but to acquire knowledge of other objects in the other sciences. Second intentions are a type of being of reason. They are nothing but instruments for discourse. They are in no sense the type of thing calculated to satisfy the appetite of the intellect for truth. The logician studies second intentions only because a knowledge of them will enable him to proceed with scientific effectiveness in those disciplines which seek knowledge of the real. Logic is in no sense an end; it is only a means. But it is a means for knowledge. Although it is useful, it remains speculative precisely because it is knowledge for the sake of knowledge.[10]

Although there is generally agreement that logic should precede the other disciplines in the order of learning, there are sometimes suggestions to the contrary. We cannot escape the fact that logic is a difficult discipline to acquire. The second intention is not the kind of subject matter originally proportioned to the human intellect. Second intentions do not have metaphysical status, but like the object of metaphysics the second intention is an object definable on the third level of abstraction. It is an object not nearly so familiar to us as the subject matter of physical science, nor so clearly grasped as the subject matter of mathematics. Because of this, and because of its rigorously scientific character, logic is a discipline ac-

[10] *In Boeth. de Trin.*, q. V, a. 1, ad 2 (Decker): "Ad secundum dicendum quod scientiae speculativae, ut patet in principio *Metaphysicae*, sunt de illis, quorum cognitio quaeritur propter seipsa. Res autem de quibus est logica, non quaeruntur ad cognoscendum propter seipsas, sed ut adminiculum quoddam ad alias scientias. Et ideo logica non continetur sub speculativa philosophia quasi principalis pars, sed sicut quoddam reductum ad philosophiam speculativam, prout ministrat speculationi sua instrumenta, scilicet syllogismos et definitiones et alia huiusmodi, quibus in scientiis speculativis indigemus."

quired only with difficulty. It is, in fact, in itself more difficult than some of the disciplines for which it serves as a tool. If the general pedagogical principle that the less difficult should come before the more difficult could be applied here, there might be some argument for deferring logic in the order of learning. But this principle is not relevant here. When one discipline is necessary *for* another, it must precede that other no matter how difficult it might be in itself. Logic is necessary as a tool for the other sciences and, for this reason must precede them—regardless of the difficulties involved in acquiring logic. In truth, were logic not needed for the acquisition of the other disciplines, it would have no excuse for being placed within the order of learning at all, for as we have seen, it is nothing apart from its usefulness.

At this point there are two difficulties to be faced. The first is textual. In his *Commentary on the De Trinitate of Boethius,* St. Thomas, approving the statement of Boethius, remarks that logic is not itself a science but is reduced to this status in virtue of the fact that it is a tool for the sciences.[11] Does this conflict with our contention that logic is genuinely a science? If the term " science " is used in a strict sense to mean science-of-the-real, logic is not a science. But because it is the art of rational discourse, it is related to science as an instrument. In virtue of this relationship it can be called " science " by an analogy of proportion. However, the term " science " can be extended to any genuinely demonstrative discipline. This is the sense of the term as we have understood it throughout this paper. In this sense, logic is properly a science. Admittedly logic is not univocally a science even in this sense, but it is a science by way of analogy of proper proportionality. The second difficulty arises in the face of an obvious objection. There seems to be a contradiction involved in saying that logic is itself a science and at the same time a prerequisite for any science. This is a legitimate objection, but it can be answered in the light of two distinctions, namely, the distinction between natural logic and

[11] *Ibid.*: " Unde secundum Boethium in *Comm. super Porphyrium* non tam est scientia, quam scientiae instrumentum."

the acquired virtue of logic and the distinction between science in an imperfect state and science in a perfect state.[12] Natural logic is our native ability to reason with some accuracy. It is fallible and unreflexive, but it can suffice for the acquisition of science in an imperfect state. This means that science in its embryonic stage can be acquired without the art of logic and that isolated demonstrations can be achieved prior to the acquisition of logic. But natural logic will not suffice for the acquisition of science in its perfect state. If we are to achieve many demonstrations within a given scientific area, know the relationships between these demonstrations, and adequately defend this science against objections, we must be already possessed of the reflexive science of logic. The science of logic itself must, of course, be acquired in its early stages through the use of natural logic. We can acquire the science of logic in its perfect state only if we constantly make use of the very rules of logical procedure we achieve in our progress towards the acquisition of logic in its perfect state. We shall have more to say about logic as a necessary tool for the other sciences. Suffice it here to note that logic in its perfect state is necessary for the acquisition of any other science in its perfect state.

The proper subject of the science of logic is the second intention. Some second intentions accrue to objects on the level of apprehension (e. g., species), some of the level of composition or division (e. g., subject) and some on the level of reasoning itself (e. g., middle term). The end of logic is sound discourse, with the emphasis upon reasoning. The three operations of the intellect are so interdependent that good order on the level of the third presupposes good order in turn on the levels of the second and first. This imposes a natural order upon the logician in his investigation of second intentions. He must study them first on the level of the first operation, then on the level of the second, and finally on the level of the third. The science of logic is naturally divided in a threefold way into the logic of the first operation, the logic of the second operation,

[12] Both distinctions are given by John of St. Thomas, *op. cit.*, p. II, q. I, a. 1.

and the logic of the third operation of the intellect.[13] In the classroom any pedagogical approach at variance with this natural progression of logic runs the risk of violating the discipline itself. There is no shortcut to the logic of the third operation despite the fact that many teachers of logic are impatient to reach it. Certainly the logic of the first and second operations demands completion in the logic of the third. But there can be no soundly scientific basis to a logic of the third operation without adequate preparation in the logic of the first and second operations.

We have noted that logic is simultaneously the art of sound discourse and the science of second intentions. The soundness of discourse is measured differently from the point of view of its form and from the point of view of its matter. From the point of view of form, an argumentation is sound when it is consistent or valid. From the point of view of matter, an argumentation is sound when the character of its premises is such as to guarantee some determinate truth-status to its conclusion. Material soundness presupposes formal soundness but adds something different to discourse. Second intentions generally of one type are required for the soundness of discourse from the formal point of view, while second intentions generally of another type are required for material soundness. The second intentions which determine the validity of discourse accrue to their objects in respect to the logical "position" of these objects in discourse, that is, from the point of view of their mode of signifying. Those which determine the probative force or scientific status of discourse accrue to their objects more proximately in virtue of their intelligible content. A scientific grasp of the first type of second intention is adequate, of course, only for the art of valid argumentation. Since the scientist must be able to defend more than the consistency of his discourse, a scientific grasp of both types of second intention is necessary in order that logic be a totally adequate instrument of the intellect for rational discourse. The

[13] Cf. St. Thomas, *In I Post. Anal.*, l. 1, n. 4.

first type of second intention specifies the branch of logic called formal logic, and the second type specifies material logic. It is clear that neither branch of logic alone (despite the fact that formal logic can be acquired without material logic) is adequately logic.

The difference between a second intention in formal logic and a second intention in material logic can be illustrated quite simply in the two propositions *Every man is rational* and *Every man is capable of speech. Rational* and *capable of speech* are both predicates in virtue of an identical " position " within the formal pattern of thought. But *rational* is related to *man* as a difference, while *capable of speech* is related to *man* as a property. This difference between the two rests proximately upon an essential difference in intelligible content between them. The relation of predicate is a second intention in formal logic, and the relations of difference and property are second intentions in material logic. It is important to note that one cannot reflexively defend the validity of a syllogism without knowing what it is to be a predicate, but that one could defend the validity of a syllogism without knowing the difference between a difference and a property. However, one must know the difference between these to be able to distinguish between an explanatory and an a posteriori demonstration. This example helps us to see that the logical relations proper to formal and material logic differ respectively in terms of the *ratio* according to which they accrue to objects and in terms of the end for which each is investigated.

The distinction between formal and material logic is most significant on the level of the third operation. Nevertheless, we can distinguish between second intentions of both formal and material import on all three levels. For example, term and universal are of formal significance on the level of the first operation, while genus and definition are of material significance here. Proposition and converse are of formal import on the level of the second operation, and immediate and commensurately universal are of material import. On the level of reasoning, conclusions and syllogisms are of formal significance, while

explanatory demonstration and dialectical argumentation are of material significance. It is evident that the distinction between formal and material logic cuts across the distinction between the logic of the first operation, the logic of the second operation, and the logic of the third operation. It is true that material logic in a sense presupposes formal logic, but it is not true that material logic in a sense presupposes formal logic, nor is it true that the investigation of second intentions in material logic must be deferred until all those in formal logic have been studied. One must surely investigate what it is to be a syllogism before one investigates what it is to be a demonstration, but one can investigate the nature of definition before one studies the syllogism. Courses in logic have frequently been more faithful to the distinction between formal logic and material logic than they have to the prior distinction between the logic of the first, second, and third operations. Thus there have been numberless introductory courses and textbooks in formal logic alone, and some (but considerably fewer) courses and textbooks in material logic alone. Because of this many students have been scandalized into considering a course in formal logic alone to be adequately a course in logic. Or perhaps more correctly, they have been led to believe that the course in formal logic alone is supposed to be adequately a course in logic. Of course it is not, since the ability to argue validly is by itself only an inadequate instrument for scientific discourse. Suspecting as much, these students have quite understandably taken a dim view of logic itself. It seems pedagogically more sound to order the course in logic basically according to the division of logic into the logic of the first, second, and third operation. Then on each of these levels the appropriate second intentions of both formal and material import can be investigated in the order that they themselves would indicate.

The names " material logic " and " formal logic " sometimes are the occasion of some difficulty. There is a legitimate sense in which both branches of logic are formal and neither of them material. Both formal and material logic are specified by the

second intention, and the second intention is a logical *form*.[14] Second intentions of both formal and material import are logical relations accruing to objects as known. The material logician, just as much as the formal logician, directly concerns himself with the intelligible structure of the second intention and not the intelligible content of the object to which it accrues. They leave this, of course, to the other sciences. The intention of predicate belonging to *man* as an object is investigated in formal logic. The intention of species belonging to *man* as an object is investigated in material logic. But human nature is investigated in psychology or anthropology. Even though second intentions of material import depend proximately upon the intelligible content of the objects to which they accrue, not even material logic can make judgments properly in respect to this intelligible content. Material logic determines the logical conditions which are generally necessary for an argumentation (in any scientific area) which is to yield a fully explained and certainly true conclusion. However, no logician, as logician, can ever say that this or that proposition (in a scientific area other than logic) is certainly true. Logic is related to the other sciences simply as an instrument to be used by each one of them, without doing the work precisely of any one of them. This is true for material logic just as much as it is for formal logic.

Discourse differs in terms of its material disposition according to the force of its conclusions. Some discourse is so rigorously disposed that it generates a certainly true conclusion. Other

[14] In his "Foreword" to *The Material Logic of John of St. Thomas* (p. xii) Professor Simon remarks, "To be sure, logical matter, in relation to the real content of science, retains the nature of a form." This entire foreword is a brilliant exposition generally of the nature of logic and particularly of the distinction between formal and material logic. It seems to have been written with a full appreciation of the fact that none of the divisions relevant to the noetic of logic is as consistently misunderstood as the division of logic into formal logic and material logic. Formal is frequently confused with the whole of logic, while material logic is variously identified with applied logic, particular scientific methodology, the sciences-of-the-real, meta-logic, or epistemology. Though a line of demarcation between some of these is questionable, no one of them is the whole or any part of material logic.

discourse is less rigorously disposed and can generate only a probable conclusion. This difference in the material disposition of discourse is the foundation for a further division of logic into demonstrative or judicative logic and dialectical or inventive logic.[15] Demonstrative logic is that branch of material logic which investigates the intentions which guarantee a certainly true or scientifically established conclusion. Dialectical logic investigates the intentions which determine discourse calculated to yield something less than a scientific conclusion.

Because the knowledge to which logic is ordered in virtue of its end is not a knowledge of its own subject matter, but rather of the subject matter of other sciences, logic is frequently spoken of as the tool of the other sciences.[16] This is correct enough, although it might be more accurate to speak of it as the tool of the reason as the reason looks to the other sciences. Each of the sciences has its own proper subject matter, but in all cases those subjects are investigated by but one intellect or reason. Because there is one reason which is common to each different scientific effort, there is one general mode of procedure for them all. This general mode is common to all the sciences because it is proper to the reason, which is common to

[15] Cf. St. Thomas, *op. cit.*, n. 5 and 6. In general St. Thomas divides the logic of sound discourse into the branch of logic which looks to the process of reason which yields a scientifically necessary conclusion ("rationis processus necessitatem inducens, in quo non est possibile esse veritatis defectum [per quem] scientiae certitudo acquiritur") and that branch of logic which yields a conclusion true for the most part ("rationis processus, in quo ut in pluribus verum concluditur, non tamen necessitatem habens"). He calls the former judicative logic and the latter inventive logic. He further divides inventive logic into the logic of probable discourse yielding opinion (["per quem] fit . . . opinio propter probabilitatem propositionum, ex quibus proceditur"), the logic of persuasion yielding suspicion ("[per quem] fit . . . suspicio"), and the logic of literary discourse which yields conjecture ("[per quem] existimatio declinat in aliquam partem contradictionis propter aliquam repraesentationem"). He speaks of these respectively as dialectics, rhetoric, and poetics. Judicative logic and demonstrative logic are unequivocally one. However, in the strict sense, dialectical logic is distinguished from judicative or demonstrative logic as a part of inventive logic. Nevertheless there is a general use of the term "dialectical" which would allow it to be identified with "inventive." Understood in this general sense, dialectical logic is, as a whole, distinct from demonstrative logic while retaining its own subdivisions.

[16] Cf. *supra*, note 10.

all the sciences. At the same time, in virtue of formal differences in scientific subject matter, there must be distinctly different particular modes of procedure for each distinctly different science. The general method of the reason must be appropriately contracted to the needs of a given scientific subject matter before it can be proximately adequate to the particular science specified by that subject matter. The science of logic is nothing more or less than a grasp of the common mode. The contractions of logic which are proper to the various sciences are the appropriate methodologies respectively for those sciences.[17] Thus there is a distinction between logic and the method of mathematics, between logic and the method of physics, between logic and the method of metaphysics. But at the same time there is a relationship between logic and the various different scientific methodologies. Each scientific methodology must be generally logical, but each must be logical in its own way.

Failure to distinguish in practice between logic and its particular contractions has serious consequences. Because of the demands of the reason, mathematical method is inadequate to the science of mathematics if it is not logical, and because of the special character of the mathematical subject matter, mathematical method is inadequate to the science of mathematics if it is only logical. Mathematical method is adequate to mathematics only if it is logical in the mathematical mode. Similarly the methodology of physics must be logical in the physical mode, and the methodology of metaphysics must be logical in the metaphysical mode. It is a fact that logic lends itself more easily to some particular methodologies than to others. Thus logic is more easily contracted to mathematical methodology than it is to the metaphysical mode of discourse.[18] This is one reason why more progress can be made in mathematics prior to the reflexive study of second intentions than in

[17] Cf. St. Thomas, *In II Met.*, l. 5, n. 335; *In II De Anima*, l. 3, n. 245.

[18] It should be noted that when we speak of mathematics throughout the paper we have principally the classical mathematics, rather than modern mathematics, in mind.

metaphysics. It is also the reason why examples of mathematical discourse come more easily and serve more profitably than others in teaching an elementary course in logic. Examples of being logical are better known to us in mathematics than in metaphysics.[19] But this is no excuse for identifying logic with mathematical methodology. To do so is to destroy the significance both of logic and of mathematics. And to do so, of course, is to rule out the possibility of being logical in any discipline other than mathematics. In itself, logic is open to all scientific discourse. It can, even though with difficulty, be contracted to the needs of the subject matter of metaphysics. However, mathematical method, though applied logically, encompasses only the subject matter of mathematics, and is in no sense able to be used properly in metaphysics. To equate logic with mathematical method is to cut metaphysics off from logic. And if metaphysical method is not basically logical, it is difficult to see how it can in any adequate sense be scientific. The distinction between logic as a common mode and its contractions in the various scientific methodologies must be recognized, understood, and respected for the sake of logic itself and especially for the sake of the sciences for which logic serves as a tool.[20]

We have seen that although logic is a speculative science, it is essentially useful. This fact is the foundation for a distinction between doctrinal logic (*logica docens*) on the one hand and logic in use (*logica utens*) on the other. Logic is an intellectual discipline which consists in the scientific grasp of second intentions. As such, logic can be said to be doctrinal. To put this

[19] Several worthwhile suggestions in this reference were offered by Rev. William Baumgaertner in an unpublished paper, "Demonstration," given at the 1959 Philosophical Institute in the Teaching of Philosophy at Marquette University. One practical difficulty in the teaching of logic arises from the fact that there are no examples simply of proceeding logically. We must use examples of proceeding logically in a definite discipline, even if that discipline is itself logic. Thus we constantly run the danger that our students will confuse general logic procedure with some particular scientific methodology.

