

SCIENCE AND RELIGION: SEEKING A COMMON HORIZON

by *Frank E. Budenholzer*

Abstract. The thought of Bernard Lonergan provides an epistemological position that is both true to the exigencies of modern science and yet open to the possibility of God and revealed religion. In this paper I outline Lonergan's "transcendental method," which describes the basic pattern of operations involved in any act of human knowing, and discuss how Lonergan uses this cognitional theory as a basis for an epistemological position of critical realism. Then I explain how his approach handles some philosophical problems raised by classical and modern science and show how his thought provides an intelligible link between the scientific and religious horizons.

It has often struck me that many of the feeling states which I as a Christian believer might describe as religious experience are not fundamentally different from those of a nonbeliever: the feeling of awe before the beauty of a sunset, the feeling of wonder at the intelligibility expressed in scientific laws, the deep stirrings of the heart as one sees a fellow human being who is willing to give up his or her life for the welfare of other human beings. The scientist, as any other human person, has such experiences. In fact there is often present in the scientist a reverence for nature and a recognition of both the finitude and greatness of the human species that many would call religious.

Many scientists are believers in the personal God of one of the monotheistic religious traditions. Many would argue that their science provides a tremendous stimulus to their faith. Many other scientists, although their experiences may be quite similar, feel that religion and science represent two divergent and incompatible world views. They would argue that a commitment to the scientific enterprise (most clearly manifested in the physical and biological sciences) is incompatible with belief in a personal (i.e., in some analogous sense, intelligent and free) God.

Frank E. Budenholzer is professor of chemistry, Fu Jen Catholic University, Hsinchuang 242, Taipei, Taiwan, Republic of China.

[*Zygon*, vol. 19, no. 3 (September 1984).]

© 1984 by the Joint Publication Board of *Zygon*. ISSN 0044-5614

The point is that, while certain experiences may be common to both the believer and nonbeliever, the interpretations of those experiences and the trajectory along which they develop will be quite different.

What is the source of these various interpretations? Is it possible to investigate some of the underlying presuppositions of both scientific and religious knowledge and find some common ground, a common horizon? In this paper I will argue that the thought of the Canadian philosopher-theologian Bernard Lonergan is particularly successful in uncovering the common ground of scientific and religious knowledge. In his major work *Insight* (1957), Lonergan seeks to elucidate the basic structure of the process of human knowing, a structure common to all forms of knowing. On the basis of this analysis he then develops what he considers to be a critically grounded theory of knowledge and objectivity.

In the first section of this paper I will discuss the nature of scientific knowing and will argue that with the development of classical physics there arose certain philosophical notions (often assumed to be scientific) that would be a source of conflict between traditional religious understandings and a scientific world view. In the second section I will move from a consideration of scientific knowing to a consideration of knowing in general. Lonergan's basic epistemological stance of critical realism will be outlined. In the last section I will explicitly consider the question of the existence of God and argue that a correct understanding of the process of human knowing can lead to an affirmation of God.

THE SCIENTIFIC HORIZON

Let us begin where Lonergan himself begins, with a consideration of the nature of human knowing. For there is surely one common element shared by the scientist and the person of religious faith, namely, the effort of the human subject to understand and deal with the surrounding world.

The world in which each one of us lives is constituted by the knowledge which is ours. For the small child the world is the world of his or her immediate experience, the world he or she directly senses and bumps into. For the adult there is a vastly larger world. It is a world constituted not only by direct and personal experience but also by the understanding and judgement brought to bear upon that experience. It is a world known not only through his or her own efforts but also through the investigations of countless others. It is the world mediated by meaning (Lonergan 1967, 252-53).

For each of us this world is bounded by the limits of our knowledge and questions. Such a boundary is described by Lonergan as one's horizon. "Literally, a horizon is a maximum field of vision from a

determinate standpoint. In a generalized sense a horizon is specified by two poles, one objective and the other subjective, with each pole conditioning the other" (Lonergan 1967, 213). The two poles of one's horizon are always intimately related. For example, for the physical scientist the objective pole is the domain of his or her science, those questions and problems amenable to the scientific method. The subjective pole is the scientist practicing the scientific method. For the religious person, his or her horizon includes an ultimate ground of being which we call God. The subjective pole of this horizon is the human person grasped by the love of God in religious experience. If we are to deal adequately with the fundamental relationship between religion and science, we must ultimately deal with the relationship between these two horizons.

The development of modern empirical science, beginning in the sixteenth century, brought with it a new ideal of science.¹ The study of nature was emancipated from broader philosophical questions. Science was not concerned with necessity but with terms and relations verified through experiment. The primary language of science was mathematics.

