

# FAITH AND THE NORMATIVE FOUNDATION OF SYSTEMS SCIENCE<sup>1</sup>

J.D.R. de Raadt  
Department of Informatics and Systems Science  
Luleå University, S-951 87, Luleå, Sweden

## ABSTRACT

The object of this inquiry is threefold. Firstly, it reviews the historical process through which science has become de-personalised and secularised. Secondly, it investigates the normative consequences of this. Thirdly it proposes a way to integrate thought as part of our person and as part of our experience of God and the universe.

**Keywords:** Multi-modal Systems, Normative Order, Ethics, God.

## 1. INTRODUCTION

In a biographical note published some years ago, C. West Churchman wrote about his progress through systems thought as a succession of discoveries made over a period of many years. He had the following to say regarding the first of these:

...my earliest speculations... were mainly on the writers of the centuries I admired the most, the seventeenth and the eighteenth. The major writers, from Descartes to Kant, were all systems researchers. Their major problem was not *how* to build systems models, but to address the question of the existence of God. It seemed to them (as it still does to me), that the nature of the human systems depends most of all on whether a perfect being exists.

If it does, then our main attention as systems researchers should be how planning relates to its existence. If it does not, then we not only have a lot of explaining to do in terms of our values, but we also have to find a whole set of god-less values to guide us. (1987, p. 140).

The existence of God has been a topic of much debate throughout the centuries. It includes the extensive work of apologetics, ancient and modern, such as Lewis (1955, 1994) and Swinburne (1991, 1993). Our concern here will not be with theorising whether God exists or not. We shall leave that to the apologists. We will instead concern ourselves with three different, yet not unrelated, questions.

The first question is this. Many, today and in the past, and from all walks of life have experienced God in a personal manner. Among these are some of

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the most famous scientists, artists and humanitarians. Claiming their inspiration as a gift of God, they have - in large volume - stated significant scientific theories, written great works of literature, composed beautiful symphonies and painted and sculptured masterpieces. Not the least, they have also gone to the slums or ghettos in modern cities, the slums of Calcutta and to the inclement barrenness of Tierra del Fuego (Thompson, 1983) and brought love, care and comfort to the suffering and destitute. If one cannot lightly discard these people as lunatics, how is it that we have been persuaded to think that science and belief in God are incompatible, how is it possible that science, together with Western culture, has become so vastly secularised?

The second question refers to the normative consequences when science becomes secularised. As we shall see, the classical scientist's main preoccupation was not with the quality of life in the modern sense, but with the quality of the person. What happens when science becomes secularised and loses its thirst to know what makes a good man and a good woman?

The third and final question is: how can we integrate our knowledge of God with science, especially systems science, and how can we scientifically concern ourselves once more with the inquiry into what type of people we ought to be?

The finding of our search should be of significance not only to systems science but to science in general. However, systems science is placed in a particularly favourable position to make a contribution along these lines because of its aim to provide a unifying link between the specialised sciences and because of its interest in systems as wholes.

## **2. THE CLASSICAL (PRE-MODERN) PERIOD**

For the purpose of this discussion, we shall distinguish three periods in the history of Western thought - classical (pre-modern), modern and post-modern - and we will regard the first one as extending from antiquity until the beginning of the 18th century and as being mostly rooted in Hebrew and Greek traditions. People as varied as Moses, Isaiah, Plato, Aristotle, Augustine, Aquinas, Luther, Copernicus and Galileo belonged to this period. Among them there was barely any dispute regarding the existence of God, of truth and the absolute; likewise, it seems that the ultimate goal of people's intellectual pursuit was to become better people: "know thyself" seems to have been the ultimate motto of inquiry. Calvin sums it up like this:

Our wisdom, in so far as it ought to be deemed true and solid wisdom, consists almost entirely of two parts: the knowledge of God and of ourselves. But as these are connected together by many ties, it is not easy to determine which precedes, and gives birth to the other. (1970, I:1)