[20] It is not the business of the logician to determine the methodology of any given science. But it is the responsibility of every scientist to be aware of the demands of logic and to introduce his proper investigation with a proemium in which he determines the contraction of logic which constitutes his own method.

another way—there are propositions which are properly logical, not only insofar as they fit into a logical pattern of thought, but precisely insofar as they express a truth within the area of logic itself. Together these propositions comprise the body of what might be spoken of as logical theory or doctrine. It is from this point of view that we speak of doctrinal logic. In a similar fashion we would speak about the psychologist's speculative knowledge of man as doctrinal (*psychologia docens*). However, unlike psychology, doctrinal logic is essentially useful. In any given case it may not be used, yet its use remains its *raison d'être*. We can say that doctrinal logic is virtually useful, but we must distinguish between this and logic actually put to the use of the reason. Logic actually put to the use of the reason can be spoken of as logic in use (*logica utens*) and distinguished from doctrinal logic (*logica docens*).

There are three different uses to which logic can be put. When it is used in its most characteristic fashion, it is used to direct the reason in the exercise of rational discourse. This can happen in two ways: first, when it directs the intellect in discourse terminating in the real through an analysis to self-evident propositions; and second, when it directs the intellect in the tentative and unterminated discourse productive of a probable conclusion. There are the two uses of logic to which we pointed when we distinguished between demonstrative and dialectical logic. These are the methodological uses to which logic as a general instrument of discourse can be put. However, logic can be put to a third use, which differs radically from the first two insofar as it is not methodological. Logic, like metaphysics, is a common science in the sense that its subject matter extends to all being.[21] Because it is a common science in this sense, it can supply propositions which are properly logical but which can be used as premises in a particular science. A commonly proposed example of this is the logical principle that

[21] The subject matter of metaphysics embraces all being ("ens commune"). Since logical relations can accure to any being *qua* known, the subjects of metaphysics and logic are coextensively universal. They differ, of course, as first and second intentions.

contraries are in the same genus when used as a premise in an argumentation calculated to manifest the psychological truth that the contrary passions of love and hatred flow from the same appetite. In this example a proposition from logic (*logica docens*) is used (*logica utens*) as a part of an argument in psychology (*psychologia docens*). In other words, logic is used to supply a doctrinal principle built into psychological discourse instead of a methodological principle governing the integrity of discourse without becoming a part of it. Thus there are three manifestations of logic in use: first, as a methodological instrument for demonstrative discourse; second, as a methodological instrument for dialectical discourse; and third, as a source of doctrinal propositions for discourse in particular sciences.[22]

In the first article of the sixth question of the *Commentary on the De Trinitate of Boethius*, St. Thomas speaks of three meanings of rational method.[23] The first of these corresponds to *logica utens* considered as logic-supplying-premises-to-the-other-sciences. The second corresponds to *logica utens* considered as logic-directive-of-the-reason-in-probable-discourse. The third refers to the demonstrative method characteristically called for by the particular scientific structure of the subject matter of natural science. As such this third meaning of rational method would seem to belong to *logica utens* in the sense of logic-directive-of-demonstrative-discourse, and it belongs to this branch of logic precisely insofar as this branch of logic is contracted to the requirements of the subject matter of natural science. In other words, the third meaning of rational method (*rationabiliter*) belongs to the proper methodology of natural science. In similar fashion, the method of learning (*disciplinabiliter*) spoken of by St. Thomas in this same article in the *De Trinitate* as characteristic of mathematical discourse, and the method of intellect (*intellectualiter*), spoken of as

[22] For a more complete discussion of the significance of *logica utens*, cf. John of St. Thomas, *op. cit.*, p. II, q. I, a. 5.

[23] *In Boeth. de Trin.*, q. VI, a. 1, resp.

characteristic of metaphysical inquiry, belong respectively to the proper methodologies of mathematics and metaphysics.[24]

It was noted at the beginning of this paper that it was to be at best a preliminary work. This brief summary fulfils that intention.[25] In the light of its end, we have seen that logic is both an art and a science. It is the liberal art of sound rational discourse. It is the speculative but useful science of second intentions. Although it is genuinely a science, it is not a science of the real. Although it has an object which it seeks to know scientifically, it is not for the sake of the knowledge of this object that it exists. The end of logic is sound discourse in the other sciences, and it is only for this that it concerns itself with second intentions. Logic confronts second intentions on the levels proper to each of the three operations of the intellect, and on each level it concerns itself with intentions of both formal and material import. Thus logic can be divided in one way into the logic of the first operation, the logic of the second operation, and the logic of the third operation; and in another way into formal and material logic. Logic is an instru-

[24] *In Boeth. de Trin.*, q. VI, a. 1, St. Thomas does not fully explicate the methodologies proper to the three genera of speculative science. He distinguishes among these particular methods of demonstration in this article only by pointing out what is especially characteristic of each. There is no intention in my remarks to find more in St. Thomas' text than this, which is sufficient to indicate for St. Thomas a distinction between scientific methods respectively proportioned to diverse scientific subject matter.

[25] We have chosen not to raise the problem of the "rivalry" between mathematical or symbolic logic and what is frequently referred to as Aristotelian logic. We have attempted to discuss logic as it is in itself, quite apart from any of its accidents (e.g., the fact that it is or is not susceptible of symbolization or the fact it has been discovered and taught by Aristotle or by some one else). The discipline we have discussed and called logic is the discipline which is determined in its essential character by the end of sound discourse. It is a science whose formal subject is the second intention. If either Aristotelian or mathematical logic measures up to this end because it adequately confronts this subject matter, it is logic in the sense in which we have understood logic. We think that this is the case for Aristotelian logic and that it is not the case for mathematical logic. If we are right, then these two are only equivocally logics, and whatever the character of mathematical logic, it is in no sense a rival to Aristotelian logic. In support of our view we recommend: Henry Veatch, "Aristotelian and Mathematical Logic," *The Thomist*, XIII (1950), pp. 50-96.

ment of the intellect for the terminated discourse of demonstrative science and also for the unterminated discourse of probable argumentation. Thus there is a division of material logic into demonstrative and dialectical logic. Logic is an instrument of the reason in the scientific effort of the reason. Yet it cannot be identified with any given scientific methodology. Logic is a common methodology which must be contracted to the needs of a given scientific subject before it is proximately adequate as an instrument in that science. Because logic is an intellectual discipline itself a science, it can be said to be doctrinal. Doctrinal logic is virtually useful; and when it is put to use we can distinguish between doctrinal logic and logic in use. Logic is used in several ways. It is used as a methodological instrument when it supplies general methodological principles for either demonstrative or dialectical discourse. And it is used in another way whenever as a common science it supplies a premise for argumentation in some particular scientific area.

EDWARD D. SIMMONS

Marquette University,
Milwaukee, Wisconsin

"ABSTRACTIO TOTIUS" AND "ABSTRACTIO TOTALIS"

THE topic of abstraction has probably attracted more attention in recent years than ever previously in the Thomistic tradition. I do not intend to recapitulate here the history of the controversy,[1] but rather to go back to its source.

It seems that this difference of opinion on the topic of abstraction takes its origin from the distinctions of certain traditional commentators on the writings of Saint Thomas. These commentators are Thomas de Vio Cajetan and John of Saint Thomas.[2] It can be said, with some degree of probability, that without their interpretations, the doctrine of Saint Thomas on abstraction would not have been subjected to the amount of critical examination that has come to it, particularly in more recent years.

In itself, this preoccupation with the topic of abstraction is beneficial to the Thomistic tradition, and this for two main reasons. Firstly, such criticism and controversy preclude the purely passive acceptance of an important element in the traditional philosophy. Secondly, and not entirely separated from the first reason, abstraction is the basis of intellectual knowl-

[1] An extensive list of the recent literature on this topic is to be found in the first foot-note of Edward D. Simmons' article—"The Thomistic Doctrine of the Three Degrees of Formal Abstraction" in *The Thomist,* XXII (1959), 37-67.

[2] For present purposes, the following quotation may be taken as summarizing the doctrine of John of Saint Thomas on *abstractio totalis* with which we will be concerned here—"Et non loquimur de abstractione 'totali' quae abstrahit aliquid ut praedicabile ab inferioribus; sic enim ista abstractio est communis conditio scientiarum, quae non agunt de singularibus sed de universalibus." (John of St. Thomas—*Ars Logica* (Reiser ed.), 822b, 17-20, q. XXVII—"De Unitate et Distinctione Scientiarum"). In this article I will be concerned only with Cajetan's doctrine. In any case, of the two, it was Cajetan who first introduced "abstractio totalis" to the traditional philosophy.

edge and the question of the distinction of the speculative sciences. As principle in both respects, its importance is manifest—"a small error in the beginning is great in the end."[3]

In its general outlines, the traditional doctrine on abstraction has certain essential features. By virtue of the cognoscitive power called intellect, man can know the quiddity of material things as represented in the phantasms of the higher internal senses.[4] Such intellectual knowledge, of its nature, abstracts from the *hic et nunc* inasmuch as it is knowledge which lays aside the individuating material conditions of the thing known and considers only the quiddity or essence. This act of abstraction is attributed to the agent intellect.[5]

An essence or quiddity is therefore capable of being understood according as it is abstracted from individuating material conditions, which is to abstract it from individual matter. But individual matter is twofold—sensible and intelligible.[6] All understanding abstracts from individual sensible matter inasmuch as it abstracts from the individual sensible appearances as represented in the phantasm, which is to abstract the universal from the particular.[7] What remains as the object of intellection, is a quiddity in whose definition is put common sensible matter, but not individual sensible matter. For instance, man is known as a being composed of rational soul and a human body of flesh and bones, but not, however, as this being (i. e., Socrates) composed of this rational soul and this flesh and these bones.[8] Man is known in this latter fashion by reflection, which is in a certain way the reverse of abstraction.

It is also possible for the intellect to abstract from all sensible matter in its understanding. Therefore even the above common sensible matter is left aside. So the intellect can understand triangle, not only apart from this color (i. e., green) and this

[3] *De Ente et Essentia,* prooemium.

[4] *Summa Theol.,* I, q. 85, a. 1, corp.; *In de Anima,* Lib. III, lect. viii, (Marietti ed.).

[5] *Ibid.,* I, q. 79, a. 3, corp.; *In de Anima,* Lib. III, lect. x; *Q. de Anima,* a. iv.

[6] *Ibid.,* I, q. 85, a. 1, ad 2 and *QQ. Disp. de Verit.,* q. II, a. vi, ad 1.

[7] *Ibid.,* I, q. 85, a. 1, corp.

[8] *In Boetii de Trinitate,* q. V, a. iii, corp.

material of which it is made (i. e., plastic), but even apart from all sensible qualities. Corporeal matter is excluded and also the sensible qualities which inhere in it, such as color, hardness, etc. Such an abstraction is of a higher order than that whereby the universal is abstracted from the particular, for it abstracts from all sensible matter, both individual and common. This is the abstraction of mathematics with which we will not be concerned here.

Turning our attention to the first manner of abstraction, we note that this is usually described by Saint Thomas as abstraction of the universal from the particular—*abstractio universalis a particulari.* However, in one notable treatise he does refer to this same abstraction as *abstractio totius.*[9]

Cajetan, in commenting on some of Saint Thomas' works, had occasion to consider the topic of abstraction. In so doing, he describes this first manner of abstraction, not as an abstraction of the universal from the particular, but of a universal whole from its subjective parts—*totum universale a partibus subjectivis.* To this process he gives the name *abstractio totalis.*

The purpose here is to compare the *abstractio totius* of Saint Thomas with the *abstractio totalis* of Cajetan to see if they are identical. Certainly the similarity in names, as well as the fact that they both seem to be applied to the same manner of abstraction, would incline one to the belief that these two abstractions are really one and the same. Notwithstanding such similarities, attempts at complete reconciliation have not been sufficiently convincing to win universal approval. On the contrary, a sharp difference in opinion is manifest.

In comparing the conclusion of this controversy over the doctrines of Cajetan and Saint Thomas on the first manner of abstraction, it is evident that two opposed views have been reached. Firstly, there are those who maintain that Cajetan is in substantial agreement with Saint Thomas.[10] Secondly, and

[9] *Ibid.*

[10] Jacques Maritain maintains that the difference is merely one of vocabulary and not of doctrine. However, he then proceeds to distinguish the two abstractions as pre-scientific (Cajetan's) and scientific (St. Thomas'). Furthermore, Maritain gives

opposed to them, there is a smaller group who deny identity between the *abstractio totalis* of Cajetan and the *abstractio totius* of Saint Thomas.[11]

As a first observation on Cajetan's *abstractio totalis,* there are two words in his description which seem to be most significant. These two words are *partes subjectivae.* We find them in his commentary on an article of the *Summa Theologiae*:

". . . he distinguishes abstraction, and applies it to divine matters. Indeed he distinguishes in abstraction total and formal: that is by which the universal whole abstracts from *subjective parts,* and by which form abstracts from matter." [12]

The same words occur in his commentary on the " de Ente et Essentia " of Saint Thomas:

". . . there is a twofold abstraction by the intellect, namely, that by which the formal is abstracted from the material: and that by which the universal whole is abstracted from *subjective* parts." [13]

We are here faced with what would seem to be an inconsistency. The intellect abstracts a whole from its subjective parts. Therefore abstraction presupposes the existence of sub-

to St. Thomas' first manner of abstraction Cajetan's title of " abstractio totalis," instead of using St. Thomas' own name: " abstractio totius." This hardly clarifies the issue. Jacques Maritain, *Philosophy of Nature,* Philosophical Library, New York (1951) especially pp. 15-23. Other authors make a more explicit identification of the two types of abstraction. This is the case with the following: F. G. Connolly, " Abstraction and Moderate Realism," *The New Scholasticism,* XXVII (1953) 72-90 (especially pages 86-88); Georges Van Riet, " La Théorie Thomiste de L'Abstraction," *Revue Philosophique de Louvain,* tome 50, (1952), 353-393.

[11] Among those who deny this identity are: L.-M. Régis, O. P., " La Philosophie de la Nature. Quelques apories," in *Etudes et Rechecherches,* Cahier I: " Philosophie," (Dominican College of Ottawa, 1936), pp. 127-156; Francis A. Cunningham, S. J., " A Theory on Abstraction in St. Thomas," *The Modern Schoolman,* XXXV (1958) 249-270; Edward D. Simmons, *op. cit.,* and also " In Defense of Total and Formal Abstraction," *The New Scholasticism,* XXIX (1955) 427-440.

[12] Cajetan, *In Summa Theol.,* I, q. 40, a. 3, ad 1, ". . . distinguit abstractionem, et applicat eam ad divina. Distinguit quidem in abstractionem totalem et formalem; idest qua totum universale abstrahit a *partibus subjectivis,* et qua forma abstrahit a materia." (Italics added).

[13] Cajetan, *In De Ente et Essentia,* Proeemium, Conclusio ad Questionem I, paulo a principio: ". . . duplex est abstractio per intellectum, scilicet qua formale abstrahitur a materiali: et qua totum universale abstrahitur a *partibus subjectivis.*" (Italics added).

jective parts. But how can the whole have subjective parts prior to abstraction if this relation of whole to parts is attained only *after* the process of abstraction? In other words, if Peter, Harry, James, etc. are posited as subjective parts of "man," then the process of abstraction which gave birth to the concept "man" is already a *fait accompli.*

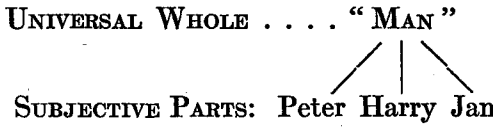
Perhaps the point is more clearly explained as follows:

1. From individuals, by the process of abstracting the universal from the particular, the intellect understands what man is.

2. As a consequence of (1) it is now possible to make the following identification:

   Peter is a man
   Harry is a man
   James is a man etc.

3. As a consequence of (2) it is now possible to conceive of "man" as a universal whole of which the parts are Peter, Harry, James, etc. This conclusion may be represented by the following diagram:



Only now are we in a position to enact Cajetan's *abstractio totalis,* because only by this third process does the universal become a whole with subjective parts from which it can be abstracted.