Along with this ideal of science there arose a conception of reality which in various forms is still very much at the heart of religion-science dialogue. Within this horizon, as originally set forth by Galileo Galilei, objective reality is identified with the so-called primary qualities of matter—extension, shape, number, and motion. Other qualities such as color and temperature are simply subjective and the response of our sense organs to the primary qualities. "To excite in us tastes, odors, and sounds I believe that nothing is required in external bodies except shapes, number, and slow and rapid movements. I think that if ears, tongues, and noses were removed, shapes and numbers and motions would remain, but not so odors, tastes, or sounds. . . . Having shown that many sensations which are supposed to be qualities residing in external objects have no real existence save in us, and outside ourselves are mere names, I now say that I am inclined to believe heat to be of this character" (Galilei 1957, 276-77). Such an approach is not, of course, surprising given the fundamental importance Galileo attaches to mathematics (Galilei 1957, 238). But at its heart it exemplifies a radical problem in the theory of knowledge. For Galileo is arguing that the real is to be identified with the extensions and motions of bodies. Thus reality is constricted to certain qualities that can be imagined; the criterion of truth becomes a certain intuition of the physical world; and, to use Lonergan's phrase, knowing is identified with "taking a good look."

The revolution in science initiated by men such as Galileo and Johannes Kepler came to its climax in the work of Isaac Newton. His

genius was to bring together in a unified system the experimental and mathematical elements of the new science of mechanics. His greatest triumph was the synthesis of terrestrial and celestial mechanics—his demonstration that the same laws of physics explain the movements of bodies in the laboratory and the motions of the spheres in the heavens. Philosophically, however, he essentially accepted the view of Galileo that nature could be described exclusively in terms of the motions of particles (Barbour 1971, 35).

Neither Galileo nor Newton saw themselves as initiating any kind of split between science and religion. Both men were devout Christians and saw the “world machine” as the creation of an all wise and provident God. Yet there is no doubt that in this scheme a new relationship between God and the universe was being envisaged. The medieval analysis of being in terms of the four causes (material, formal, efficient, and final) allowed for the intelligible grounding of all being in God; however, if the criterion of reality is simply its observability or imaginability, then the need for this intelligible grounding evaporates. The world machine is a matter of fact and may simply be left unexplained.

Within this framework, God was first seen as the initiator and preserver of the world order—a God who set the cosmos in motion and then occasionally intervened to keep it in good running order. As these gaps were gradually closed with the accumulation of scientific knowledge, the activity of God was relegated to the beginning of the universe, and the Deism of the seventeenth and eighteenth centuries was the result.

To many, however, Deism proved untenable. For the believer, the God of Deism bore little relation to the provident and caring God of the biblical tradition. For others Deism was the last vestige of a clearly discredited religious system. God was an unnecessary hypothesis and unknowable by the enlightened methods of science.

The history of modern philosophy is to a large extent a reaction to the epistemological problems raised by the new science. We need not be concerned here with these philosophical responses. What is important is to realize that at this point the underlying conflict between science and religion had already emerged. The person doing science was expected to accept a metaphysics which envisaged reality as essentially an imaginable system of particles in motion. Within such a horizon God, and possibly the human mind, may be seen as exceptions to this materialist criterion of reality (see Descartes 1968). Yet even if this is the case, the relationship of God to the world becomes problematic and religion becomes an inner matter to be verified in a way that is incompatible with scientific knowing.

By the middle of the nineteenth century the mechanistic materialism we have been describing dominated much of European philosophy

and science (Suppe 1977, 8). There was an air of optimism that soon all knowledge of the physical world would be reduced to the laws of mechanics; in fact the tremendous scientific advances of the last 120 years have produced a significant synthesis. The work of Charles Darwin and others in evolutionary biology gave a reasonable account of the origin of the great variety of living forms. Analogous advances in the earth sciences brought a clearer understanding of the development of the planet and its environment. In the early years of this century chemistry and physics were brought together through the quantum theory. The last twenty years have seen a revolution in molecular biology where for the first time the macromolecules that form the basis of living systems have been characterized and studied in detail.

It is significant that these very advances, which on one level seem to vindicate the reductionistic materialism of the nineteenth century, have forced a reevaluation of the accepted philosophy of science. Even before the new physics, the increasing complexity and abstractness of physical theory along with developments in psychology indicated that a simple positivistic epistemology was inadequate. Albert Einstein's theory of relativity, with its introduction of non-Euclidean geometries, denied the primary quality of extension the privileged place it had held since the time of Galileo. The wave-particle dualism of quantum mechanics along with the Heisenberg uncertainty principle seemed to shatter the imaginative, deterministic picture of physical reality that had been part of modern science up until the twentieth century.

The general reaction of the philosophers of science was to move to a more thoroughgoing empiricism. Logical positivism argued that the only meaningful discourse "was that done either in terms of phenomenal language or using terms that were abbreviations for (that is, could be rephrased equivalently as) expressions in phenomenal language; any assertions failing to meet these criteria were metaphysical nonsense" (Suppe 1977, 13). Such a stance had even less room for religious discourse than did the mechanistic materialism of earlier times.