Yet, there were conflicting ideas of how one should search oneself and what role God ought to play in all this. The conflict mirrored firstly the divergent experience of God and secondly the different perception of how God

relates to the cosmos. Israel's Yahweh was thoroughly personal, in fact personhood was entirely contained in him. Conversely, while there are some indications of a personal God in Plato's works (e.g. *The Last Days of Socrates*), the Greek perception of God, such as Plato's Demiurgos and Aristotle's Prime Mover are essentially rationalistic and impersonal. Yahweh on the other hand, continuously sustained and ordered the cosmos by his personal rule. As a result of this, the universe displayed everywhere the personal character of God, e.g. his omnipotence, wisdom and kindness. All things in the universe were dependent upon God, including man and his thought. Even man's understanding was dependent upon God's revelation being mediated through faith. Revelation contained every form of knowledge, from things eternal to the more mundane matters of ploughing a field and sowing caraway. It was revelation that provided the bridge between the mind and the object. By contrast, Greek thought was somewhat devoid of such personal involvement of God and man's dependence upon it. Plato's creation account in *Timaeus* (1977), told us that the world was created in the image of a "unique, perfect and eternal model." This model was "the highest and most completely perfect of intelligible things" that one could understand through reason (pp. 42-43).

Attempts to synthesise these two views of God seem to have often led to the sacrifice of the personal for the benefit of the abstract. One can perceive this, for example, in the efforts of Philo of Alexandria to synthesise the creation account in Genesis (*De Opificio Mundi, III*) with the Platonic idea of creation. In his synthesis, God created the world guided by an "archetypal idea conceived by the intellect" and "only perceptible by the intellect" much in the same way as was described by Socrates in *Timaeus*. Other thinkers who capitulated to the abstract were Clement of Alexandria and Origen (Klapwijk at al., 1991).

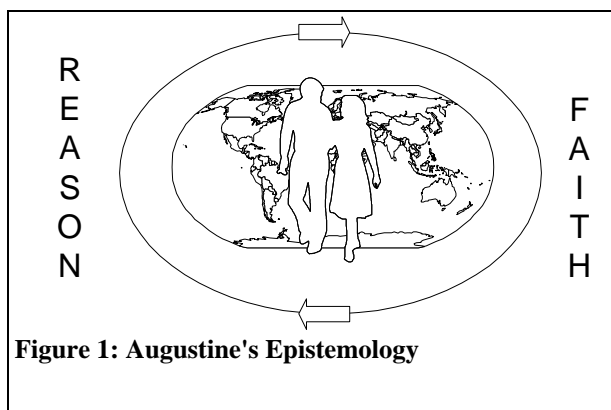
This conflict between a personal world view and an abstract reductionism has played a major role in shaping the history of Western thought. In the midst of this history stand two dominant thinkers - Augustine and Aquinas - representing the two opposing epistemologies in the conflict. The former relied on a personal experience of God; the latter depended on a synthesis of personal and impersonal views of God.

Augustine was originally influenced by Neo-Platonism but, after his conversion to Christianity, adopted a Hebrew 'epistemology'. In his scholarly legacy he left us four main tenets. Firstly, he proposed that reason was not autonomous but dependent upon faith. While every system of thought must start with faith or an intellectual assent to a set of presuppositions, Augustine extended this to a more profound and personal reliance upon a God who revealed Himself and his cosmos to man (see Figure 1). Unlike Plato's or Philo's "eternal model", this revelation personally involved God in leading man into all truth (*Soliloquies* I: 3). The intellectual task was for him a fully personal encounter between God and man as is evinced for example in his *Confessions* which are written in the form of a dialogue between God and himself. Secondly, Augustine promoted an intelligent and educated faith, a faith that

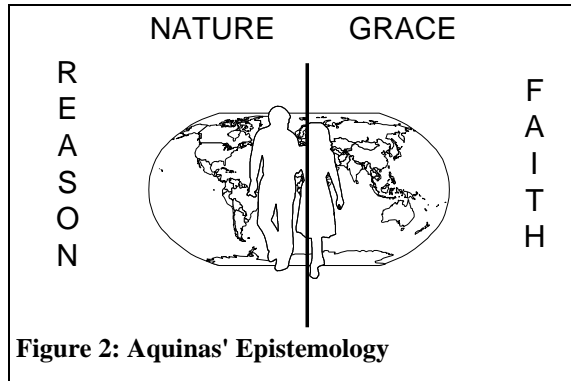
dynamically interacted with reason. While faith provided the foundation for reason, reason enhanced faith and helped it on its way to maturity. For Augustine, faith without intellect crumbled into credulity, a highly unstable state in which man could believe anything without discernment or reflection. Thirdly, truth exhibited unity. The surety of this unity was God himself who, for Augustine, was the truth. "He who finds truth, finds God" - he declared in his *Confessions* (xxiv). Fourthly, Augustine stressed the importance of the moral character and integrity of the thinker in his scientific task. This not only meant that the scholar had to give his whole self and devotion to the pursuit of truth but, in addition, his life had to be consistent with his findings.