Nor are the above distinctions invalidated by the fact that the initial understanding of what man is, is necessarily a most confused notion. So long as the intellect understands even most confusedly what the essence is, apart from individuating accidents, it is in a position to predicate it of individuals, which thereby become related to it as subjective parts.[14]

[14] The particular example used here differs from that of Cajetan in which

There is no question of the individual nature as it exists in reality having this relation of universal whole to subjective parts. The nature can have a twofold existence—one in individual matter, the other in an immaterial manner in the intellect. It cannot have the intention of universality according to the first manner, for it is singularized, but it can and does have it according to the second manner of existing wherein it is abstracted by the intellect from individual matter.[15]

It is obvious, therefore, that to consider a nature with the relation of one to many of which it can be predicated is to consider it *after* the process of abstraction whereby it is known. Therefore to propose abstracting a universal whole from its subjective parts is to consider abstraction as it can be realized in something quite posterior.[16]

On the other hand, and in strong contrast, the *abstractio totius* of Saint Thomas is something quite prior. In its fulfillment it is the *fait accompli;* it is the process by which we understand what man is, to continue the above example.

Moreover, the whole, the *totum* which is abstracted in *abstractio totius* is the nature " man "; the parts from which it is abstracted are not *partes subjectivae,* but *partes materiae*—the nature " man," as it is partitioned or singularized in this or that individual and consequently with these or those individual characteristics has peculiarities which pertain to the individual but not to man as man. By the *abstractio universalis a particulari* which is also *abstractio totius,* the nature " man " is known apart from those accidental parts which would baffle understanding—*singulare est ineffabile.*

The nature: " man," as it exists in intellect is indeed a whole

" animal " is abstracted from " ox " and " lion," its subjective parts. I don't think that there is much point in arguing that this difference would alter the conclusion reached. I chose this example because that of Cajetan would obscure the issue, since " ox " and " lion " can also be considered universal wholes with subjective parts. I realize that Cajetan stipulates that he does not intend that *abstractio totalis* be from singular, but from species and genera- " non dico a singularibus sed a speciebus et a generibus " (*Ibid.*). However, my concern here is with the " partes subjectivae," which would seem equally justified in either example.

[15] *In de Anima,* Lib. I, lect, i, n. 13 and Lib. II, lect. xii, n. 378.

[16] *In de Anima,* Lib. I, lect. i, n. 13 and also *S. T.,* I, q. 85, a. 3, ad 1.

with parts—rational soul and human body. But these are essential parts—essential to the understanding of what man is, for just as man cannot be without these parts, so also he cannot be understood without them. From such parts there is no abstraction in the understanding of what man is. These parts therefore are quite distinct from the *partes materiae*. They are *partes speciei*—essential parts of man as man, not as this or that man.[17]

Against the above distinction which I have made, which is really a criticism of the expression *partes subjectivae*, it could be argued that the individuals in reality can be denominated subjective parts on the ground that they become such via the abstraction of intellect. Therefore it differs little as to whether one speaks of individuals or of subjective parts.

The reply to this would be that in speaking of subjective parts, we are assuming that the process of abstraction is already a *fait accompli*, as has been explained. Only *after* abstraction, via judgments and a certain collation can one speak of "subjective parts." Moreover, in using such an expression, one designates an area of mental experience which is quite posterior to the basic operation of abstraction whereby the intellect comes to know what something is. To thereby superimpose one domain of intellectual activity on another is to invite confusion.

As far as can be ascertained, Saint Thomas does not explicitly make this distinction between abstraction of a universal from the particular and abstraction of a universal whole from its subjective parts. Yet, on the other hand, never does he speak of such abstraction from subjective parts. In the cases where he might have used *abstractio universalis a partibus subiectivis*, he uses instead- *abstractio universalis a particulari*, or *abstractio totius a partibus* (*materiae*).[18]

[17] *In Boethii de Trinitate*, q. V, a. iii, corp.

[18] To my knowledge, the latter occurs only once; in the celebrated q. V, a. iii, corp. of the *In Boethii de Trinitate*, it is here that we also find the former expression *universalis a particulari*. This is the expression which Saint Thomas uses when describing the first manner of abstraction. Thus we find it in a. ii, corp. of the above work, as well as *S. T.*, I, q. 40, a. 3; *ibid.*, q. 85, a. ad 1, as also in other treatises.

What is important to point out, however, is that in practically every case it is possible to read into the text the familiar *abstractio universalis a partibus subjectivis,* with the result that one is attempting to ride two horses. In such a case, it would seem that basically one is entangled in a confusion between the *things* which intellect knows, on the one hand, and on the other, the ideas and consequent mental relations *by which* such things are known and set in order.

Admittedly, it is not an easy matter to make the necessary distinction, for it concerns the internal experience of intellectual activity, a complex activity in which direct and reflex knowledge are in constant communion. The intellect knows its ideas indeed, but in a posterior fashion, indirectly and by a certain reflection. First and directly, it knows the things of extra-mental reality, which are the object of science. It pertains to logic, the instrument of science, to study concepts and their mental relations.[19]

With these distinctions made, it is seen that the *totum* in Cajetan's *abstractio totalis* is not a *real* whole, but a *mental* whole with foundation in reality—*ens rationis cum fundamento in re.* That universal whole " animal " of which the parts are " ox " and " lion," *does not exist* as such in extra-mental reality. In fact, Saint Thomas, following Aristotle, takes issue with Plato over this same point. Animal, the universal, can be considered as a one respecting many, or as it is animal. In this latter case, it can be considered as existing in the nature of things, or as existing in intellect. Plato maintained that as a one respecting many, it exists actually and is something prior to, and apart from the individual animals, after the fashion of an exemplar. Aristotle denied this, saying that it does not exist, or if it does, it is in a posterior fashion (i. e., in intellect).[20]

By strong contrast, the *totum* of Saint Thomas' *abstractio totius does* exist essentially in reality, for this is the *totum* of which the parts are rational soul and human body. Every existing man has a rational soul and human body, for just as

[19] *In de Anima,* Lib. III, lect. viii, n. 718.
[20] *Ibid.,* Lib. I, lect. i, n. 13.

man cannot be understood without the understanding of these, neither can he exist in reality without them. The parts from which there is abstraction are not parts of this whole, but *partes materiae*—parts, not of man as man, but of man the individual. In abstracting from man the individual, what pertains to him as an individual is left aside, and what is considered is that which pertains to him as man. This is to abstract the universal from the particular, and which Saint Thomas also calls *abstractio totius*.[21]

The *totum* of Cajetan is something posterior—an *ens rationis cum fundamento in re*. The *totum* of Saint Thomas is something quite prior, and an *ens reale*—something really existing together with the accidental parts from which intellect abstracts in understanding it.

There is another way in which the *abstractio totalis* of Cajetan has engendered confusion, a manner which is reminiscent of the ancient conflict between the One and the Many. The *totum* of Cajetan's *abstractio totalis* is a universal whole with respect to the subjective parts from which it is abstracted. In his commentary on the *de Ente et Essentia* of Saint Thomas, having described formal abstraction, then total abstraction, he says of the latter:

"What is really abstracted by second abstraction is a universal whole in respect to that from which it is abstracted." [22]

This poses a problem, for if the *totum* is a universal whole with respect to the parts from which it is abstracted, how can it be such if it has been abstracted from them? If one eliminates the subjective parts, then there no longer remains the universal whole which must respect a many (*unum-versus-alia*: one respecting many). On the other hand, if the universal element is eliminated there remains a whole indeed, but not the universal whole which Cajetan's doctrine requires. In the resulting dilemma one cannot be quite sure as to whether ox and lion

[21] *In Boethii de Trinitate*, q. V, a. iii, corp.

[22] Cajetan, *In de Ente et Essentia, loc. cit.* "Quod vero abstrahitur secunda abstractione, est ut totum universale respectu eius a quo abstrahitur."

really do or do not pertain to the understanding of the essential nature of animal.

By contrast, no such perplexity arises with Saint Thomas' *abstratio totius*. The *partes materiae* from which abstraction is made are indeed parts of the individual, but not parts of man as man—"for these parts are indeed parts of the essence of Socrates and Plato, not however of man precisely as man."[23]

What then of the many? We do not deny the knowledge of many singulars as such. This, however, is the function of the *vis cogitativa*, which is in the sensitive part of the soul.[24] From the collecting of many singulars the *experimentum* is obtained.[25] For this reason, the *vis cogitativa* is also named *ratio particularis*, because it gathers together many singular intentions, just as the *ratio universalis* collects universal intentions.[26]

What is denied here is the belief that a plurality is essential to the nature understood by the abstraction of the intellect. This is quite beside the point, for as Saint Thomas says repeatedly, the intellect understands *by abstracting from the singular*. Consequently, to be in one or many singulars is, by the very abstractive process itself, excluded from the understanding of the nature of the thing being considered.[27]

Nor is it denied that the intellect itself knows singulars. While such knowledge is precluded in the process of abstraction, nevertheless it can be had in a posterior fashion and by a certain reflection: "Whence preserving the understanding of the nature of the species, it can be understood as existing in many."[28]

Moreover while such knowledge of singulars pertains to the

[23] *In Boethii de Trinitate*, q. V, a, iii, corp. "Hae enim partes sunt quidem partes essentiae Socratis et Platonis, non autem hominis in quantum homo."

[24] *In de Anima*, Lib. II, lect. xiii, nn. 396-8.

[25] *In Metaphysicorum*, Lib. I, lect. i, n. 15, (Marietti ed.).

[26] *Ibid.*

[27] *S. T.*, I, q. 13, a. 9, corp.

[28] *Ibid.* and *In de Anima*, Lib. III, lect. viii, nn. 712-3. "unde servato intellectu naturae speciei, potest intelligi ut in pluribus existens."

practical sciences, it does not belong to science in the speculative order.[29]

The language of Saint Thomas reflects a careful exclusion of the plurality which comes from singulars. When speaking of abstraction, his well-known phrases are—*abstractio universalis a particulari* and *abstractio universalis a singulari.*[30] Sometimes we meet with the double plural—*universalia a singularibus.*[31] We do not meet with the phrase—*abstractio universalis a particularibus,* but it could happen (perhaps through a rare slip of Reginald's quill), without completely disproving the point.

To return to Cajetan's *abstractio totalis,* consider next those properties which he imputes to this manner of abstraction when contrasting it with his *abstractio formalis.* There are some interesting observations which can be made on the properties of *abstractio totalis,* and which will further enable us to appreciate the difference between this manner of abstraction and that of Saint Thomas.

The first characteristic which Cajetan imputes to *abstractio totalis* is that each concept does not remain after such abstraction, but the concept only of that which is abstracted:

" In fact in total abstraction each complete concept does not remain separately so that one does not include the other." [32]

For instance, in abstracting " animal " from man, the concept " man " includes that of animal, but not vice versa. It is therefore possible to abstract the latter from the former by total abstraction. Since " man " has been removed in the process of abstraction, only " animal " remains in the intellect. This example (which is used by Cajetan), reminds us immediately of the famous article 3 of question 40 in the prima pars of the *Summa Theologiae.* Here Saint Thomas says almost the same thing, using also the same example of abstracting " animal "

[29] *S. T.,* III, q. 11, a. 1, ad 3.

[30] See footnote 18.

[31] For instance in *In Metaphysicorum,* Lib. XII, lect. ii, n. 2426, as also *In de Anima,* Lib. I, lect. iv, n. 48.

[32] Cajetan, *loc. cit.* " In abstractione vero totali non remanet seorsum uterque conceptus completus, ita quod alter alterum non includit."

from " man." He calls this act *abstractio universalis a particulari.*

In commenting on this article, Cajetan on this occasion definitely identifies his *abstractio totalis* with the above abstraction of Saint Thomas, of which he says:

" He distinguishes indeed in total abstraction . . . that is, by which a universal whole is abstracted from subjective parts." [33]

We have already seen the difficulties involved in identifying the two types of abstraction. The example can be interpreted in Cajetan's manner, when it is abstraction of a universal whole (animal) from its subjective parts (one of which is animal). It can also be understood as abstraction of the universal (i. e., " animal ") from the particular (i. e., the particular animal—man). To interpret it according to the former way is to superadd to the text of Saint Thomas some extraneous elements.

The second characteristic of *abstractio totalis* is that it produces a concept full of the confusion of potentiality and less intelligibility:

" there arises in that which is abstracted the confusion of potentiality and less intelligibility." [34]

In regard to this, it must be admitted, along with Saint Thomas, that to know some whole without a distinct knowledge of the many which it contains, is to have a confused knowledge of the whole.[35] However, to consider a nature as a whole with subjective parts, or of greater or less extension is for the intellect to reflect upon its own concepts vis-à-vis extra-mental reality. This is a perfectly legitimate operation indeed, and most necessary; but it is by nature quite posterior to the abstraction whereby the intellect directly knows what something is.

[33] *Idem., In Summa Theol.,* I, q. 40, a. 3. " Distinguit quidem in abstractionem formalem. . . . idest qua totum universale abstrahit a partibus subjectivis."

[34] *Idem., In de Ente et Essentia,* ". . . oritur in eo quod abstrahitur potentialitatis confusio et minor intelligibilitas."

[35] *S. T.,* I, q. 85, a. 3, corp.

As to the third property of *abstractio totalis*, it consists in this: to the extent that a concept is more abstract, so much the better known is it to us.[36]

About this characteristic, several pertinent observations can be made. Firstly, it implies degrees of abstraction inside *abstractio totalis*—the concept "animal" is more abstract than that of "ox" or "lion"; while the concept "animate" is again more abstract than "animal." The question may well be asked then, in what way are these concepts more or less abstract in the opinion of Cajetan. Quite obviously the extent of abstraction in Cajetan's understanding of abstraction does not depend upon the degree of separation from individual matter. For him, to be more abstract means to be more separated from specific actualities.[37]

This underlines again, the difference between *abstractio totalis* and *abstractio totius*. The latter consists in separation from individual matter and its consequences. Cajetan's *abstractio totalis* seems to consist in abstracting more universal concepts from less universal ones. As such, it is not an abstraction exercised by the mind on reality, as is *abstractio totius*, but is rather an abstraction by the intellect on the concepts by which it understands reality.

Moreover, it is secondarily and by reflection that the intellect knows its own ideas. Primarily and directly it knows the things.[38] It is in this area of intellectual activity that Saint Thomas' abstraction is to be found. Cajetan's total abstraction is concerned with what comes secondarily and by reflection.

Another observation which can be made on the third characteristic of *abstractio totalis* is that it essentially involves degrees of abstraction—"animate" is more abstract than "animal" which in its turn is more abstract than "ox" and "lion." By contrast, Saint Thomas would admit of no varying degrees of *abstractio totius*, for this is the first degree of ab-

[36] Cajetan, *In de Ente et Essentia, loc. cit.* ". . . in abstractione vero totalis quanto est abstractius, tanto est notius nobis."

[37] *Ibid.* "Abstractio totalis fit per separationem a specificis actualitatibus."

[38] *S. T.*, I. q. 85, a. 3, corp.

straction. For a concept to be more abstract, it must belong to the second degree, or manner of abstraction—mathematical abstraction. From such considerations, it is evident that by "abstraction" Saint Thomas means something quite different from Cajetan.

What Saint Thomas does admit on the same level of abstraction is the possibility of varying degrees of clarity of knowledge. Our intellect goes from a confused to a distinct knowledge of the thing, while still remaining on the *same level* of abstraction. Thus we know first what animal is, before we know man. The reason for this is that the understanding of man requires the understanding of animal plus something else.[39]

This raises another aspect in which the two notions of abstraction differ radically. Cajetan's *abstractio totalis* proceeds from what is less confused to what is more confused, or from distinct knowledge to confused. Saint Thomas' abstraction proceeds in the very reverse direction—from confused to distinct knowledge; and this has the advantage of being the natural direction in which the human intellect moves in knowing.[40]

The fourth characteristic of *abstractio totalis* which Cajetan gives is that it is common to all the sciences.[41] But this is what Saint Thomas says of *abstractio totius*- "it belongs also to physics and is common to all the sciences."[42] Perhaps this common property of the two abstractions is one of the principal reasons for identifying the two.

According to Saint Thomas, other sciences use the first manner of abstraction which belongs to physics, because in every science it is necessary to put aside what is *per accidens* and consider what is *per se*.[43] However, with Cajetan it would seem that *abstractio totalis* is not permanently borrowed from physics by the other sciences. Physics appears to have its own

[39] *S. T.*, I, q. 85, a. 3, ocrp.

[40] *Ibid.*

[41] Cajetan, *loc. cit.* "communis est omni scientiae."

[42] *In Boethii de Trinitate*, q. V, a. iii, corp., ad finem. "Competit etiam physicae et est communis omnibus scientiis."