Contemporary philosophy of science is in a state of flux and is in the process of searching out new directions (see Suppe 1977; Lakatos and Musgrave 1970; Blackwell 1981). Recent work in the history of science has forced philosophers of science to take into account the way in which science has actually developed.² Furthermore the logical and epistemological status of the theoretical terms of science (e.g., mass, momentum, quantum number) has always been problematic and continues to be so.

Of course the horizon of the working scientist is not necessarily that of the philosopher of science. Most scientists are at heart realists; there is a strong and persistent belief among scientists that scientific investi-

gations do result in true knowledge (Suppe 1977, 716). Yet, because of the importance of images in human knowing, many scientists continue to feel that the real world is somehow an imaginable system of particles in motion, possibly made a little more "fuzzy" by quantum mechanics. Such an horizon does not necessarily preclude religious faith; yet, when the consequences of this mechanistic horizon are spelled out, it is inevitable that conflicts and tensions will arise for the religious believer.

LONERGAN'S CRITICAL REALISM

I have argued that, if the conflicts between scientific and religious world views are to be dealt with adequately, an epistemological position must be found that is both true to the exigencies of contemporary science and open to the possibility of God and revealed religion. It is my conviction that the thought of Bernard Lonergan is particularly able to do this.

To understand Lonergan's analysis of human knowing we must shift our inquiry from the realm of scientific theory to what Lonergan calls the realm of "interiority" (Lonergan 1972, 83). We will not be concerned primarily with the theories of the scientist or even with the results of the social scientist or psychologist. Rather our concern must center on the concrete processes by which the human subject, that is each of us personally, comes to know. The book *Insight* should be viewed not so much as a compendium of Lonergan's philosophical system but rather as an aid to the personal appropriation and objectification of one's rational self-consciousness. In this process of coming to know one's knowing, we are confronted with three fundamental questions: "What am I doing when I am knowing? Why is doing that knowing? What do I know when I do it?" (Lonergan 1972, 83). Or to put it more technically, we are confronted with the questions of cognitive analysis, epistemology, and metaphysics.

Fortunately for the scientist (and perhaps unfortunately for some members of the theological and philosophical community) Lonergan begins his study of human cognition by considering examples from mathematics and physics. His goal is not to elucidate any particular methodology but to elucidate what he calls a "transcendental method"—the pattern of operations that characterize any act of knowing and transcend any particular area of knowledge. What Lonergan finds, and what he invites each individual to verify through a consideration of his own personal process of knowing, is a dynamic structure characterized by three fundamental operations: experience, understanding, and judgement.

Experience (seeing, touching, tasting, feeling, as well as our inner experience of ourselves) is the source of data. In science the data is

primarily the data of sense; in the realm of interiority we experience not physical bodies but the very processes of experience, understanding, and judgement.

Understanding organizes this data into intelligible wholes; it discerns the intelligibility within the data; it answers the questions, What is it? and Why is it so? In science we attempt to understand things and their interrelationships using either classical or statistical laws; in the realm of interiority we seek to understand the data provided by our experience of our own knowing.

Experience calls forth understanding and understanding calls forth judgement; beyond the questions for understanding there is the further question of whether or not something is in fact the case. Lonergan describes judgement as a "virtually unconditioned." A prospective judgement is transformed from a conditioned statement into a virtually unconditioned judgement when the knower recognizes that certain conditions must in fact be fulfilled if the prospective judgement is to be known as true and when the knower then grasps that, in fact, the conditions are fulfilled (Lonergan 1957, 280). However, further questions may arise as to whether all the conditions have been fulfilled: Has something been overlooked? Have I missed the point? We must continue asking questions until all *pertinent* questions have been dealt with adequately. Only then can we consider a judgement as true (Lonergan 1957, 284).

In concrete judgements of fact the number of relevant questions is usually small and conclusions can be arrived at quickly. Is it raining outside? I look out the window to see. If necessary I may check further by going outside or asking a friend to corroborate my observation. Soon the number of pertinent questions is exhausted and the judgement is made.

However, in science the matter is more difficult. Science seeks not simply to know things in relation to human persons (common sense) but to gain a systematic understanding of things in relation to each other. In its efforts to apply classical and statistical laws to concrete situations, further questions may arise which affect an entire area of inquiry. The empirical generalizations of science must therefore be considered as probable until such time as all further questions arising from concrete judgements of fact have been dealt with. Whether we will ever come to such a point seems doubtful; more importantly, it is clear that the ideal will not be attained in the near future.

This probable nature of scientific theories is significant if we are to interpret the history of science correctly. Scientific theories are open to revision. The recent explosion in scientific knowledge has raised more questions than it has answered. Advances in one area of science have often forced a major rethinking of other areas. Yet the theories are also

truly probable; they do answer significant questions. Furthermore there exists a process of convergence, for each succeeding theory answers a broader and broader range of questions. "This convergence, this increasing approximation [upon truth] is what is meant by the familiar phrase, the advance of science" (Lonergan 1957, 303).