In contrast to Augustine, Aquinas, living almost eight hundred years later than Augustine, tried to resolve the conflict between Hebrew and Greek traditions by finding a middle course. The philosophy of Aristotle rather than Plato dominated his era, a factor that may have influenced the type of epistemology that he eventually was to adopt. Of all Greek philosophers, Plato and his followers were the closest to the Hebrew tradition, especially by maintaining that one should seek truth apart from the concrete reality of this world. It must have been easier for the Neo-Platonist Augustine, therefore, to have switched to a Hebraic world view. Aristotle, on the other hand, conceived truth as being located in concrete reality and capable of being understood by autonomous reasoning without any aid from God. Aquinas attempted to accommodate this autonomous reasoning with the Hebrew notion of understanding through faith, by splitting reality into two realms and establishing a boundary line that kept one epistemology separate from the other. One was the realm of grace which could only be comprehended by faith and the other was the realm of nature, which could be known by reason (see Figure 2). In the realm of grace, Aquinas placed such things as heaven, the soul and the Trinity, while in the realm of nature, he placed the earth and all that resides in it including the human body and, interestingly, also the presence of God. Regarding the knowledge of God, he had the following to say:

There is a twofold mode of truth in what we profess about God. Some truths about God exceed all the ability of the human reason. Such is the truth that God is triune. But there are some truths which the natural reason also is able to reach. Such are that God exists, that He is one, and the like. In fact, such truths about God have been proven demonstratively by the philosophers, guided by the light of the natural reason. (Kerr, 1966, p. 107)



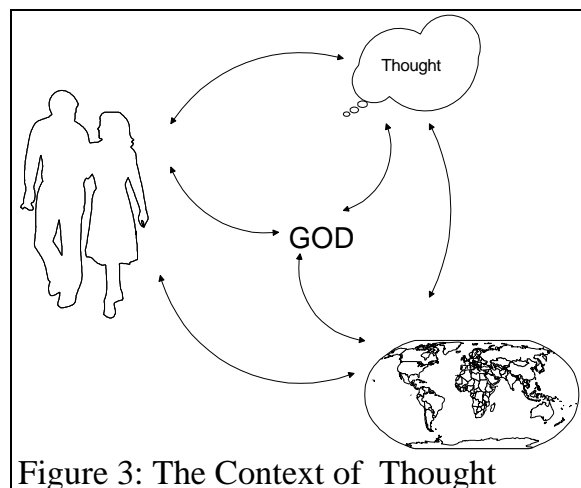
This division promoted the idea of an objective reality during and after the Middle Ages. In the 18th century the line that divided faith and reason was to take us on a journey leading to the modern and eventually post-modern eras. We shall return to this, but at this stage we must again consider Augustine as we introduce multi-modal systems thinking.



### 3. MULTI-MODAL SYSTEMS THINKING

Augustine exerted a forceful influence during the Reformation. This was not limited to the theological arguments of reformers such as Calvin and Luther; it had an impact on the rise of modern science that followed the Reformation. A great number of the post-reformation scientists ascribed to Augustinian epistemology. For many of those living in the 16th and 17th centuries, such as Brunfels, Bock, Fuchs, Clusius, Lobelius, Kepler and even the 18th century's Linnaeus, making science was a communion and dialogue with God (Hooykaas, 1972). Multi-modal systems thinking grows out of sharing with Augustine and those who followed him - as well as those who preceded him - the same personal experience of God and the universe and of wishing to integrate this experience with our thought. Figure 3 represents this experience with God at the centre, not only caring and governing us and the universe, but also speaking and responding to us, and offering guidance to our thought.

We can think of God's government as reaching us in two intertwined forms. The first is determinative, that is, it always exerts its own fulfilment. To this belong laws such as gravity. Gravity is always obeyed: if a man jumps off the twentieth floor of a high rise building one may be assured that he will go down and is not likely to be seen around again. All the cosmos, including man, is subject to the determinative order. Only man, however, is subject to the second form of order, the normative. This is because this order addresses the human will and only humanity has will. It is what distinguishes us from other creatures and makes us persons. For example, traffic regulations stipulate maximum speed limit on