[43] *Ibid.*

proper manner of abstraction, while the common denominator of the sciences is *abstractio totalis*. Cajetan maintains that the sciences are diversified according to diverse manner of *abstractio formalis*, and which he has carefully distinguished from *abstractio totalis*:

" with the different modes of formal abstraction, the speculative sciences are diversified." [44]

In going to the appropriate reference in the *Metaphysics*, we find that according to Saint Thomas, following Aristotle:

" there are three parts of theoretical philosophy: mathematics, physics and theology which is first philosophy." [45]

Therefore it would seem that in Cajetan's doctrine, there are three degrees of formal abstraction, each degree being proper to one science. The abstraction which is common to every science is *abstractio totalis*, making a total of four different manners of abstraction in his doctrine.

By contrast, Saint Thomas admits of only three manners of abstraction.[46] Therefore, if the *abstractio totalis* is to be identified with the *abstractio totius* of Saint Thomas, one would have to eliminate one of the four manners of abstraction which Cajetan requires, or identify the *abstractio totalis* with the first degree of *abstractio formalis*, an identity which Cajetan has taken care to preclude. If the *abstractio totalis* is eliminated, then one is nearer the doctrine of Saint Thomas. On the other hand, if this manner of abstraction is to be identified with the

[44] Cajetan, *loc. cit.* ". . . penes diversos modos abstractionis formalis scientiae speculativae diversificantur, ut patet VI Metaph. in principio."

[45] *In Metaphysicorum*, Lib. VI, lect. i, n. 1166. ". . . tres sunt partes philosophiae theoreticae, scilicet mathematica, physica et theologia, quae est philosophia prima."

[46] *In Boethii de Trinitate*, q. V, a. 1, corp. Here Saint Thomas also restricts this division to a tripartite one. This tripartite division is consistently maintained by Saint Thomas in other places: *In Metaphysicorum*, Lib. VI, lect. 1, nn. 1144-1170; *In Physicorum*, Lib. I, lect 1, nn. 1-2, (Marietti ed.); *In de Sensu et Sensato*, Lib. Un., lect, 1, n. 1, (Marietti ed.), etc. It is to be observed here that Saint Thomas, with few exceptions, speaks of only *two* manners of abstraction. The third manner he calls, not *abstractio*, but *separatio*, (*In Boethii de Trinitate*, q. V, a. 3, corp., ad finem). For present purposes we will speak of three manners of separation, or abstraction from matter (cf.: *S. T.*, I, q. 85, a. 1, ad 2).

abstractio totius of Saint Thomas, then one is faced with the difficulties already explained.

However, a little further on in the text, it would seem that Cajetan intends the above identification, for we read:

" Total abstraction is common to all science. On this account metaphysical matters as such are not compared to natural things in the manner of a universal whole to subjective parts, but as formal things to material things." [47]

This would pose an inconsistency with his reference to the sixth book of the Metaphysics, wherein the three sciences are distinguished by diversity of degree of formal abstraction. On the other hand, it is consonant with his interpretation of Saint Thomas' *abstractio universalis a particulari* in I, q. 40, a. 3, corp.

What then of Cajetan's *abstractio totalis*? It is certainly not to be identified with the *abstractio totius* of Saint Thomas, notwithstanding the similarity in names and the fact that both abstractions are common to all the sciences.

It seems that it cannot pertain to that manner of intellectual knowledge which is primary and direct and wherein the intellect by abstraction knows the quiddity of a thing. On the other hand, it may well belong to the domain of secondary reflex knowledge, wherein the intellect reflects upon its own concepts with a view to ordering and extending the knowledge it has acquired. Here it is possible to consider the universal together with the intention of universality. Under this aspect the universal can be a principle of knowledge, just as abstraction is the principle in the order of direct knowledge.[48]

In actual fact, it is possible to find passages in Saint Thomas' works which seem to imply an abstraction reminiscent of some features of Cajetan's *abstractio totalis*. What is noteworthy in such passages, is the important fact that secondary, reflex knowledge is implied in addition to the direct knowledge in

[47] Cajetan, *loc. cit.* " Abstractio enim totalis communis est omni scientiae. Propter quod metaphysicalia ut sic non comparantur ad naturalia per modum totius universalis ad partes subjectivas, sed ut formalia ad materialia."

[48] *S. T.*, I, q. 85, a. 3, ad 4.

abstraction.[49] Nor is this unusual. It would be an over-simplification to maintain that direct knowledge *alone* is used in the understanding of the quiddity of a thing. This has not been my position here. Both kinds of knowledge are necessary, but concomitance does not prove identity.

Summary

The *abstractio totius* of Saint Thomas and the *abstractio totalis* of Cajetan are held to be distinct for the following main reasons:

I. They differ as *prior* and *posterior*. Cajetan's abstraction *per se* presupposes previous abstraction by the intellect. Saint Thomas' *abstractio totius* does not *per se* presuppose such abstraction.

II. The *totum* in Cajetan's *abstractio totalis does not exist* in reality with the parts which it has in intellect. That of Saint Thomas' abstraction *does exist* in reality with the parts which it has in being understood.

III. Cajetan's *totum* seems contradictory in that it intrinsically involves a many from which it has already been abstracted. That of Saint Thomas does not encounter any such difficulty.

IV. Cajetan's *abstractio totalis* applies to the domain of *reflexive* intellectual knowledge. Saint Thomas' abstraction pertains to *direct* knowledge.

V. Cajetan's abstraction is concerned with the *concepts* by which the intellect understands. Saint Thomas' *abstractio totius* bears upon the *thing* being understood.

VI. Cajetan's *abstractio totalis* involves degrees of abstraction, while Saint Thomas' *abstractio totius* does *not* admit of such degrees.

VII. Cajetan's abstraction is from actual specifics; Saint Thomas' is from individual sensible matter.

[49] For instance—*In de Anima*, Lib. II, lect. xii, n. 379; *Q. Un. de Anima*, a. iv, corp., where Saint Thomas speaks of abstracting a genus from species.

VIII. Cajetan's abstraction proceeds from the distinct to the confused. Saint Thomas' moves in the *opposite* direction: from the confused to the distinct.

XI. Cajetan seems to require *four* different manners of abstraction, while Saint Thomas admits of only *three*.

LEO FERRARI

Mount Saint Vincent College,
Halifax, N. S., Canada.

THE KANTIAN UNITY OF PURE APPERCEPTION *

THERE is in common use in ordinary conversation, the expression " I think," whose meaning is as difficult to analyze as its uses are manifold. We propose to examine one of the meanings of this phrase, namely, that assigned to it by Immanuel Kant in the *Critique of Pure Reason.* Kant claims that it can refer to the synthetic unity of pure apperception. Our task is to discover what he means by that impressive concatenation of words. Since Kant is by no means as clear on this point as could be desired, we shall have to choose between several possible meanings. Our guide will be the necessity of an interpretation that is consistent with the relevant texts, with the entire Kantian philosophy, and with what we conceive to be the purpose of introducing a " synthetic unity of apperception " as a necessary condition of knowledge.

The *Transcendental Analytic* of the *Critique* commences with a plan for the discovery of the Categories, *a priori* concepts which not only are applicable to experience, but without which objective experience, as distinguished from a purely subjective welter of unconnected sensations and impressions, would be impossible. The Categories are defined as " concepts of an object in general by means of which the intuition of an object is regarded as determined by one of the logical functions of judgment." [1] Each Category is a mode or manner according to

* (Editor's Note): The exposition here presented by Fr. Wassmer may be complemented with previous articles published in THE THOMIST which offer a Thomistic critique of Kantian theory. See " Kantian Theory of Sense Intuition: A Critique," by Sister Mary Aloysius, S. S. J., XIX, Oct. 1956, 506-515; " Kant and Aquinas," by Germain G. Grisez, XXI, Jan. 1958, 44-78.

[1] Ewing, A. C., *A Short Commentary on Kant's Critique of Pure Reason* (Chicago: University of Chicago Press, 1938), p. 132.

which passively received sensations are ordered into a system, a network of connected, related elements. Unless sensations were so ordered, there could be no experience of an intersubjective, predicable sort. Kant believes that to each different way of arranging data in space and time there corresponds some Category, and this correspondence is specified by the schemata, referential rules governing the application of the Categories to the sensory manifold. The Categories are also logical features of judgments. The connection between the two apparently different functions served by the Categories will be made clear by a brief look at Kant's views on the nature of the mind.

The only cognitive faculties of the mind are, according to the *Critique,* sensibility and understanding. Sensibility is the faculty of receiving sensations in a passive manner. About the understanding, Kant says:

> Independently of sensibility, we cannot possibly have any intuition, consequently, the understanding is no faculty of intuition. . . . But we can reduce all acts of the understanding to judgments, so that *understanding* can be represented as the *faculty of judging*. . . . All the functions of the understanding therefore can be discovered, when we can completely exhibit the functions of unity in judgments.[2]

These functions of unity in judgments are the Categories. And when we see just how broad are the tasks performed by the versatile Kantian understanding, we shall grasp why Kant considers the Categories to be equally versatile. They are both the logical features of judgments and the *a priori* conditions to which objective experience must conform. The following selection of knarred prose shows just how protean the Kantian understanding is.

> The same function which gives unity to the different representations in a judgment, gives also unity to the mere synthesis of different representations in an intuition; and this unity we call the pure conception of the understanding. Thus the same understanding,

[2] Immanuel Kant, *Critique of Pure Reason* (London: J. M. Dent and Sons, Ltd., 1934, 2nd ed.), p. 79.

and by the same operations, whereby in conceptions, by means of analytical unity, it produced the logical form of a judgment, introduces, by means of the synthetical unity of the manifold in intuition, a transcendental content into its representations, on which account they are called pure conceptions of the understanding and they apply *a priori* to objects. . . .[3]

Kant continues his sketch of the understanding and mentions the crucial idea of conjunction of the elements in consciousness as follows:

But the conjunction of a manifold in intuition never can be given us by the senses; it cannot therefore be contained in the pure form of sensuous intuition, for it is a spontaneous act of the faculty of representation. And as we must, to distinguish it from sensibility, entitle this faculty *understanding*; so all conjunction—whether conscious or unconscious, be it of the manifold in intuition, sensuous or non-sensuous, or of several conceptions—is an act of the understanding. To this act we shall give the general appellation of *synthesis*, thereby to indicate at the same time, that we cannot represent anything as conjoined in the object without having previously conjoined it ourselves.[4]

The above words introduce the possibility that *unconscious* acts produce the synthetic unity of the manifold, and elsewhere Kant suggests that in these unconscious acts the understanding may be the same as what he calls " a blind but indispensable function of the soul " the imagination, or faculty whereby sensory elements are ordered in space and time. On the introspective, conscious level there seems to be no hint of this. The diverse functions mentioned in the above quotation are all allocated to the understanding. This is apparently so because Kant's aprioristic delimitation of the cognitive faculties to the two, sense and understanding, and his belief that sensibility is a purely passive faculty, force him to make the understanding, the only remaining faculty, responsible for all these diverse operations. The convenient result is that the latter faculty is thus shown to be responsible both for the logical properties of judgments and the spatio-temporal arrangements of mani-

[3] *Ibid.*, p. 79.

[4] Ewing, *op. cit.*, p. 81.

folds, that *Erfahrungen* (sense experiences) are characterized by certain spatio-temporal groupings of data, and to each of these modes of arrangement corresponds a Category.

If there is to be any grouping or synthesis of sensory data, then there must be conjunction of these given in some consciousness. Kant analyzes the idea of conjunction and finds that it involves "besides the conception of the manifold and of the synthesis of it, that of the unity of it also." He goes on to say:

> Conjunction is the representation of the synthetical unity of the manifold. This idea of unity, therefore, cannot arise out of that of conjunction; much rather does that idea, by combining itself with the representation of the manifold, render the conception of conjunction possible.[5]

Kant is here talking about the logical relations between different ideas and claiming that the idea of conjunction presupposes that of unity, rather than vice versa. After distinguishing this sort of unity, presupposition of all Categories, from the specific Category of the same name, he makes the point that:

> We must therefore look still higher for this unity (as qualitative), in that, namely, which contains the ground of the unity of diverse conceptions in judgments, the ground, consequently, of the possibility of the existence of the understanding, even in regard to its logical use.[6]

The logical use of the understanding is that use wherein it unites diverse concepts into single judgments, and the Categories, viewed as logical entities, are the ways in which these concepts can be so united. The necessity of a unity is deduced by an examination of the term "single consciousness." This latter is a presupposition of all knowledge and experience, since we would not know how to make sense of either of these terms without conceiving them as denoting something that happens or takes place within a single consciousness.

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[5] *Critique,* pp. 93-4.
[6] *Ibid.*

For the manifold representations which are given in an intuition would not all of them be my representations, if they did not all belong to one self-consciousness, that is, as my representations (even though I am not conscious of them as such), they must conform to the condition under which alone they can exist together in a common self-consciousness, because otherwise they would not all without exception belong to me.[7]

Several phrases are introduced to characterize this unity, the " I think," " pure appreception " and the " subject."

All the diversity or manifold content of intuition has, therefore, a necessary relation to the *I think*, in the subject in which this diversity is found. . . . I call it (the representation *I think*, which is also referred to by Kant as an " act of spontaneity," recalling the active synthesis of the manifold), pure apperception, because it is a self-consciousness which, whilst it gives birth to the representation *I think*, must necessarily be capable of accompanying all our representations. (Parenthesis added.)[8]

This distinction between pure and empirical apperception is of fundamental importance, for it manifests Kant's belief that there is more to the self or ego than simply an empirically derived impression of permanence in consciousness. Such an impression would result from an association of ideas. But any association of ideas logically presupposes a unity in the consciousness which entertains either idea. The association of two or more ideas presupposes that the previous occurred singly, or at least could so occur. Both the entertaining of a single idea and the associating of this idea with another entail that the consciousness which entertains or associates has a unity which is logically prior to either of these operations.

A further terminological convention is introduced by Kant in the following words:

It (the *I think*) is in all acts of consciousness one and the same, and unaccompanied by it no representation can exist *for me*. The unity of this apperception I call the transcendental unity of self-consciousness, in order to indicate the possibility of *a priori* cognition arising from it. (Explanatory parenthesis added.)[9]

[7] *Ibid.*, pp. 94-5.
[8] *Ibid.*
[9] Ewing, *op .cit.*, p. 81.

The first sentence looks ambiguous. Does Kant mean that in everybody's acts of consciousness there is something common, some sort of agent intellect or absolute consciousness which is shared by all mankind? The second clause implies that Kant means only that the phrase "pure apperception" refers to something which is common to all the acts of a particular mind ("mine" or "yours"), but not shared by other minds. Further, this common factor may be purely abstract, such as uniformity of laws operating in consciousness and necessary to it. Or perhaps what is common to all acts of any mind is the possibility which all of them have of being accompanied by an empirical apperception of themselves. We have not yet established that the *I think* must refer to a particular existent or Pure Ego. Kant would certainly say that there is not a directly apprehended datum which is denoted by the "I," since if there were, we would then have direct awareness (*Anschauung*) of an individual existent, and this intuition would be non-sensory. But Kant repeatedly states that the only intuitive faculty possessed by humans is the sensory. Ewing brings out this point very neatly as follows:

> The transcendental unity of apperception is to be distinguished sharply from any object of ordinary empirical perception. Kant wavers between maintaining that we are always conscious of it in some way and maintaining merely that we *can* become conscious of it at any time in connection with any representation. In either case we are conscious of it in a very different way from that in which we are conscious of empirical objects, for we are conscious of it as a presupposition and not as an object of knowledge. To be conscious of it as an object we should require another transcendental act of apperception to make the former its object. Hence it is irrelevant to retort that our representations are in a ceaseless flux and none of them remain identical: skepticism about the transcendental unity of apperception arises from looking for it where it could not possibly be found even if it exists.[10]

So I must have a sensory manifold in order to become aware of the unity of pure apperception, and the belief in such a unity is justified by simple analysis of what is meant by a

[10] *Ibid.*, p. 81.

manifold's being present to a single consciousness. But we have the belief before we engage in the analysis. Kant says that the fundamental principle of the necessary unity of apperception is analytic.