Within this framework objectivity is simply the authentic carrying out of this process. "The objectivity of human knowing is a triple cord; there is an experiential cord that resides in the givenness of the relevant data; there is a normative component that resides in the exigencies of intelligence and rationality guiding the process of knowing from data to judging; there is finally an absolute component that is reached when reflective understanding combines the normative and experiential elements into a virtually unconditioned, i.e., a conditioned whose conditions are fulfilled" (Lonergan 1967, 230). There are false judgements in which we thought something to be the case, but in actuality all the conditions were not fulfilled, all the relevant questions were not answered. There are probable judgements where we may feel quite sure that the conditions are fulfilled, but all the facts are not in yet or our understanding is still a little foggy. Finally, there are true judgements where there is a conditioned whose conditions are in fact fulfilled. In such cases there is objective knowledge, and we recognize that the reality of whatever is in question is independent of our cognitional activity.

Judgements do not, however, stand in isolation; as soon as one question is answered, others arise and they too are answered more or less satisfactorily. Hence there arises the principle notion of objectivity which is "contained in a patterned context of judgements" (Lonergan 1957, 375). It is in a whole series and pattern of correct judgements that we come to know what people generally call the real world.

Does Lonergan's notion of knowing and objectivity provide the critical grounding for which modern philosophy has been searching? Each person must decide this for himself. Yet in attempting to decide each individual will begin with his experience of his knowing process, attempt to understand that process, and then make a judgement about the adequacy of his understanding. Thus the primary question is not one of necessity but a simple question of fact, Am I a knower? It seems to this author at least, that in attempting to answer the question the answer has already been given (Lonergan 1957, 335-36).

Once this affirmation has been made there is no possibility of fundamental revision. For revision implies appeal to new data, or some change in understanding, or a change in judgement. "Clearly, revision cannot revise its own presuppositions. A reviser cannot appeal to data to deny data, to his new insights to deny insights, to his new formulation to deny formulation, to his reflective grasp to deny reflective grasp"

(Lonergan 1957, 336). On such a basis Lonergan is able to elucidate his critical realism. It is truly realism for it is confident that persons can and do transcend themselves in knowing the real; yet it is critical in that the real is to be known not in some mysterious intuitive way, but only through a correct pattern of judgements.

Lonergan's arguments are subtle and controversial. Let us for a moment consider some of his presuppositions. The first and perhaps most basic is that there is no road to knowledge except the process we call knowing. We have become accustomed to viewing knowledge as a mental picture of the real world. When we are asking for objectivity, we are asking to somehow stand apart from the knowing process and verify the correspondence between the picture and the real world. Of course, this is impossible; there is no possibility of a super-look. Thus objectivity cannot be separated from subjectivity.

Given this state of affairs, is it possible for us to come to any knowledge of the real world, or are we simply confined to our collective subjectivities? At this point we consider the knowing process itself, the so-called triple cord of experience, understanding, and judgement. I have argued that objectivity is the authentic carrying out of this process. The knower begins with experience and then seeks the intelligibility within the data. In judgement he then affirms that such and such is in fact the case. In correct judgement there is true knowledge. But how does one know when his judgements are correct? When all pertinent questions have been answered. When have all pertinent questions been answered? There seems to be an endless series of questions. There is, however, one question that is basic to all others: Am I a knower? It is a question of fact, not of necessity. To answer the question we advert to our experience of knowing, seek understanding, and make a judgement. Lonergan's affirmative answer to this question is the critical moment in the development of his thought.

Once we have accepted this perspective, our notion of the real world shifts dramatically. We have a tendency to presume that the really real consists in the hard objects of experience and that in knowing we get a true picture of those realities. But, in fact, the real is simply verified intelligibility—the real is the known, the object of experience, understanding, and judgement.

The fallacy of the mechanistic horizon of classical science is to assume that the objects of science are completely analogous to the bodies of perception. Within this horizon things are no longer unities to be understood and verified in data, but the objects of biological sensation.

In ascribing reality only to qualities such as extension, Galileo failed in two respects. First, while his division of qualities into primary and secondary might seem to anticipate the distinction between common sense and theory, he failed to recognize that both common sense and

theory are equally valid ways of knowing. Common sense is concerned with things in relation to us: the fire is hot, the sky is blue. Scientific knowing also makes use of concrete judgements of facts, but beyond this it seeks generalizations which deal systematically with the relation of things to other things: fire is the rapid oxidation of hydrocarbons, light on passing through the atmosphere is shifted toward higher frequencies. There are no qualities more real than any other on the level of biological sensation; they all provide data. It is true, however, that certain qualities, such as extension and number in classical mechanics, may provide data more useful for the empirical generalizations of science.

The second and more fundamental error of Galileo was to identify knowing with an intuitive sense analogous to looking. If the distinction between common sense and theory is overlooked and if knowing is analogous to looking, then we have no choice but to consider the qualities that seem invariant in scientific investigations to be real while all others exist only in us.