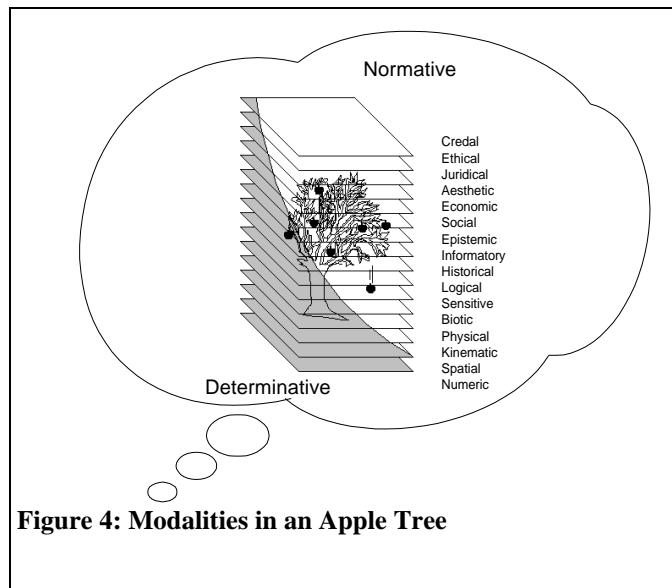
roads, yet the fulfilment of these speed limits is contingent upon the will of the people to obey or disobey them. One can expect that the majority of citizens will obey such laws, but this is only an expectation.

We can also think that both the normative and determinative orders appear in diverse modalities (von Bertalanffy, 1971; Bunge 1959). Dooyeweerd (1958, 1975), who developed an elaborate theory of modalities, identified fifteen: numeric, spatial, kinetic, physical, biotic, sensitive, analytic, historic, informatory, social, economic, aesthetic, juridical, ethical and credal. To these, an epistemic modality has been added between the informatory and social. The order given by Dooyeweerd to these modalities - exhibited in Figure 4 - is not accidental. There is an increasing complexity as one moves upwards from numerical to credal. In addition, each modality has the prior modalities as its foundation. For example, the biotic modality is founded upon the physical, kinetic, spatial and numeric modalities. Finally, as Figure 4 illustrates, the upper modalities are more strongly normative (blank area) than the more determinative (shaded area) lower modalities. Note however that the line separating the two types of orders only represents the intensity of each type of order in each modality and does not represent a separation between the types. As indicated earlier, both types of orders are closely intertwined with each other. Note also that the highest modality is the credal modality, the realm of faith. We will discuss the epistemological significance of this modality later.

Each of these modalities is unique and each is governed by its own modal order. Each modal order is also irreducible, that is, one cannot totally understand one modal order in terms of another, and it requires a distinct intellectual discipline to study each modal order. For instance, economics, jurisprudence, theology and mathematics are dedicated to studying the economic, juridical, credal, and numeric modal laws respectively. While unique, each modal order weaves itself with the others into a rich multi-modal thread in the cosmic order.

Let us consider, as an illustration, the order that is displayed at each modal level in the tree illustrated in Figure 4. The tree has seven apples on it but one is falling, the numerical modality would rule that now there will be only six apples on the tree. The tree takes space to live, as determined by the spatial modality and the kinetic modality governs the movement of the falling apple as it travels down to the ground. The physical modality determines the velocity with which the apple will hit the ground, which can be measured in metres per square seconds. The tree requires nourishment, the nature and quantity of which is controlled by the biotic modality. A person approaching the tree can see, feel and taste an apple, all of which is controlled by the sensitive modality. The tree may be planted in an orchard with other apple trees, ordered in a rational manner to facilitate care and harvesting activities, reflecting the logical modality. The different varieties of apples with their distinctive appearance and flavours, have changed through time because of the influence of tastes and uses; this is governed by the historical modality. Each variety of apple has a name, and there are also botanical names for the trees. All these names are

governed by the informatory modality. Growing apple tree requires a specialised knowledge, this is governed by the epistemic modality. When the harvest time arrives, the orchardist hires fruit pickers; the manner in which they organise their work and their interaction with each other is shaped by the social modality. The resources needed to run an orchard, such as labour and capital are governed by the economic modality. Apple trees bloom in spring and are beautiful to behold, the appreciation of this beauty belongs to the aesthetic modality. The tree is legally owned by the orchardist and he also enters into contractual obligations with the people who help him with the care of the tree. Ownership and contractual employment are ruled by the juridical modality. Growing apples may not mean just economics and observance of the law. The orchardist may love his trade and the trees inherited from his ancestors. Likewise, in addition to his economic and contractual obligations, the orchardist may have a special attachment and loyalty to the people who work for him. These are expressions of love functioning in the ethical modality. Finally, after a good harvest, the orchardist may acknowledge that the harvest is not only the product of his and his colleagues labour, but he may also thank God for the harvest. This belongs to the credal modality.