> This fundamental principle of the necessary unity of apperception is indeed an identical, and therefore analytical proposition, but it nevertheless explains the necessity for the synthesis of the manifold given in intuition, without which the identity of self-consciousness would be incognitable.[11]

I assume that the principle referred to could be enunciated as follows: "If there is a manifold in consciousness, then that consciousness must be characterized by the unity of pure apperception." This seems reducible to "If there is a manifold in a single consciousness, then it must be in a single consciousness." That brings out the analytic quality. Now it might be thought that since this principle is analytic it cannot give knowledge of any existing entity other than the elements of the manifold, for analytic propositions have no existential import. But I wish to leave open the possibility that the unity of pure apperception somehow involves a Pure Ego, an existent of some sort which is not a sensory datum and not a part of the manifold. I think that this is consistent with the analytic quality of the above principle. For the principle would contain as one of its terms "single consciousness," and the analysis of this term may reveal that it surreptitiously contains the idea of a pure, non-sensory, existent ego. So if we say "Here is a manifold synthesized within a single consciousness," we would have a synthetic statement asserting the existence of the data comprising the manifold *and* the existence *also* of a pure ego, an existent which is not among these data but whose presence is presupposed if they are to be unified within a single consciousness, for it is responsible for this unity. If we say, "The presence of a manifold in a single consciousness entails a unity of pure apperception," then we certainly have a non-existential analytic statement, and this is, I believe, the principle to which Kant refers above.

[11] *Critique*, p. 96.

Certain distinctions, formulated by C. D. Broad, may help us find out what the unity of pure apperception involves. The latter is invoked to explain and constitute the unity characterizing a single consciousness. Broad suggests that all such theories about the mind's unity or lack of it can be divided into two general classes, "*Centre-Theories*" and "*Non-centre-Theories.*" Since Kant's talk about unity and his belief that the "I think" is for all acts of consciousness one and the same, seem to suggest that he is introducting a Centre-Theory, we shall focus our attention on this possibility first.

Broad's definition is as follows:

> By a centre-theory I mean a theory which ascribes the unity of the mind to the fact that there is a certain particular existent—a Centre—which stands in a common asymmetrical relation to all the mental events which would be said to be states of a certain mind, and does not stand in this relation to any mental events which would not be said to be states of this mind.[12]

The unity in question can be either one or both of two sorts. It can be "transverse unity," i. e., the unity which characterizes a given consciousness at any particular moment of its history, or "longitudinal unity," i. e., the unity through time characterizing the different mental states of a particular person or mind. Kant is certainly referring to transverse unity and perhaps to longitudinal unity also.

Since most centre-theories of mind have posed as the requisite centre a pure ego, and since they have most often supported this contention with speculative metaphysical arguments, we shall consider Kant's condemnation of these arguments in the *Transcendental Dialectic* in order to eliminate some possible views as to what he may have meant by synthetic unity of pure apperception, or rather, some possible views as to how he reasoned to it. But first let us give the definition of a pure ego from the Dictionary of Philosophy.

Ego, Pure: The self conceived as a non-empirical principle, ordi-

[12] C. D. Broad, *The Mind and Its Place in Nature* (London: Routledge & Kegan Paul, 1925), p. 558.

narily inaccessible to direct introspection, but inferred from introspective evidence.[13]

Let us remark that the principle can be some sort of an existent entity, and therefore need not be simply an abstraction. Furthermore, need the pure ego necessarily be inferred? Perhaps one could maintain that it is postulated, that knowledge of it is gained by direct contact, intuition, and/or that it is known only discursively, (as the subject of certain propositions) but *not* inferentially. We owe the latter suggestion to Doctor Broad. The pure ego can be conceived to be a temporally persistent, qualitatively uniform particular, a qualitatively uniform but timeless particular, or a completely unknown X.

Kant's attack in Book II, Chapter I of the *Transcendental Dialectic* is directed against Rational Psychology, or that science which attempts to deduce the existence and properties of the pure ego through *a priori* premises, sometimes supplemented by empirical ones. Kant's delimitation of the initial data of this science is rather strict, since he says, " The *I think* is, therefore, the only text of rational psychology, from which it must develop its whole system." This is held because of Kant's view that the least use of empirical data would " immediately change the rational into an empirical psychology." Kant considers the possible objection that the *I think* reports an intuited, introspective experience of a pure ego, and replies that this phrase is

> . . . nothing more than the mere apperception *I think,* which in fact renders all transcendental conceptions possible, in which we say, I think substance, cause, etc.[14]

Kant thus rejects what the Cartesian argument (*Cogito, ergo sum*) would probably have to mean in order to establish the conclusions which are deduced from it. Kant claims that we simply do not have an intuitive experience of a pure ego, for the only intuitions which we have are sensory ones, and there is no sensory datum serving as pure ego.

[13] Dagobert Runes, *Dictionary of Philosophy* (Ames, Iowa: Littlefield, Adams & Co., 1955), article " Ego, pure," by Ledger Wood.

[14] *Critique,* p. 234.

The essential conclusions of rational psychology are declared to be the following: that the soul is a substance which is simple as regards its quality, numerically identical at all moments of the existence of the person whose self-identity it constitutes, and in relation to any spatial objects that may happen to exist. Notice that Kant's objections are levelled principally against the sort of argument by which these propositions are allegedly established, that is, speculative, metaphysical deduction.

Kant launches his attack:

> We can, however, lay at the foundation of this science nothing but the simple and in itself perfectly contentless representation *I*, which cannot even be called a conception, but merely a consciousness which accompanies all conceptions. By this I, or He, or It, who or which thinks, nothing more is represented than a transcendental subject of thought = x, which is cognized only by means of the thoughts that are its predicates, and of which, apart from these, we cannot form the least conception.[15]

It appears evident that Kant wishes to make the *I think* as contentless as possible. When he uses the word " contentless " he means only that there is no direct awareness (*Anschauung*) of an individual existent which is denoted by the *I*. But when he says the *I* cannot even be called a conception, he may be going too far, because we have at least the idea of it as a necessary condition of singleness of consciousness, the use of the understanding in any of its functions, the awareness of a manifold, and so on. Now perhaps we shall have to ascribe certain properties to this *I*, if it is to serve the function for which it was introduced. Perhaps, in other words, we can develop a fuller conception of what it means.

The error of rational psychology consists, according to Kant, in the supposition that because the *I* can function only as the logical subject of propositions, its mode of existence must therefore be that of a substance. It is then held to be an entity whose existence is independent of all thought, and its properties, simplicity, immortality, and so forth, are deduced. It is conceived to be the ultimate basis of personal identity, to persist

[15] *Critique*, p. 236.

through time, to exist whether or not the person who owns it is thinking, and to be the ultimate reason why all my thoughts can be called *mine*. The root of the entire venture can be seen to be the tendency to predicate both existence and the Category of substance of anything which in thought functions only as the logical subject of propositions. Kant believes himself to have demonstrated that the Category of substance is known to be applicable only in the case of sensory experience. This is because the same function by which a manifold is ordered in a certain way is responsible for the conception of substance in the understanding, and the predication of this Category of something can be known to give rise to a true judgment only if the subject of the judgment denotes a manifold.

Now it might be objected that when we say "I think" we do relate this "I" to an ordered manifold, as, for example, when we say, "I am presently warming myself by the fire." That we are referring to an ordered sensory manifold is demonstrated by the fact that another person could verify the statement by making the relevant observations. And the Category of substance would be applicable to what he would see warming itself by the fire. However, Kant has limited the initial data of rational psychology to the *I think* of pure apperception, and the *I* in the example above would be at best the *I* of empirical apperception. The subject in each case denotes something different, assuming that the *I* of pure apperception *denotes* anything at all. We should have to establish the meaning of pure apperception before we could hope to determine its relation to empirical apperception.

Is it possible that what is denoted by the *I* of pure apperception is nothing more than the characteristic functions of minds, the qualitative similarity of logical and categorical operations, regardless of the particular mind in which they are performed or the particular empirical self by which this mind is given personal identity? Pure apperception would thus refer to that which distinguishes mind or consciousness from anything else. Kant does say:

And thus the conception of the simple nature of substance, which

is connected with the objective reality of this conception, is shown to be also invalid, and to be, in fact, nothing more than the *logical qualitative unity of self-consciousness in thought;* whilst we remain perfectly ignorant whether the subject is composite or not. (Italics added.)[16]

On this view, the *I think* would mean " thought is taking place," and the unity involved would be the uniformity of logical operations whenever and wherever they take place. By "logical operation " would be meant any use of the understanding. This interpretation would give meaning to Kant's previously quoted statement that pure apperception is " in all acts of consciousness one and the same."

However, this interpretation would mean that pure apperception and its unity referred simply to those notes which distinguish mind from whatever else there may be. There would be no reference to that which makes a single consciousness single. In this case Kant's talk about the " identity of the subject " and the " transcendental subject of thought=x " would apparently have nothing to do with pure apperception. But the contexts in which these expressions appear make clear that they constitute what is meant by pure apperception. We are forced to conclude that this expression does have something to do with a theory of what constitutes the unity of particular minds.

Could we not suggest that pure apperception refers to both a necessary condition and a possibility? The necessary condition is that which must be met if perception of or thinking about a determinate object is to take place. The manifold in question, or the ideas in question, must be synthetically unified in a single consciousness. The possibility is that any being which is conscious of a determinate object can produce a true proposition stating that the diverse elements which constitute that object are presently within a single consciousness, namely, his own. Such a statement would always take the form " I think. . . ."

[16] *Critique,* p. 240.

This view of the nature of pure apperception seems to be what Körner has in mind when he says:

> For this unity (of pure apperception) it is not necessary that I should permanently think about my presentations. Nor is it necessary that when I think about them I should be aware of them as *my* thinking and *my* presentations. All that is required for the unity of myself in thought and perception is the *possibility* of this self-consciousness.[17]

The trouble with the view outlined above, to which Körner's words do not fully commit him, of course, is that it says either too little, or else it says the wrong thing. It says too little if it is interpreted as follows. Part of what is meant by " unity of pure apperception " is " necessary condition of awareness of determinate objects." There is no explanation of the nature of this necessary condition, or of how much can and cannot be known about it. The interpretation just gives one of the functions served by the term " pure apperception " in the Kantian theory, this is, the function of substituting for the clumsy phrase " necessary condition of the awareness of determinate objects," whenever this phrase occurs. But it does not tell me what other terms could be substituted for " pure apperception." How about " pure ego "? " substantial soul "? Or perhaps " mere qualitative logical uniformity of thought "? So this interpretation would tell me nothing about *how* and *why* pure apperception is a necessary pre-condition, but only *that* it is. It also says too little about pure apperception as a possibility. Pure apperception is held to mean only that consciousness of a determinate object by a given mind entails the possibility that this same mind can produce a true proposition of the form " I think . . .(the object in question)." However, the theory gives me no information regarding the nature of the *nominatum* denoted by *I*. It could mean " this particular substantial soul," " this aggregate of mental states," " this particular empirical self," or as many different things as there are theories concerning the nature of the mind. Since Kant's unity

[17] S. Körner, *Kant* (Hammondsworth, Middlesex: Penquin Books, 1955), p. 61.

of pure apperception involves a particular theory as to what constitutes the singleness of any mind, explanations of pure apperception must indicate the peculiar distinguishing properties of the theory.

Consider again the formula "Pure apperception refers both to a necessary condition and a possibility." This could be interpreted as saying quite enough, that is, as giving us a theory about the mind's unity, but not what I believe to be Kant's position. This new interpretation would first of all identify the possibility and the condition, by saying that "The necessary condition of the mind's unity is the possibility that. . . ." And the possibility would be of an empirical apperception of the subject, no more. Thus, all that we should mean by "This is a single consciousness" would be "this is an ensemble of representation which can be accompanied by the apperception of an empirical self." What is meant by the apperception of the empirical self is simply another ensemble of representations bearing the name "I." The sentence "I am standing next to the desk" reports an apperception of an empirical self. The *nominatum* of "I" in this case is a manifold of sense data, those next to the desk, and perhaps also some other data, such as memories. So this view of pure apperception would simply mean that any ensemble of representation synthesized must be capable of being accompanied by an apperception of an empirical self. It would mean nothing more than this. If there were no empirical apperception which could be called into consciousness in connection with any ensemble of representations, then these representations could not have any connection among themselves and could not be said to be in a single consciousness.

It is evident that this interpretation is a non-central theory of mind. What is held to constitute the mind's unity is a particular sort of event-apperception of an empirical self, or rather, the possibility of it. This empirical self is not a particular existent which stands in a relation of ownership to all states of a given mind, and what is referred to by the "I" is not always the same thing whenever a given person uses it to report different apperceptions of his empirical self. He would

actually have apperceptions of different empirical selves at different times, all of these " selves " being his. We shall attempt to show that Kant's theory involves something which is a bit more permanent and substantial at the core of the mind; that his theory is, in fact, a centre theory.

The difficulty with this is that it is not easy to produce a centre theory which does not involve a substantial pure ego, in the sense in which rational psychology uses the term. But Kant wishes both to advance a pure ego theory and to reject that proposed in rational psychology, as is indicated by these words:

> The proposition of the identity of my Self amidst all the manifold representations of which I am conscious, is likewise a proposition lying in the conceptions themselves, and is consequently analytical. But this identity of the subject, of which I am conscious in all its representations, does not relate to or concern the intuition of the subject, by which it is given as an object. This proposition cannot therefore enounce the identity of the person, by which is understood the consciousness of the identity of its own substance as a thinking being in all change and variation of circumstances.[18]

If the subject is a substance, as rational psychology would have it, then it must be in principle capable of existing independently of any representations. This independence is part of what is meant by calling it a substance. Now the Kantian ego is defined as that which exists only to constitute the unity of a single consciousness. It does exist, to be sure. But we cannot know whether it can or does exist independently of conscious states unless we can prove that there is some identity between it and the noumenal self of the *Critique of Practical Reason.* What would be required of it, if it were capable of " enouncing the identity of the person," would be its numerical identity in *all* the conscious states of the same person and the unconscious states as well. This is so because what we generally mean by a person is something that can be either conscious or unconscious, and is both at different times. The Kantian pure ego, we believe, can be known only as that which is the principle of

[18] *Critique,* p. 248.

unity in a single state of consciousness, the principle of "transverse unity." Whether it is the same in different conscious states of the same person, and whether it persists throughout his unconscious states, is something which cannot be known.

Kant's argument comes to this. If I am to discuss knowledge, I must discuss it as existing in a single consciousness. This is shown to be an analytical proposition. If I am to talk about a single consciousness, I must be capable of offering distinctions between consciousness in general and non-conscious things, and also between this consciousness and that consciousness. In practice, of course, the latter distinction is made on the basis of empirical apperceptions of the selves in question. This, however, will not do for the theory, because the very concept of an empirical apperception implies the presence, within a *single* consciousness, of those representations which constitute an empirical apperception. Therefore, what I do in practice by means of empirical appreception, is distinguish *my* particular consciousness from *your* particular consciousness and from *his* particular consciousness. However, before the idea of empirical apperception can ever be given any meaning, I must have given meaning to the concept of a single consciousness in general, for an empirical apperception is something which, by definition, must occur, like any other conscious event, within a single consciousness; therefore, the definition of empirical apperception presupposes the definition of a single consciousness. I cannot invoke the former to give meaning to the latter, for this would be plainly circular.

"Single consciousness" implies conjunction of a manifold; conjunction implies an ensemble of elements with a principle of unity. The principle of unity in question is a Pure Ego which actually exists. It stands in a common asymmetrical relation to all elements which are said to be "within a single consciousness now," a relation of "ownership." That is what we mean when we say "Pure Apperception." The only positive thing that we can know about it is that it is a particular which is the subject of all these relations; this is what Kant means when he says that it is a "transcendental subject of thought=x, which

is cognized only by means of the thoughts that are its predicates, and of which, apart from these, we cannot form the least conceptions." It is what Maréchal refers to when he says:

> Perception of objects shows me their relation to the unity of a single consciousness. I know that this unity, as is the case with every synthetic unity, is " a priori ": I know myself, then, as the " a priori " condition of all these phenomena of which I am conscious, that is, in my formal relation to their diversity. In this sense I have " consciousness of self," if you wish, but only as a " unifying point of synthesis for the phenomena." [19]

It must provide some sort of " longitudinal unity " (unity through time), for any single conscious state must, on Kantian principles, have duration. At the same time, it need not provide the longitudinal unity which connects the different states of the consciousness of a single person, for its only function is to act as the necessary condition of the existence of a single consciousness, and " a single consciousness " does *not* imply " composed of several successive states " as it would have to be, if the Pure Ego were interpreted as necessarily providing this sort of longitudinal unity. While the Ego does provide some sort of unity through time, it is not itself temporal, because only intuitions can be temporal and we have no intuition of the Ego. It, is therefore, best described as a timeless particular.