From this point it is an easy step to empiricism or idealism. The empiricist realizes that the naive realism of someone like Galileo is inadequate. Nevertheless he retains the notion that knowing is analogous to biological sensation. Then he argues that theories and correlations are not facts because they cannot be seen. Instead, following David Hume, they are habits of mind or, in the view of instrumentalism, rules and principles "for analyzing and symbolically representing certain materials of gross experience, . . . a technique for inferring observation statements from other such statements" (Nagel 1961, 129). The idealist is uncomfortable with this account of scientific theory, but, retaining the notion of knowing as looking, the idealist is unable to get beyond his own subjectivity and so pronounces the real as the ideal.

Against both of these positions the critical realist argues that knowing is no single operation but a dynamic trio where knowledge of the real is attained through experience, understanding, and judgement. To the contemporary scientist this statement at first seems almost trivial, for it describes what he or she does when doing science; yet its full implications lead to a radical restructuring of the horizon in which most of us operate. For now, within this horizon, the real is simply verified intelligibility. Real things—electrons, atoms, molecules, genes, human persons—are not constituted by their being out there but by the fact that they are "unity, identity wholes" which can be grasped in the data (Lonergan 1957, 250-54). The properties of these things can be understood either in relation to us (common sense) or in relation to each other (theory, science). Furthermore, their materiality is not constituted primarily by their being perceived or by their ability to be

imagined, but by the fact that there exists in the empirical data a residue that is not intelligible in terms of the thing itself. Thus there exist different individual things at different times and places and, within the context of science, these differences must be accepted simply as a matter of fact (Lonergan 1957, 25-28, 517).

This process of clarifying the nature of human knowing is what Lonergan calls intellectual conversion. "Intellectual conversion is a radical clarification and, consequently, the elimination of an exceedingly stubborn and misleading myth concerning reality, objectivity, and human knowledge. The myth is that knowing is like looking, that objectivity is seeing what there is to be seen and not seeing what is not there and that the real is what is out there to be looked at" (Lonergan 1972, 238).

Lonergan grounds his metaphysics on his analysis of human cognition. He argues that there exists an isomorphism between the knowing process and the object of that knowledge. (Isomorphism is a concept of central importance in contemporary mathematics and science. In general, the term refers to two sets that have nonidentical elements but similar relationships between their respective elements. Thus relationships determined to exist in one set of elements will also be true in the other set.) In other words certain questions about the nature of those beings that can be known by human persons can be answered by considering the structured process by which those beings are known. Hence metaphysics is heuristic, that is, we learn something of the nature of what Lonergan calls "proportionate being" before we are able to answer the many particular questions that full knowledge of proportionate being implies.

This is not the place to summarize Lonergan's metaphysics. Suffice it to say that there exists a dynamism in proportionate being parallel to the dynamism of the human mind. He also explains "the traditional metaphysical categories (potency, form and act) as the structural contents isomorphic to the cognitional acts, experience, understanding and judgement" (Tracy 1970, 157).

It is important to recognize that these philosophical positions cannot take the place of the physical sciences or any other field of human learning. There is no short cut to knowledge; if you want to learn about the nature of the physical world, then do science. Furthermore, Lonergan's epistemology and metaphysics are not tied to any particular scientific theory. Rather they are grounded on the processes of human knowing that make science possible.

Before going on to discuss the implications of Lonergan's critical realism for the religion/science dialogue, I at least should indicate some of the ways his position is able to deal with a number of the philosophi-

cal questions raised by contemporary science. If the criterion of the real is verified intelligibility and not imaginability, then a number of problems either disappear or can be transposed in such a way that the real issues are dealt with. Thus the famous wave-particle dualism of contemporary microphysics expressed in the question, Are subatomic particles really particles or really waves? misses the point. Wave-like and particle-like properties can be verified for these entities, and both images may be useful in attempting to understand them. But the compatibility of images is not the real question. Incompatible images may suggest a problem in a theory, but they may also simply suggest the limits of imagination. Images are essential for the development of a theory; but ultimately the real is verified intelligibility, and a true theory is a verified set of terms and relations. The things studied by the particle physicist—or for that matter by the zoologist—are not constituted by their ability to be imagined; they are unities understood and affirmed in the data. Their reality is that of a verified intelligibility and not that of an imaginable body.

Loneragan devotes several chapters in *Insight* (1957, 33-139) to a consideration of classical and statistical methods in the sciences. In his view classical laws are inherently abstract for they deal only with ideal cases abstracted from the particularities of place, time, and individuality. Statistical laws depend on classical laws for the definition of variables. However, statistical laws deal not with the relationships between abstract variables but with aggregates of events. Using statistical methods one may determine ideal norms and frequencies from which the actual frequencies will diverge only nonsystematically. Classical and statistical laws are thus complementary, "data as similar are explained on classical lines; but their numbers and their distributions become intelligible only by some synthesis of statistical considerations" (Loneragan 1957, 115).

In physics before the advent of quantum mechanics, classical and statistical laws were applied independently. Thus in classical statistical mechanics statistical theory is used to deal with aggregates of classically defined entities. However quantum mechanics combines both of these functions in a single formalism. Thus the philosophical elucidation of quantum theory requires an understanding of statistical methods (see Jammer 1974). Lonergan provides some important insights in this area which could be further developed. Some work has been done on this topic, but much remains to be done (Heelan 1965; McShane 1970).

The relationship of the various sciences to each other is a perennial problem. Within the mechanistic horizon, particle physics is the premier science to which all others will, in time, be reduced. The critical realist recognizes successive levels of organization, each level systemati-

cally integrating previous lower levels (Lonergan 1957, 256). Thus, for example, organisms are higher integrations of what would otherwise be random chemical processes. A complete understanding of one level requires understanding of the previous levels; yet a particular level cannot be simplistically reduced to lower levels, nor is there one level that is somehow more real than the others. Chemistry, biology, and psychology are not provisional sciences, necessary only until they can be reduced to their physical underpinnings.

One point that is particularly difficult, especially for those educated within the traditional scientific horizon, is the nature of matter and spirit. If matter is what is real, what is out there, then spirit, if it is real at all, must be some sort of vacuous matter. However, within the framework we have been discussing, the real, whether spiritual or material, is the intelligible. Matter differs from spirit in that it is "constituted by the empirical residue or is conditioned intrinsically by that residue" (Lonergan 1957, 517). Thus the things studied in physics, chemistry, biology, and sensitive psychology are material. On the other hand, our understanding abstracts from that residue—from the particular individual, the time, and the place—and therefore is spiritual. God, if God exists, will also be spiritual for God will in no way be conditioned by the empirical residue.

Much more could be said about each of these areas. However, the point is not to deal with any of them exhaustively but simply to indicate how the positions we have been describing can deal with the problems raised by modern science. We now go on to consider the place of God within this horizon.

THE RELIGIOUS HORIZON

This paper began with a consideration of the scientific horizon, its objective pole being the physical world which the scientist seeks to understand and its subjective pole being the scientist engaged in scientific method. I have also argued that, if we are to understand the scientific method and its implications, we must shift from the horizon of the scientist to the realm of interiority. Through a consideration of the concrete processes of human knowing we can elucidate a critically grounded position on human knowing and objectivity that is truly adequate to contemporary science.

We can also speak of a religious horizon. The subjective pole is the believer who is in some way grasped by a power beyond. The objective pole is that reality in which the believer is immersed and which gives some sort of new meaning to the events of his or her daily life. While some may doubt the objectivity of this referent—at least as conceived in traditional Western thought—the fact of religion is indisputable.

Religion is rarely simply an individual affair. The shape and texture of our religious experience is determined to a large extent by the myths, rituals, and shared experiences of the community of which we are a part (Lonergan 1972, 118). Furthermore, religion tends to find its authentication within its own horizon. Thus the believer will appeal to his or her religious experience, or that of another member of the community, to validate religious claims. In the Christian context it is claimed that only if the person is receptive to God's grace will he or she feel God's presence and recognize God's working in his or her life.

But to claim that authentication takes place primarily within the religious horizon is not to say that religion can be considered in isolation from the other aspects of one's life. This is especially true for the scientist. For the questioning dynamism that impels investigation of the physical world cannot be arbitrarily cut off when religious questions arise. The scientific methodology may be inadequate to deal with religious claims, but the questions must nevertheless be dealt with.³ The scientist seeks and expects an intelligible continuity between the religious and scientific spheres.

Furthermore, this exigency for continuity arises not only from within the scientific horizon but also from within the religious horizon. The meaning which the religious person finds cannot be arbitrarily confined to the religious sphere. Religious myth brings order and intelligibility to the cosmos, and any attempt to exclude some particular sphere of reality from this process must seem arbitrary and unjustified.⁴ The very tensions that have arisen in the West between religion and science are themselves indicative of this search for unity.

As pointed out in the introduction, intimations of religious experience are not lacking in the scientist; yet the objectification of this experience and the path along which it is allowed to develop will depend on the overall horizon in which the person perceives him or herself operating. Thus, if the perceived horizon is a flat mechanistic determinism (reality is ultimately particles in motion completely determined by classical laws), then any hint of God will be taken as an unwarranted projection of the human psyche. If belief in a personal God seems ruled out by a scientific world view, then religious experience will be seen as an expression of the fact that we as human beings are part of a much larger, though ultimately impersonal, evolutionary drama. Finally, if one affirms a personal God in religious experience yet still feels that belief in God is untenable within a scientific world view, then one will have no choice but to compartmentalize the religious and scientific spheres of his or her life.