What are its relations to personal identity? Few and far between must be the reply. In addition to the differences already brought out between the two, we should note the following similarity. At any moment of time, if there are two single consciousnesses, there must be two numerically different particulars, Pure Egos, each of which serves as the principle of unity for one of the minds. The two Egos need not be qualitatively, but only numerically different, assuming that this

[19] La perception des objets me montre *leur* rapport à l'unité d'*une* conscience; je sais que cette unité, comme toute unité synthétique, est a priori: je me connais donc comme la " condition a priori " de tous les phénomènes dont j'ai conscience, c'est à dire dans mon rapport formel à leur diversité. En ce sens j'ai " conscience de moi," si l'on veut, mais seulement comme " unité de synthèse des phénomènes." J. Maréchal, S. J., Le Point . . ., (Paris: Desclée de Brouwer, Troisième Edition, 1944), Cahier III, *La Critique de Kant*, pp. 203-204.

can be the case between any two entities. We can say therefore, that at any given time there must be at least as many Egos as there are separate minds in operation, though, of course, there may be more, since we can neither assert nor deny that the Ego exists independently of consciousness.

The Ego of Pure Apperception must stand in the relation of ownership, not only to all the elements present in that particular consciousness at that particular time, but also to the subconscious activity by which the manifold is produced. For to say that an activity produces this particular manifold is to imply the distinction of this particular manifold for any other. This means referring to its synthetic unity, which means referring to the principle of this unity, which is, of course, the Self of Pure Apperception. As Kant has said:

> The supreme possibility of it (all intuition, and therefore, all consciousness) in relation to the Understanding is: that all the manifold in it be subject to conditions of the originally synthetical Unity of Apperception.[20]

THOMAS A. WASSMER, S. J.

St. Peter's College,
Jersey City, N. J.

[20] *Critique,* p. 96.

NOTES ON OUR CONTRIBUTORS

WILLIAM A. WALLACE, O.P., M.S., Ph.D., S.T.D., an associate member of The Albertus Magnus Lyceum for Natural Sciences, author of *The Scientific Methodology of Theodoric of Freiberg*, and lecturer for a Newman Club series on philosophy and modern science, is Professor of Natural Philosophy at the Dominican House of Studies, St. Stephen's Priory, Dover, Massachusetts.

BRUNO WEBB, O.S.B., Ph.L. (Subiaco Congregation, O.S.B.), a graduate of Cambridge University, author of the book *Why Does God Permit Evil?* and a frequent contributor to *The Downside Review*, is assigned now to Pluscarden Priory, Elgin, Moray, Scotland.

EDWARD D. SIMMONS, Ph.D., a frequent contributor to scholarly journals, is Assistant Professor of Philosophy at Marquette University, Milwaukee, Wisconsin.

LEO FERRARI, B.Sc., Ph.D., a graduate of Laval University, began his studies of philosophy at the Aquinas Academy, Sydney, Australia, and is now on the faculty of Mt. St. Vincent College, Halifax, Nova Scotia, Canada.

THOMAS A. WASSMER, S.J., Ph.D., a graduate of Fordham University and contributor to many American and European journals of philosophy and theology, is engaged in the preparation of *A Phenomenological Study of Guilt* at St. Peter's College, Jersey City, New Jersey.

RUDOLF ALLERS, M.D., Psychologist and author of many scholarly works, a frequent contributor to THE THOMIST and other philosophical journals, is a Professor at Georgetown University, Washington, D.C.

THOMAS GILBY, O.P., Ph.D., of Blackfriars, Cambridge, England, author *Philosophy of St. Thomas Aquinas*, has been Visiting Professor in the Graduate School of Philosophy, Notre Dame University, Notre Dame, Indiana.

RAYMOND J. NOGAR, O.P., Ph.D., associate member of The Albertus Magnus Lyceum for Natural Science, recent guest lecturer at the Philosophy of Science Institute, St. John's University, is a Professor in the Faculty of Philosophy, Dominican House of Studies, River Forest, Illinois.

JOHN A. OESTERLE, Ph.D., former Fulbright Research Scholar, member of the Department of Philosophy at the University of Notre Dame, who contributes frequently to THE THOMIST and other scholarly journals, is author of *Ethics: The Introduction to Moral Science.*

PAUL VAN K. THOMSON, Ph.D., author of the recent book, *Why I Am a Catholic*, also of essays and studies on Lord Byron and Francis Thompson, is an Associate Professor of English at Providence College, Providence, Rhode Island.

BOOK REVIEWS

Psychoanalysis, Scientific Method and Philosophy. Edited by SIDNEY HOOK. New York: New York University Press, 1959. Pp. xiv, 370, with index. $5.00.

This symposium was held at the Institute of Philosophy at New York University in March 1958. Three topics were discussed: Psychoanalysis and Scientific Method, Psychoanalysis and Society, Psychoanalysis and Philosophy. On each of these topics three reports were presented. There are, furthermore, eighteen contributions by other participants, submitted after the close of the Institute, whose length varies from one to twenty-six pages. It is regrettable that there is no report on the discussion itself; it would have been interesting to know how the psychoanalysts and their friends replied to the several critical objections.

Two papers on methodology were read by psychiatrists, H. Hartmann and L. S. Kubie; the third by E. Nagel; "Methodological Issues in Psychoanalytic Theory" examines critically the logical structure of Freud's doctrine and the nature of the empirical evidence supposedly supporting this theory. Nagel finds fault with psychoanalysis in both respects; his remarks deserve serious consideration on the part of anyone desiring to arrive at an objective appraisal of the theory; they do not, however, deal with questions of a strictly philosophical nature and, therefore, cannot be summarized here. The same applies to the papers on psychoanalysis and society by A. Kardiner, E. van den Haag and A. Inkeles.

M. Lazerowitz spoke on the "Relevance of Psychoanalysis to Philosophy." The paper reproduces, in an abbreviated form, ideas which the author has developed in his *Structure of Metaphysics* (New York, 1955). "There is evidence . . . for supposing that the philosopher, despite all appearances, does not use language to express scientific propositions but instead uses it in such a way as to create the illusion of doing so, while in fact he gives expression *only* to his unconscious fantasies." (Italics L.'s.) One is not a little astonished to hear such a confession of unadulterated psychologism sixty years after the publication of Husserl's *Prolegomena.* Even if it could be demonstrated, *per impossible,* that the ideas of a philosopher originate from "unconscious fantasies," such a demonstration would have no bearing on the validity of the ideas themselves. Newton, too, may have been motivated by some such fantasies, but they do not enter into the structure of his physics and neither enhance nor diminish the significance of the law of gravitation.

Having thus made a methodological principle out of the "genetic fallacy," Lazerowitz proceeds to analyse the philosophies of Bradley and Spinoza.

The latter's statements "that all things are in God" and "without Him could neither exist nor be conceived" justify, in the eyes of the speaker, the assumption that Spinoza's curiosity concerning the problem of birth had remained unsatisfied. And so on. It does not seem, so far as one may judge from the printed statements, that this performance, which is as naïve as amazing, created a favorable impression on the audience. Although there is a rather halfhearted defense by J. Hospers (in one of the appended papers), one finds only severe criticism of Lazerowitz, especially in the two reports by D. C. Williams of Harvard and A. Flew of North Staffordshire, England. S. Hook and R. Demos, too, view the ideas of Lazerowitz as quite unacceptable. Williams points out that another philosophizing analyst or psychoanalyzing philosopher, L. Feuer, has proposed a different interpretation of Spinoza as a "cringing masochist." It is not, says Williams, our part to marvel that men can "read through Spinoza and come out with such scraps of junk, but only to comment on the farcialness of the logic to which philosophical psychoanalysis drives its devotees." A harsh judgment, but one which is perfectly justified by the vagaries of men like Lazerowitz.

One has reason to be grateful to the participants of this symposium for having made clear the illegitimate use of psychological procedures—whether they be empirically well founded or not—in discussions on things philosophical. Philosophers, of course, will not be disturbed by such opinions; they can afford to brush them aside. But there is more to it. This mode of looking at intellectual achievements penetrates everywhere. The concluding words of Demos deserve to be quoted in length:

> It used to be that a teacher reading a Ph. D. thesis with whose ideas he disagreed would say to himself: "Of course, this is nonsense; what I want to know is whether it is the right kind of nonsense." Now, it seems, we are to say that an opponent is not just a fool, but a neurotic and a schizoid to boot. . . . Why argue with my opponet if I have no respect for his intellect? Let us return to the honorable tradition of philosophical discussion. And if psychoanalysis is to be used, let us apply it to ourselves, searching our hearts for secret motives and vanities; but let us leave the other fellow alone.

These are words of wisdom on which to meditate.

If one looks at the outcome of these reports and discussions, one may feel that a notable step has been made forward to a clarification of our ideas on psychoanalysis and its significance. One realizes, on one hand, that Freud's original ideas will have to be modified and clarified in more than one respect if psychoanalysis is to justify its claim to be a scientific discipline; on the other hand, that philosophy will have to take account of the empirical findings, so far as they can be shown to be just this and not statements cast in the language of a preconceived theory. Such theory cannot be considered relevant in the field of philosophical endeavor. It must be noted, though, that this symposium is concerned exclusively with

Freudian ideas and that other schools of medical psychology, be they dependent on Freud or not, are hardly mentioned. In regard to Freudian psychoanalysis, however, the perusal of these papers will certainly further understanding and critical appraisal.

RUDOLF ALLERS

Georgetown University,
Washington, D. C.

We Hold These Truths: Catholic Reflections on the American Proposition. By JOHN COURTNEY MURRAY, S.J. Sheed and Ward. Pp. xiv, 336. $5.00.

Were politics merely to treat of the morally permissible, as Vincent McNabb once declared, the dispute between the temporal and spiritual powers would go scarcely deeper than or be different in kind from accomodations between the village policeman and the parish priest. In fact, however, the indifference of politics towards morals, including religion, has rarely been a working theory, though manifestly hostility has been a frequent practice. For when the community is truly civil, that is not merely a collection of people making the same noises or enclosed, as Aristotle said, by the same wall, it will reach for ends which politics assume and which can be discussed only by asking and attempting to answer psychological and theological questions about the nature of man and his destiny. Some of these appear in the Report of the Commission, appointed by President Eisenhower, on National Goals.

The political history of the classical world and most of the world's great cultures is not a tale of two cities. That began only with the entrance of Christianity into the Roman Empire, and even so, it was developed only in the West, in one direction by the Augustinist contrast of the *civitas terrena* and the *Civitas Dei,* in another by the Thomist distinction of functions within a single polity. Moreover when this last was so pressed that State and Church became separate legal corporations, it is slapdash to represent the differences between them as being that the State is concerned only with what we do with our bodies while the Church is concerned only with what we do with our souls; and the dualism becomes all the more confused when it is put into the categories of public and private life, of penal and moral law, of natural and supernatural virtue, of the profane and the sacred, and of this world and the next. These slip into clichés which can conceal the State's possession of rights which engage Christian obedience as objects and not merely as occasions of virtue. The believer is left with a divided mind, the size of each half depending on the ratio of his " worldliness " to his " church-going," while the secularist is well

content to reckon only with the one and be good-mannered and incurious about the other.

One great merit of Fr. Murray's essays is to challange this state of affairs, and less on religious grounds than from the high political position of his own country. He does that courteous and most difficult thing, he conducts a dialogue with those who differ with him on the principles where they agree, and keeps to the medium of proper conversation within the City and under the law. In logical terms, he raises contraries rather than contradictions, for he seeks the continuance of argument, not its closure. What lies at the root of agreement is reasonable assent and unfeigned loyalty to a set of constitutional principles declared at the independance of the American Nation and augustly maintained and developed ever since. To this " proposition," as it was called by Abraham Lincoln, and justly, for it is at once a doctrine and a project, Catholics are not late adherents, whatever may be the findings of historical sociologists. For though the Natural Law of the Fathers of the Republic may have been clad with the verbiage of the Englightenment it was rooted sturdily in layers formed by the Church, namely the English Common Law and the Christianized philosophy of Greece and Rome.

It is a strength of America to represent a very old world, older than the era of Concordats, and older than those Latin politico-ecclesiologists dominated by memories of religion either privileged by the King or dispossessed by the Assembly. The very notion of a free Church in a free State is foreign to their experience, and, while not disposed to seem ungrateful for the advantages that follow across the Atlantic, they can appear as nonplussed as the Nuncio at Paris was in 1783 when he sounded Benjamin Franklin about the establishment of a bishopric and was told that the States did not conceive themselves to have the authority either to permit or refuse such an exercise of spiritual jurisdiction.

Some see the dangerous error of indifferentism in a State not pledged to protect the prerogatives of the Church. They include those who treat the *Imperium,* and the *Studium* too, not as principal causes but as merely instrumental to the *Sacerdotium,* or who recognize in a Natural Law agreement no more than a minimum basis or conventional framework extrinsic to virtue. Not all of them notice that because nobody has the right to propagate error it does not follow that nobody has the legal right to stop them. They do not belong to the tradition which can be traced through Bellarmine, John of Paris, and Aquinas back to the ideal of a free State in a free Church.

So. Fr. Murray may find critics behind him as well as in front of him among the people to whom he addresses himself. His argument is set forth both clearly and at depth, and with a dignity and modesty that deserve debate, not denunciation. Some may think that he hits out rather wildly at Locke, but then he is already in his thirteenth round, and perhaps

losing his puff. He offers variations on two themes, that civil government should practice the virtue of self-denying ordinances, and that true democracy is not the rule by the majority of the minority.

As to the first, it may be remarked that nowhere in the American structure is there accumulated the plentitude of legal power possessed in Great Britain by the Queen in Parliament. Fr. Murray shows that the American limitation of governmental powers guarantees the Church a stable condition of freedom as a matter of law and right. Historically it springs from no spirit of Jacobin secularism nor of religious indifference, such as Gallio's, " who cared for none of these things," but of solicitude to compose the articles, not of religious dogma, but of civic peace. If there is neutralism, then it is rather like that of those Irishmen in the Great War who professed that they were belligerent neutrals. In fact, however, America is officially committed to the affirmation of God's sovereignty, of human rights antecedent to positive law, and to the principle of consent.

As to the second, that is really the heart of the book, a reasoned plea for Americans to look into the moral and political philosophy on which their country is built. The *res publica* is less extensive than the *bonum commune;* the State is not the whole of society, nor does it seek to absorb the citizen completely; it maintains an active tolerance of personal values and free associations, even when, as they inevitably do, they form power groups. The *E Pluribus Unum* is not a flat conformity but an agreement in pluralism, a manifold in analogy such as calls for metaphysics if it is to be explicated and poetry if it is to be sung. It is not for a stranger to harp on the substitutes that are offered and exported instead, for Americans themselves are the best critics of these infantilities and banalities. But he can say this, that their prestige is never higher than when they are searching their own minds and hearts, and a book such as Fr. Murray's provides one of the reasons why they will always keep their staunch friends abroad.

THOMAS GILBY, O.P.

Blackfriars, Cambridge.

The Scientific Methodology of Theodoric of Freiberg. By WILLIAM A. WALLACE, O.P. Fribourg, Switzerland: University Press. 1959. Pp. 395. FR./DM 22.

This scholarly case study of the relationship between science and philosophy is an important addition to the *Studia Friburgensia* published under the direction of the Dominican Professors at the University of Fribourg.

The relationship of modern science and philosophy is, first of all, very much the proper object of the study of a competent historian, that the history of science might be read forward and not backwards. This book

is a highly competent historical treatment of scientific method. A corollary to this is the necessity, in a case study approach, for accurate, detailed biographical material on the intellectual development of the scientist's thought. This book is an effective biography of the great Dominican experimental scientist of the 13th Century, Theodoric of Fribourg (1250-1310). To understand the philosophical tradition which formed the context of Theodoric's scientific work, it is further necessary to get an accurate and intelligible understanding of the Aristotelian methodology of the natural sciences, a task not always successfully accomplished by those treating of the work of the experimental scientists of the Middle Ages. THE SCIENTIFIC METHODOLOGY is a thorough treatise on Aristotelian methodology.

Furthermore, it is necessary to the case study approach to the science-philosophy problem that there be a professional treatment of a truly significant scientific contribution. This book is a fascinating treatise on the rainbow and related optical phenomena. The reader is offered not only a detailed account of the magnificent contribution of Theodoric himself, but also a fully documented record of the progress of optical science from the time of Theodoric, through Descartes and Newton, to the present.

Finally, and this is the unifying motif of this multi-dimensional case study, the author takes his singular position among Thomist philosophers of science, attempting to answer the question: Is "science" in the modern understanding of the word, specifically distinct from "natural philosophy" as conceived in the Thomistic tradition? Though this book may fruitfully be read from any one, or all, of these points of view, it is impossible, in a short review, to reproduce the sense of organic unity which the author intended by his case study approach.