I have argued that the science/religion conflict is at least in part the result of the acceptance of an epistemological stand, often accepted

uncritically and assumed to be scientific, that assumes biological sensation to be the most adequate model for human knowing. I have suggested that the realism of Lonergan, critically grounded in cognitional analysis, provides a notion of objectivity that resolves the epistemological problems associated with the rise of classical physics and is furthermore able to deal with the philosophic issues raised by contemporary science. I have also suggested that this critical realism will provide an intelligible link between the religious and scientific horizons. It is to this last topic that we now turn our attention.⁵

To deal with this question we again move into the realm of inter-irreducibility. Do the very process and dynamism that make the scientific enterprise possible give any hint as to the ultimate grounding of the reality of both the investigator and the objects of his or her investigation? Lonergan's thought on this topic is summarized in his so-called proof for the existence of God:

If the real is completely intelligible, God exists.
But the real is completely intelligible.
Therefore, God exists (Lonergan 1957, 672).

The major premise is essentially a statement of what Lonergan means by complete intelligibility. For to say that the real is completely intelligible implies that there exists a basic reality that leaves nothing further to be understood and no further questions to be asked. There are no questions that can be legitimately answered by simply saying "that's the way it is." God's existence implies that there can be no unexplained matters of fact. God is the final explanation why there is something rather than nothing, why there is this rather than that. God, if God exists, will also be the source of his own being. The contingent beings of our experience are, but need not be. Their ultimate explanation lies outside themselves. The reason for God's existence lies within God—in the classical phrase, it is God's nature to exist.

Such a being will in a real sense be personal, that is, intelligent and free. *God* is not just a name for the last in a series of causal relations—the unexplained explanation for the big bang. The complete intelligibility of the real implies that it has its source in an intelligent act by an intelligent being. The contingency of the world of our experience implies that this world need not be. The final answer to the question of why contingent things are, rather than are not, is to be found in the free creative choice of God.

The minor premise of the argument has been the source of considerable controversy, even among scholars who consider themselves as working within the Lonergan framework (Burrell 1967, 250-53). It seems to imply that we must know everything about everything before any conclusion can be drawn; how else can we know if in fact all being is

intelligible? In other words it seems to be saying that we must possess some sort of unrestricted knowledge if God's existence is to be demonstrated.

Loneragan firmly rejects such notions (1957, 643). Rather, the verification of the minor premise must be sought in the heuristic analysis of human knowing and not in the restricted content of that knowing. He argues as follows:

To begin from the minor premise, one argues that being is completely intelligible, that the real is being and that therefore the real is completely intelligible. Now being is completely intelligible. For being is the objective of the detached, disinterested, unrestricted desire to know; this desire consists in intelligent inquiry and critical reflection; it results in partial knowledge in as much as partial knowledge yields understanding and critical reflection grasps understanding to be correct; but it reaches its objective which is being, only when every intelligent question has been given an intelligent answer and that answer has been found to be correct. Being, then, is intelligible, for it is what is to be known by correct understanding; and it is completely intelligible, for being is known completely only when all intelligent questions are answered correctly (Loneragan 1957, 672-73).

When first considering this line of argument, there seems to be some sleight of hand. One has the feeling that Lonergan has simply defined being as the object of knowing and then proceeded to argue that because being is the object of knowing it must be intelligible. Now in a conceptualist or purely logical framework, such a criticism would be decisive. But Lonergan is not arguing from some logical first principle; he is arguing from the *de facto* nature of human knowing.

Empirical science is ultimately satisfied with matters of fact. It is true that the physical scientist seeks more and more abstract and unified correlations of phenomena, but there comes a point when he or she has to be satisfied that this simply is the way things are. Nevertheless, mere matters of fact—whether they be the masses, momenta, and positions of the classical physicist or a set of symmetry relations for the contemporary physicist—also call for an explanation. For to say that things simply and unintelligibly are, is to leave aside further questions for intelligibility and to deny the very dynamism that allows us to meaningfully engage in scientific research.

If the real is known by taking a good look then one can be comfortable with unexplained matters of fact—there they are, just look at them. But if the real is known only through intelligent grasp and reasonable affirmation, then such a state of affairs is untenable. It is not just that it would be nice to have things make sense; rather the existence of being as verified in judgement is contingent on intelligibility. Only if there is understanding can the conditions of the unconditioned be fulfilled.

Science is concerned with theoretical knowledge of the realm of being that is experienced. In itself it can tell us nothing of transcendent

being; yet, the dynamism exemplified in scientific knowing leads to further questions that cannot be authentically brushed aside. The horizon that grounds the scientific enterprise opens onto a fuller and richer reality. Ultimately God is within the human horizon. It is possible to talk meaningfully about God. God is the object of human knowledge, not in the sense that we can understand God's being in itself, but in the sense that we can affirm as true an heuristic understanding of God extrapolated from our knowledge of proportionate being.

What purpose can such an argument have? It is surely not meant to be a proof in the sense that it is a compelling argument.⁶ For if the upward dynamism of the human spirit, which first urges the knower to transcend him or herself through knowledge of the physical world, is not in some way touched by God, then any argument is doomed to failure. Just as one cannot convincingly argue physics without entering into the scientific horizon, so one cannot "prove" God without having in some way entered into the religious horizon.

Faith is defined by Lonergan as "knowledge born of religious love" (Lonergan 1972, 115). It is felt by the believer to be a gift from God and the appropriate response is self-surrender to this God. It is the response of a person who has in some way experienced God's love, both in creation and, for many, in the historical persons and events through which God has revealed himself.

No matter what our intellectual horizon, faith can lead the way. It can bring us to recognize the God who otherwise would have remained distant and obscure. Yet faith does not absolve us from seeking a truly integrated view of ourselves and our activities. We have argued that the horizon of critical realism provides the matrix in which there can be an authentic intellectual integration of our lives as scientists and persons of religious faith.

God is the intelligible and intelligent ground of all being—not a God-of-the-gaps to readjust the world machine when it gets out of repair, nor a first cause in the sense of being the initiator of a chain of self-sufficient temporal events. God is not simply the sum of the evolutionary forces that have resulted in the emergence of the human species on the planet earth. Further, God neither can be excluded from the realm of the personal and the existential nor arbitrarily confined to that realm. In the words of the Greek poet quoted by Saint Paul in Athens, "In him we live and move and have our being" (Acts 17:28).

NOTES

1. Much of this historical material is summarized in Ian G. Barbour (1971). See also E. A. Burt (1954) and Herbert Butterfield (1957).

2. For the best-known of these works that brought about this rethinking of the history of science, see Kuhn (1970).

3. In this paper I am primarily concerned with so-called foundational questions, for example, the nature and adequacy of religious discourse, the nature and existence of God, the possibility of revelation. The consideration of historical events of religious significance adds a new dimension to the inquiry which will not be considered here.

4. In using the word *myth* I refer to a paradigm or model that intelligibly orders the cosmos for the believer. In using this word no position is taken on the adequacy or inadequacy, truth or falsity of a particular paradigm. See Barbour (1974).

5. For the best study to date on Lonergan's philosophy of God, see Tyrell (1974).

6. "Natural knowledge of God is not attained without moral judgements and existential decisions. These do not occur without God's grace. Therefore the natural light of reason does not suffice for mankind's so-called natural knowledge of God" (Lonergan 1974, 133).

REFERENCES

- Barbour, Ian G. 1971. *Issues in Science and Religion*. New York: Harper & Row.
- _____. 1974. *Myths, Models and Paradigms*. New York: Harper & Row.
- Blackwell, Richard J. 1981. "New Directions in the Philosophy of Science." *Modern Schoolman* 59 (November): 55-59.
- Burrell, David. 1967. "How Complete Can Intelligibility Be?" *Proceedings of the American Catholic Philosophical Society* 41: 250-53.
- Burtt, E. A. 1954. *The Metaphysical Foundations of Modern Science*. New York: Doubleday Anchor Books.
- Butterfield, Herbert. 1957. *The Origins of Modern Science*. New York: Free Press.
- Descartes, René. 1968. "Discourse on Method." In *The Philosophical Works of Descartes*, trans. E. S. Haldane and G. R. T. Ross, 80-130. New York: Cambridge Univ. Press.
- Galilei, Galileo. 1957. "The Assayer." In *Discoveries and Opinions of Galileo*, trans. Stillman Drake, 232-80. New York: Doubleday Anchor Books.
- Heelan, Patrick A. 1965. *Quantum Mechanics and Objectivity: A Study of the Physical Philosophy of Werner Heisenberg*. The Hague: Martinus Nijhoff.
- Jammer, Max. 1974. *The Philosophy of Quantum Mechanics*. New York: John Wiley & Sons.
- Kuhn, Thomas. 1970. *The Structure of Scientific Revolutions*. Chicago: Univ. of Chicago Press.
- Lakatos, Imre and A. Musgrave, eds. 1970. *Criticism and the Growth of Knowledge*. London: Cambridge Univ. Press.
- Lonergan, Bernard J. F. [1957] 1965. *Insight: A Study of Human Understanding*. New York: Philosophical Library.
- _____. 1967. *Collection*. New York: Herder & Herder.
- _____. 1972. *Method in Theology*. New York: Herder & Herder.
- _____. 1974. *A Second Collection*. Philadelphia: Westminster.
- McShane, Philip. 1970. *Randomness, Statistics and Emergence*. Dublin: Gill & Macmillan.
- Nagel, Ernest. 1961. *The Structure of Science*. New York: Harcourt, Brace & World.
- Suppe, Frederick. 1977. *The Structure of Scientific Theories*. Urbana: Univ. of Illinois Press.
- Tracy, David. 1970. *The Achievement of Bernard Lonergan*. New York: Herder & Herder.
- Tyrell, Bernard. 1974. *Bernard Lonergan's Philosophy of God*. Notre Dame, Ind.: Univ. of Notre Dame Press.