THE SCIENTIFIC METHODOLOGY is the mature work of a graduate physicist who spent two years in test laboratories doing research in magnetic and acoustic field theory, four years in pure research in ultrasonics, qualifying him to judge competently in matters of modern scientific methodology. Fr. Wallace is also a graduate philosopher of science and professor of natural philosophy at the Dominican House of Studies, giving him title to speak authoritatively about his specialty, Aristotelian methodology in the natural sciences. He spent four years in post graduate studies on historical techniques, combing the libraries of Europe for original source materials on the medieval origins of modern science, concentrating on the life and works of Theodoric. Consequently, no matter how the reader may evaluate the results of Fr. Wallace's work, he must grant that the multi-leveled treatment of the science-philosophy problem could not be successful without the rare qualifications of the author of THE SCIENTIFIC METHODOLOGY.

In the first chapter, Fr. Wallace explains his choice of the case study method of presenting the problem and carefully defends his selection of the work of Theodoric; he has found in Theodoric's life work an excellent

example of great simultaneous scientific contribution to the problems of optics and rigorous application of detailed Aristotelian methodology of natural science.

Because the foundations of Theodoric's scientific methods are vital to his thesis, Fr. Wallace then proceeds, in chapter two, to explain Theodoric's methodology. This chapter is one of the best treatises on Aristotelian dialectics available.

In chapter three, the author introduces one of the most crucial elements of Aristotelian natural science, the qualitative aspect of Theodoric's approach to scientific questions.

In chapter four, Fr. Wallace takes up the scientific question with which Theodoric was preoccupied: optical phenomena. After a brief history of optical studies, the reader is introduced to the problem of the rainbow and radiant phenomena which confronted Theodoric. The application of Theodoric's methodology to the issue is described in detail, with a summary analysis of the " scientific " and the " philosophic " aspects of Theodoric's method. It is at this point that the author is able concretely to relate and document his thesis that experimental science in its best historical tradition combined a thorough qualitative, causal analysis of sense data with the use of quantitative, experimental procedures in the modern vein.

Chapter five traces the problem of optics through its later developments, from Theodoric to Descartes, Descartes to Newton, Newton to the present, with the very interesting observation, (highly challenging from the standpoint of historical interpretation of scientific work) that Newton's contribution to the optical problem, now accepted as most stable, was based rather on the Aristotelian tradition in which Theodoric worked than on the hypothetical and purely quantitative approach stemming from the Cartesian tradition.

From this scrupulously documented analysis of the work of Theodoric (the author adds an appendix of previously unedited opuscula of Theodoric), and from the scientific history of the development of this optical problem through the 14th, 15th and 16th Centuries, the author defends the reliability of the method and permanent contribution to the understanding of the rainbow resulting from Theodoric's analysis. Descartes introduction of a method based upon a misunderstanding of the use of hypothesis added nothing to the understanding of the scientific problem. Newton's return to the causal analysis of Theodoric, by which, contrary to Descartes, he thought he could arrive at demonstrable certitude concerning the nature of the rainbow, advanced the science of optics toward its present respectable state. The methodology by which this scientific development was assured was not the method of mere hypothesis and statistical, quantified experimentation, but rather the method of drawing qualitative inferences of a probative character.

So, the author argues, we are brought logically to the final conclusion to

be drawn from this case study. Both Theodoric and Newton regarded their "science" as a specialized application and continuous development of "natural philosophy" in the traditional issues of the phrase. Some historians of science rashly drive a wedge between "scientific methodology" and "philosophical reasoning" in explaining the developments of the 17th century, reading history backwards from the jaundiced view of a positivistic philosophy of science. The postulational and hypothetical approach was used by Theodoric and Newton, but only in the sense of a preliminary dialectic or investigative technique. Both Theodoric and Newton thought that their methodology ultimately arrived at, not merely conjecture, but a permanent contribution: demonstrative certitude about the nature of the reality of the world they studied.

Thus, so far as the history of this scientific question is concerned, the author concludes, the simple contemporary assertion that science answers the question "how" and philosophy answers the question "why" breaks down; the assertion that science seeks only a functional, empiriological intelligibility whereas philosophy seeks essential causal intelligibility also finds little documentation in the scientific history of optics. The scientist may, if he wishes, settle for provisional answers based upon hypothetical procedures, and many cosmic questions may ever remain in this state, but, the author concludes, the most realistic solution of the science-philosophy problem today, is to integrate them at the same level that Theodoric and Newton did, using a methodology which, whenever possible, aims at demonstration and permanent solution concerning the nature of the world in which we live.

Fr. Wallace's thesis is rigidly argued and documented with tireless scholarship. Many, no doubt, will not find every page equally convincing, every inference equally compelling. But even if the reader finds room for serious disagreement with the author's thesis, he will be rewarded by a refreshing kind of science history, one which dispells many myths about the early stages of the development of modern science, one which inspires the reader to ask that the scientific methodology of great scientists of the past be examined with more patience. Modern science may have lost more, in all its development, than it has gained. *The Scientific Methodology* is a bold attempt to assure us that science need not lose the wisdom of the past as it discovers daily a new way to press forward.

RAYMOND J. NOGAR, O.P.

Dominican House of Studies,
River Forest, Illinois.

Word and Object. By WILLARD VAN ORMAN QUINE. New York: John Wiley & Sons, Inc., and The Technology Press of the Massachusetts Institute of Technology, 1960. Pp. 294, with index. $5.50.

Words about words can apparently be written without end, and one is tempted to pick up any current book on the subject with something of a resigned sigh. Still, there must be abiding interest and philosophical value in writing words about words; the Greeks, after all, started it and there is no end in sight. Nevertheless, the Greeks (and the Medievals, for the most part) focussed their attention, not primarily on words and symbols for their own sake, but on the function of words to convey thought about things. Many contemporaries leave the impression that dissection of verbal and symbolic expression is an end in itself and perhaps the highest of philosophical pursuits.

But Professor Quine's book bears the title *Word and Object* and thereby purports to be "an inquiry into the linguistic mechanisms of objective reference." And it must be said at once that in many important respects Quine lives up to his title. On topics and issues taken up, the patient reader finds a thoroughness of investigation and exposition, starting with the modest but necessary "beginning with ordinary things" in the opening chapter of "Language and Truth." The author initially and soundly recognizes that since language is a social art, not only is it acquired by intersubjectively available clues, but it must accordingly be investigated in a similar fashion. Thus we reflect on how we start with single words as wholes—one-word sentences—and then learn words as parts of longer sentences and so build up our use of language and thereupon generate our knowledge of the world.

With this quite elementary and therefore quite sound beginning, and with an interesting second chapter on the difficulties of retaining meaning in translation, noting in particular an inevitable factor of indeterminacy in any translation, we then come to something of a switch in approach. The third chapter, entitled "The Ontogenesis of Reference," leads one to expect the sort of relating of word to object that the title and opening chapters suggested; instead, in order to study a "semantics of reference," we are forced to direct our attention to the study of language from within. Such a method, of course, has much to commend it, but the suspicion arises at once that we may become, as we usually do in studies of this kind, encased in language and linguistic structure. The word may become the object after all, with forms of language and symbolism becoming the forms of reality. Professor Quine's intent, to be sure, is to treat both word and object (despite the ambiguity of the word "object") but starting with the third chapter, the preoccupation with the development and structure of our referential or linguistic apparatus makes it difficult to retain the distinction as well as relation between word and object which we have been led to expect and which Quine himself seems always to have in mind.

Nonetheless, the ensuing chapters offer many illuminating remarks and penetrating investigations of language, both as analyzed and as used. The exposition of the referential function of language in Chapter Three is of particular interest. Quine speaks of phases of referential function of language. Thus, in the first phase, terms like "Mama" and "Water" are learned as names of spatiotemporal objects. The second phase introduces general terms and demonstrative singular terms. The third phase brings compound general terms, i.e., the attributive joining of general terms. The fourth phase, in applying relative terms to singular or general terms, e.g., "smaller than that speck," serves principally to give access to new objects. This widening of the referential horizon is continued in further phases of relative clauses and abstract terms. Discussion of these phases along with apt illustrations makes this chapter rewarding and instructive reading.

The following chapter, "Vagaries of Reference," is a study of the indeterminacies and irregularities of reference which pervade language as a going concern. Quine sensibly does not view vagueness as something intrinsically evil that should be eliminated as far as possible. He recognizes that vagueness is a natural consequence of the mechanism of word learning, noting further that vagueness is not incompatible with precision. Ambiguity, which he discusses next, differs from vagueness: "vague terms are only dubiously applicable to marginal objects, but an ambiguous term such as 'light' may be at once clearly true of various objects (such as dark feathers) and clearly false of them" (p. 129). A good deal of this chapter is devoted to various ways in which ambiguity of terms arises, and also ambiguity of syntax and scope. Curiously enough, the most important feature about ambiguity is almost completely overlooked, namely that type of 'systematic ambiguity' which consists in the analogical naming of words. Quine refers to words which are analogical in this way ("true," "light") but fails to note or bring out how different such ambiguity is from other types of ambiguity. The failure to note the significant role analogical words have in our coming to know objects is, it must be said, a serious omission in a study devoted to language and reality. Indeed, nothing widens our referential horizon as much as recognizing that many, if not most, of our important words are analogical. Their deliberate ambiguity testifies to our progress in knowing, that is, to our being able to come to know unknown objects from what we already know.

We might note, in this connection, that it is in just this respect that the Greeks and the Medievalists were especially perceptive in understanding words and objects. St. Thomas, for example, (in *Summa Theologiae*, I, q. 67, a. 1) uses the same word ("light") as Quine to show how it can be considered in two ways. First, in its primary or original imposition it signifies that which produces clarity in the sense of sight; secondly and afterwards, it was extended to produce clarity in any sort of knowledge,

e. g., in the " light " of the evidence. In this second and common usage, the word " light " is no longer metaphorical (as it would be if understood only in the first sense) but is deliberately ambiguous. Hence we are led from the narrow, but very evident, meaning of " light " in its original meaning to the knowing of objects less evident to our understanding. The history of our important words, thus analogical in meaning and which especially characterize philosophical terminology, testifies to our progress in acquiring knowledge of objects through words. Perhaps no other feature of words signifying objects is more important than this.

Since Quine recognizes only the kind of ambiguity which is simply unclear or misleading, his concern in the next two chapters is to remedy the various " anomalies " and " conflicts " in our linguistic apparatus by means of techniques of modern logic. The paraphrasing of a sentence of ordinary language into logical symbols, he points out, is not unlike what we do everyday in paraphrasing sentences to avoid ambiguity. " The main difference apart from quantity of change is that the motive in the one case is communication while in the other it is application of logical theory " (p. 159). In a rather interesting touch, Quine entitles this chapter " Regimentation," wherein is described how logical theory is developed for the sake of paraphrasing ordinary sentences into " convenient canonical " form. To be sure, techniques of symbolic logic serve admirably to avoid the ambiguity we encounter in ordinary language; and for certain prescribed situations, this kind of rigor of symbolic formulation is necessary. At the same time, the specialized and restricted view this analysis offers for the vast topic of Word and Object should be recognized. For most of the literature in philosophy, " regimentation " in this way is of little value however great its value is in mathematical and certain scientific endeavors. From the point of view of much of philosophy, deliberate ambiguity, i. e., analogical naming, is indispensable to progress in philosophical knowing, and this type of ambiguity we need and want to keep.

Apart from this point of emphasis we have laid upon systematic ambiguity, which we think need special stress at this time, Quine's book remains an especially acute analysis of some of the important aspects of the broad topic of Word and Object. The final question of its value as resolving basic philosophical issues is undertaken in his closing chapter on " Ontic Decision." He recognizes that a resort to canonical notation as an aid to clarifying ontic commitments has a limiting effect, but within that framework the question may still be faced as to what to admit to the universe of values with respect to variables of quantification. In this context, Quine disavows being a nominalist, but what he finally avows is not wholly clear. Perhaps this difficulty stems from the fact that even in a chapter devoted to " ontic decision " he has had, as he says, to talk more of words than of objects even when most concerned to decide what there really is. However, Quine does not wish to subscribe to Carnap's view that

questions of philosophy are in effect simply questions of language. Quine hopes to avoid this position by a "semantic assent," a shift from talking in certain terms to talking about them, e. g., from talking of miles to talking of "mile."

This is the attempt, finally, to reach the object. This question of the object, of what there is, is shared by philosophy with geography and astronomy, by physics and even pure mathematics. All that distinguishes the "ontological philosopher's" concern is breadth of categories and a scrutiny of an uncritical acceptance of the realm of physical objects or of classes. The philosopher's task, then, can differ only in detail. But this view of Quine once more leaves the philosopher only as an analyst, a critical commentator, of what others have said. The philosopher has the task "of making explicit what had been tacit, and precise what had been vague; of exposing and resolving paradoxes, smoothing kinks, lopping off vestigial growths, clearing ontological slums" (p. 275). The value of such work cannot be denied. How it will resolve into any "ontic decision" worthy of the name is another question.

JOHN A. OESTERLE

University of Notre Dame,
Notre Dame, Indiana.

Christianity in Conflict: A Catholic View of Protestantism. By JOHN A. HARDON, S. J. Newman Press, Westminster, Maryland, 1959. Pp. 300. $4.50.

In this sequel to his excellent descriptive manual, which was entitled *The Protestant Churches of America,* Father Hardon has attempted to provide Catholic readers with a comprehensive and readable appraisal of contemporary Protestant thought and practice. The result is a book which is certainly readable but something less than comprehensive, for the focus of attention is upon the author's special area of competence with regard to Protestantism in the United States.

Father Hardon rightly argues that Protestants and Catholics should cooperate against the rising tide of secularism. If they are to do this intelligently, they must have more than a superficial knowledge of their respective points of view. Furthermore, the rising interest in Christian unity among Protestants and the emphasis given to it by Pope John's convocation of the approaching general council call for more studies of the kind which Father Hardon has undertaken. In addition, the apostolate of good will on the part of Catholics, which is a vital obligation for both laity and clergy, requires a knowledge of the extent and the limits of the common ground which Catholics and Protestants hold together.

That common ground has been much reduced since the sixteenth century, and nowhere is this more evident than in the liberal Protestantism which prevails so widely in the United States. When Luther insisted upon the supreme authority of the Bible as the inspired Word of God, he was not taking a stand against Catholicism's traditional view so much as he was opposing the antinomian assertions of the Anabaptists. Yet, the end of the matter was the separation of the inspired Word from its roots in the community of the faithful and an increasing rejection of the place of tradition. As Father Hardon says, the real point of difference between Protestants and Catholics was not the authority of the Word of God, but the question of who has the right to interpret it. Insistence upon the grace given to the individual believer to make his own interpretation led finally to the dichotomy which today separates the fundamentalist minority from the liberal majority of Protestants in the United States. Among the latter the Scriptures are not infrequently thought of as the mythological manifestation of developing religious insights but hardly as necessary channels of salvation.

Father Hardon points out that in recent years a certain reversal of trends in Protestant Biblical studies has led, as in the work of Cullmann, to at least a greater appreciation not only of the role of the Church in its historical relation to Scripture but also of the way in which the New Testament establishes the idea of the Church's organic unity from its first foundation by Our Lord. If this trend continues, it may do much to regain part of the common ground which was lost in the religious revolt of the sixteenth century and its aftermath.

The conditions for a true dialogue require that the present extent of this common ground should be carefully explored. They also call for the clear enunciation of existing differences. It is in this area that Father Hardon's book has a certain informative, if somewhat limited, apologetic usefulness. For the whole approach of *Christianity in Conflict* is that of the rapid survey rather than the study in depth.

The author's language cannot be described as being notable for its irenic tone. At times it is frankly polemical, and it seems improbable that Father Hardon will be accused of being soft on Protestantism. He has, for example, a most forthright chapter on the shortcomings of the various notions of the ministry which prevail in the churches of the Reformation. More than anything else, perhaps, it is the question of the nature of the Church and the role of the priesthood which continues to divide Christians into Catholics and non-Catholics. As Father Hardon says, "Differences in doctrine and ethical values were disruptive . . . but the breach would have been less radical and even possibly healed if the principles of Reformed theology had not become fixed in a clerical system that was tailored to fit the new heresy."

He then goes on to examine what he calls "the most serious aspect of

modern Protestantism" from the Catholic point of view. This is its missionary drive, especially in Latin America. The history of Protestant missions is recent, for until the nineteenth century the churches of the Reformation showed little concern for the heathen world. In the past one hundred and fifty years, however, the missionary movement among Protestant churches has become "phenomenally successful, to the point where it seriously hinders the apostolate of the Catholic Church." Whether the mission agencies stress the social aspects of Christianity or direct evangelism and personal indoctrination, whether they are liberals of the Y. M. C. A. variety or fundamentalists of the type of Billy Graham, Protestant missions today are concentrating more and more upon Spanish America in a spirit of competition with the traditional Catholicism of that area. It is clearly a challenge that arises from a view of the Church that is completely antithetical to that which Catholics hold.

Here, as on the question of marital morality, Father Hardon clearly shows how the practical situation reflects the essential cleavage. The modern inheritors of the Reformation, he points out, "are as hostile to Catholic morality in marriage as their ancestors were against the Church's teaching of faith." Their disagreement with Catholicism in this regard calls into question not so much theological creeds and dogmas as the existence of an objective moral order based upon the natural law itself.

Protestantism's moral teaching reflects the influence of modern relativism, just as its handling of Church and State relations reflects its original relationship to the rise of nationalism and capitalism. Promoting their religion as a national concept and using the civil power to promote their beliefs, as in the case of Prohibition, American Protestants in particular have demonstrated that their idea of "separation of church and state" means nothing so much as the separation of the Catholic Church from American civil government.

This is particularly reflected in their attitude toward Catholic schools. These schools they see as authoritarian, divisive, anti-democratic, and representing principles that are against the teachings of the Bible. It is not too much to say that the growth of the ecumenical movement among some powerful American Protestant groups is the result of a sense of the need for protective action against the influence of the Catholic Church in general and its schools in particular.

The future of Protestant ecumenicism is obscure, for Protestantism is, according to Father Hardon's useful formula, "subjective Christianity, whose positive contents are derived from Catholicism and whose radical error is a denial that faith belongs essentially to the intellect." Subjectivism and negativism alone are sufficient to produce a fluidity which no amount of good will can channel into a united life. The positive aspect of what moves Protestants to unity must be, in part, an "unwitting instinct to regain what they had lost by their separation from Rome." Knowing this, the obligation of Catholics toward them is seen to be very great in charity.

The deepest motivation for such charity, however, Father Hardon's book does not supply. He is learned in Protestant thought and skilled in the use of primary documentation. What he lacks is the experiential knowledge of Protestant piety. This has been supplied for Catholic readers by the far more penetrating work of Father Louis Bouyer in his *The Spirit and Forms of Protestantism* (1956). If it is true that the positive aspects of Protestantism—its emphasis upon grace and the authority of the Word of God—are indeed remnants of Catholicism, it is still incumbent upon Catholics to seek a deeper understanding of how it is that so many Protestants lead a Christian life. Only out of such an understanding can we begin to move to help them to realize the fullness of the unity of Christ, Who is Our Lord and theirs.

PAUL VAN K. THOMSON

Providence College,
Providence, Rhode Island.

BRIEF NOTICES

Redemption Through the Blood of Jesus. By DOM GASPAR LEFEBVRE, O. S. B.; transl. by Rev. Edward A. Mazarz, C. PP. S.

This volume is a translation of "La redemption par le sang de Jesus" (Desclee de Brouwer, Bruges, 1944) written by Dom Gaspar Lefebvre. The translation has appeared at the right time to implement our Holy Father's appeal for the promotion of the Devotion to the Most Precious Blood of Our Lord Jesus Christ.

One fourth of the book, deals with *the Person* of the Redeemer, His two Comings, His name, and His helpers, viz. His Mother, His foster father, the angels, the Precursor, and the aged Simeon. The rest of the book is dedicated to the treatment of *the work of redemption,* (and this part makes good Lenten reading and meditation material.)

The emphasis is on the Passion of Christ. The author is at great pains to explain the idea of redemption, and especially the four key notions of merit, satisfaction, sacrifice and ransom, together with their corresponding virtues of love, obedience, religion and patience. The whole humanity of Christ is divinity's instrument of redemption. The precious blood is the material instrumental cause of our redemption, for the profuse outpouring of this Blood was directly connected with the death of the Son of Man. The body being dependent on the soul, the redeeming blood of Christ cannot be separated from the acts of the soul of Christ which form the formal element of the work of redemption. The blood of Jesus is, therefore, the most eloquent symbol of the acts of meritorious love, reparative obedience, sacrificial religion, and heroic ransoming patience under sufferings submitted to in our stead.

In what does the devotion to the precious blood consist? "This devotion is centered in the notion of sacrifice. It is centered in the Holy Sacrifice. One of its characteristics is to consider the divine Sacrificer, the divine Sacrifice, and the divine Sacrificed One. The sacrifice of Calvary and that of the altar, which is but a replica of Calvary, constitute the vital center of true devotion to the precious blood."

It is sixteen years since this book first appeared in French. Much research has been done concerning the Blood of Christ, especially the studies conducted by the Society of the Precious Blood. However, until the results of these studies find their way into devotional-theological literature this volume will prove a great help for all to appreciate and love the great Mystery of the Most Precious Blood.

REV. ANDREW POLLACK, C. PP. S.

The Book of Mary. By HENRI DANIEL-ROPS. Translated by Alastair Guinan. New York: Hawthorn Books. Pp. 224. $4.95.

In this volume, M. Daniel-Rops succeeds in presenting a knowledgeable, clear and uncluttered theological picture of the Mother of God. Proposing to investigate "the circumstances and conditions of her historical existence," he examines the sources of her history, working his way through the Gospels, the Apocrypha and the writings of the Fathers. As the examination develops he sets for himself the task of explaining the growth of our knowledge of Mary from its apparently sketchy beginnings in the Gospel narratives.

His presentation of the Gospel data is characterized by the ease with which he handles the New Testament background and for the warm and balanced picture of Mary sketched out against this background.

In order to describe the growth of the popular image and to provide a reasoned evaluation of it, he discusses the Apocrypha with care and at some length. He takes up the question of their psychological origin in Christian piety and natural curiosity, presents samples of their sometimes absurd and shocking stories, explains the severe limitations that have to be placed on their value, and then very sensibly outlines and defends the values they do have.

The writings of the Fathers are presented as witnesses to the mainstream of Christian tradition. The problems involved in explaining the development of doctrine are faced frankly and in working out an explanation of development the author emphasizes the spontaneous surge of devotion in the believing soul as a significant factor.

A sizable second section is given over to the citation of documents used in presenting the theology of Mary. All of the relevant Gospel texts are quoted, a few from the Fathers and a fairly generous sampling from the Apocrypha. These last include selections from the Protoevangelium of St. James, the Pseudo-Matthew, the Ascension of Isaiah, the History of Joseph the Carpenter, and the *Transitus Mariae* literature. Because they are not ordinarily discussed or quoted and because they are not easily available, these selections are of special interest and value.

Like all of his other work, this volume shows the author's eye for contemporary questions and needs and his genuis for meeting these needs at a fundamental level in a refreshing, graceful and eminently satisfying way.

WILLIAM F. HOGAN

Immaculate Conception Seminary,
Darlington, N. J.

Saint Augustine on Personality. By PAUL HENRY, S. J. New York: The Macmillan Company, 1960. Pp. 44. $2.25.

This little book is the first in "The Saint Augustine Lecture Series" sponsored by Villanova University and edited by Robert P. Russell, O. S. A. Its thesis is that Saint Augustine is "the first thinker who brought into prominence and undertook an analysis of the philosophical and psychological concepts of person and personality." It is maintained, first of all, as a working hypothesis, that no philosophy before Saint Augustine developed so satisfactory a concept of personality. Neither Greek philosophy nor primitive religion affords such a concept. Father Henry finds Saint Augustine's most elaborate discussion of the subject in the treatise *On the Trinity,* where, instead of using the Platonic tradition, Saint Augustine utilizes an Aristotelian concept to describe the substantial relation existing among the Divine Persons. As Saint Augustine describes this relation, God is seen as "the only perfect prototype of that which all love between persons tends to achieve . . . absolute unity and yet distinction." The technicalities by means of which this concept is developed may be left for those who wish to pursue Father Henry's penetrating analysis in detail. It will suffice to indicate here that Saint Augustine's use of Aristotle in this connection, and his refinement of Aristotelian ideas of mutual relations, amply demonstrate his flexibility and independence of mind. His concept of personality was developed, as Father Henry goes on to point out, as a result of the challenge presented to Christian thought by the paradoxical dogma of the consubstantiality of the Persons of the Trinity, which had been previously defined, but not explained. The solution to this problem led simultaneously to a new concept of human personality, elaborated on the basis of analogies, not between God and the world, but between God and man. In the closing pages of his lecture, Father Henry traces the doctrine of the Divine Persons as subsisting relations in the official pronouncements of the Church and considers the relevance of Saint Augustine's concept of personality in terms of contemporary philosophy. The lecture is followed by a series of careful and helpful notes. Altogether, this is a stimulating book, presenting in a very satisfactory way still further evidence of the richness, variety, and enduring significance of Saint Augustine's thought. Those who read it will undoubtedly look forward to the publication of succeeding lectures in the series.

D. W. ROBERTSON, JR.

Contemporary American Philosophy, Proceedings of The American Catholic Philosophical Association Volume XXXIII.

The papers found in this volume were delivered at the thirty third annual meeting of the American Catholic Philosophical Association in New York City on March 31, and April 1, 1960. The issue was dedicated to the late Msgr. Charles A. Hart, for many years the secretary of the association.

In his presidential address, Lawrence Lynch used the symposium of Plato as a point of departure for some trenchant remarks concerning contemporary philosophy and the nature of the philosophic enterprise itself. Conferring the Cardinal Spellman-Aquinas Medal on his friend Gerald Phelan, Jacques Maritain noted the wisdom of Father Phelan's insistence on the existential character of true philosophy. Maritain went on to comment upon Farther Phelan's high reputation among those who share neither his faith nor his philosophy. In his response Father Phelan stressed the need of our times for metaphysics and proceeded with his usual clarity and cogency to a detailed examination of the vast difference between *esse* and *esse-habens*.

In one of the morning symposia Fulton H. Anderson spoke on some Platonic elements in epistemology which have had effect on contemporary philosophizing. On the same panel Professor Herbert Spiegelberg discussed the meaning of the term subjective in the philosophy of Husserl. Husserl's tendency to transcendental idealism was noted as well as his dependence on Kant and Descartes. He concluded that phenomenology may be considered subjective in the sense that its objects are subject-related. Professor Spiegelberg warned that phenomenology was not a finished philosophy and would be a rebellious handmaiden if expected to serve such " ambitious " enterprises as metaphysics and metaphysical theology.

In a paper on the axiology of John Dewey, Ralph W. Sleeper stressed the role of experience in the philosophy of Dewey and the fact that Dewey equated the experience of " things " with the experience of " values." Some agreements between doctrines of St. Augustine and positions of Dewey were also noted.

Many other informative papers were given which cannot be taken into account here. Those on the philosophy of science, the naturalistic theory of ethics, social pluralism, and the philosophy of law were especially worthwhile.

JESSE A. MANN

Georgetown University.
Washington, D. C.

The Search for Values. By RUSSELL COLEBURT. New York: Sheed and Ward, 1960. Pp. 135. $3.00.

Among the best features of this work are the author's sensitivity for the difficulties and sufferings of current "thinkers," his confidence that he has ground on which to stand, and the comprehensive character of so small a book.

What we encounter in many spokesmen from many areas is anxiety and uncertainty. Men are valuing, seeking, aspiring for all they are worth, but in a world of uncertainty. At least in the practical order, their world may be said to be a world of uncertain values.

Mr. Coleburt is aware of the situation and of men's sufferings. At least he is well aware that they do suffer, above all, those of them with an awareness of the kind of thing that man is.

Just as clear to his own mind is his reply and recipe for getting over the suffering. As he says, the basic aspiration of these tortured souls is precisely the basic aspiration of man at any time. It is the aspiration to live and to feel sure that life's values are grounded in what is real and true. This is just where the men in question stick. What is real and true is not obvious to them, and whether Mr. Coleburt ever makes the foundations of the universe convincing to them is, of course, a question for them to answer. It would be remarkable if he did.

What he does not take seriously enough is how they got into the fix. He is zealous to get them out, and good, so far, for him. It is another question how they happen to be in and how he happens to be out. Just here there seems to be quite a gulf between him and them, and our query is whether he has really offered them a plank they can accept and trust to get them across the gulf.

LEO R. WARD

University of Notre Dame,
Notre Dame, Indiana.

Cities in Crisis. By DENNIS CLARK. New York: Sheed and Ward, 1960. Pp. 177. $3.50.

Into the making of this apostolic-minded work there is a mixture of history, sociology and social philosophy, permeated with Christian zeal and the practical knowledge which the author has derived from several years of service on the Commission on Human Relations for the City of Philadelphia. The disparate footnotes and the relatively lengthy appendix on the history of cities make one wonder if it is not a doctoral dissertation in Catholic social action. But the appendix does not have to be read, and the rest of the book does merit the thoughtful attention of Catholics, who are chiefly to be found in urbanized areas.

Family life and housing are the author's main concerns. The urban family is reduced largely to a consumer unit, he says, with decisions increasingly directed by advertising and corporate expedients (p. 55); and strains upon family life are not provided for by religious organizations (p. 71). The strong social ties in some urban parishes merely prove, perhaps, the exception to the rule. Yet one senses that many bishops and priests are aware of family needs within the parish community.

The most important section of this book is the chapter entitled: "The Christian Response" (pp. 117-142). Mr. Clark rightly points out that technicians are taking over urban planning, and there is an urgent call for Christians to have a knowledgeable part in this.

Almost certainly the author would agree that while pointing up family and housing needs in particular, he really wishes that the Catholic lay apostolate would embrace large numbers of Catholics, willing to acquire both the professional and the political knowledge to be effective. To this, the Catholic Bishops' Statement of November 1960 adds the necessity of promoting a society where the ideals of freedom, personal responsibility, and the equality and dignity of all men are assured. This is a large program, and while some Catholics are already trained, or partially so, the paucity of their numbers can only be added to by well-planned programs for future recruitment and the lengthy training and learning processes involved. Political and social leaders are not developed by crash programs: more Catholics might be zealous enough to give their time and abilities to the needs to which the author rightly calls attention, but one must not forget rural, mission, and other apostolic calls. One must realize, too, that possibly only a relatively few of our members have the qualities of leadership.

EVA J. ROSS

Trinity College,
Washington, D. C.

The Idea of Catholicism: An Introduction to the Thought and Worship of the Church. Edited by WALTER J. BURGHARDT, S. J., and WILLIAM F. LYNCH, S. J. New York: Meridian, 1960. Pp. 479. $6.00.

This volume is an anthology in two parts. The first section, a series of essays by modern European and American theologians, presents the structure of Catholic theology. Among the contributors are the long familiar Cardinal Newman, Karl Adam, Edward Leen, Alban Goodier, M. D'Arcy, and Gerald Vann. Selections from Cardinal Suhard, Célestin Charlier, P. Benoit, Yves de Montcheuil, A. M. Roguet, and the two editors are also included. The introductory and concluding essays treat the notion that religion is a relation between God and the soul. Within this framework

the various authors discuss the mind's assent to the existence of the one God, the bible and history, Christ, the Trinity, the Church, Mary, the sacraments, the papacy, and the episcopacy.

The second part deals with worship and shows how the teaching of the Church is complemented and intensified by the action of faith. Various confessions and creeds, the text of the midnight Mass at Christmas, the ritual for the sacraments, prayers of the Church, teaching of the saints, and modern papal pronouncements are presented.

The purpose of the work is to put the serious student, Catholic or non-Catholic, in basic and solid contact with the theology and prayer of the Church. In it this class of reader will find much of interest. The Catholic, priest or layman, can come to a fuller understanding and appreciation of his faith. The non-Catholic will meet the Church's teachings treated in a manner which is firm but devoid of spirited polemics. Points of controversy are handled with Christian charity.

In the organization of such a diverse group of authors around a central theme there are difficulties. The total impression, however, is that of a well-chosen, well-organized presentation of the Church's teaching.

Some of the selections are inspiring, as when Karl Adam considers Christ as man's brother, or when Goodier exhorting the Christian to the imitation of the Savior proposes the Gospels for this purpose: "It is important for us to bear always in mind that we learn our Lord as he was and therefore as he is, wholly from the Gospels. Other lives may help us to interpret him but in the end they must be referred back to the Gospels."

There are also examples of modern trends in biblical exegesis and theological speculation. "The Bible and History" by Charlier throws light on the problem of messianism and the fulfillment of Old Testament prophecy in Christ. Fr. Benoit in "The Holy Eucharist" mentions the necessity of re-thinking and deepening traditional terminology in terms of biblical thought.

The editors' familiarity with the field of Catholic thought and worship is attested by the number and diversity of their selections. Their experience has enabled them to present a work of value, one highly recommended for the audience intended.

EDWARD J. CARNEY, O.S.F.S.

DeSales Hall,
Hyattsville, Maryland.

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