**Figure 4: Modalities in an Apple Tree**

The modalities, and the sciences that have developed to study them, allow us to look at ourselves, the universe and our relationship to God in a disciplined and ordered manner. There are a few aspects we need to consider briefly. Firstly, the modalities, or their sum, do not represent the universe, or humanity or our relationship to God in its entirety. That is: man, or the universe is not the addition of each modality. Rather, the modalities indicate the rich variety in human life and the universe, flowing as it were, through channels which, though diverse, maintain an essential integrity. Secondly, multi-modal thought - or any type of thought for that matter, is not autonomous, nor is able to replace personal knowledge. Any scientific statement is ultimately a personal statement. The arrows that connect thought in Figure 3 cannot be disconnected, for thought remains dependant at all times upon our person and upon our experience of God and the universe.

Thirdly, despite the great benefit that can flow out of the experience of God, there are nevertheless people who under the guise of being guided by God, inflict a great deal of suffering on others through oppression, abuse and even violence. Sadly, people are apt to corrupt anything including religion,

science and other worthy things. There is no safeguard against this, but among people who attest to a sincere relationship to God and who make a positive contribution to society one can observe that this relationship is often guided by three things: faith, hope and love.

Faith has four main properties. One, it implies certainty or conviction. Two, though their faith is "...the conviction of things not seen...", it is not blind. Faith does not preclude rigorous thinking about the things that one believes. We have already indicated earlier that this was captured in Augustine's integration of faith and reason. Three, faith is the bridge between the person and all reality that surrounds him, including our thought. People live by faith. Trust is the essential element in relationships, whether to God, spouse, children, friends or others. Four, faith implies commitment. People who believe with certainty, diligently endeavour to shape their life by what they believe.

Yet, even those who exercise a sincere faith and who make a positive contribution to society would admit that they are far from perfect. They also must struggle to stifle a drive within themselves which in some people, and sometimes in whole societies, becomes unleashed leaving a string of deceit, injustice, cruelty and other crimes against our fellow man. The verdict of history seems to be that our ability to constrain totally this drive has not shown much advance; on the contrary, the power of science and technology have successively handed us the tools to eliminate our fellow man, the whole tribe, the village, the city, the nation and ultimately the whole of life on earth. We seem to be far too clever for our own good.

This does not leave much space for optimism in man being able to pull himself out of his predicament. We seem to be left with only two choices: and existentialist type of pessimism (Evans, 1971) or hope in God's intervention. The latter does not mean that we take a passive attitude, but on the contrary, if we look at people like Mother Theresa, it appears that those who live by hope often labour with extraordinary self-sacrifice in situations that are utterly miserable. For Lewis (1955) and other Christians:

Hope ... means that a continual looking forward to the eternal world is not (as some modern people think) a form of escapism or wishful thinking...It does not mean that we are to leave the present world as it is. If you read history you will find that the Christians who did most for the present world were just those who thought most of the next...It is since Christians have largely ceased to think of the other world that they have become so ineffective in this. Aim at Heaven and you will get earth "thrown in": aim at earth and you will get neither. (p. 116)

Self-sacrifice is an ingredient of love. Unfortunately, the English language has only one word to cater for a large number of meanings of love. What we are talking about is what the Greek language attributes to *agape* in contrast to *eros*, which means sensual love. Richardson gives the following distinction between these two: "...the latter is brought into action by the attractiveness of the object loved, whereas [*agape*] loves even the unlovable, the repellent and those who have nothing to offer in return." (1969, p. 269.) Out of a genuine relationship with God there flows this type of love: a love that

goes beyond the boundaries of duty or justice - and that comprises self-sacrifice as an essential element - and brings comfort and alleviation for those who receive it.

We shall return to consider this further when we discuss the normative order in the modalities but at this stage we shall apply multi-modal thinking to analyse the progress - or regress - of mankind through modernity and post-modernity.

#### 4. MODERNITY AND POST-MODERNITY

Modernity was shaped by the emergence of determinism, which in turn was an outcome of 17th century rationalism. Determinism strove to explain the universe by employing two major notions: mechanistic and economic reductionism. These eventually drove society into the modern and post-modern eras.

Mechanistic thought became popular during the 18th and 19th centuries and was first promoted by such people as d'Holbach (1821) and de La Mettrie (1960). In this perspective (see Figure 5), the universe was a closed machine, positioned to the left of Aquinas' line. Thought was reduced to a science preoccupied only with the

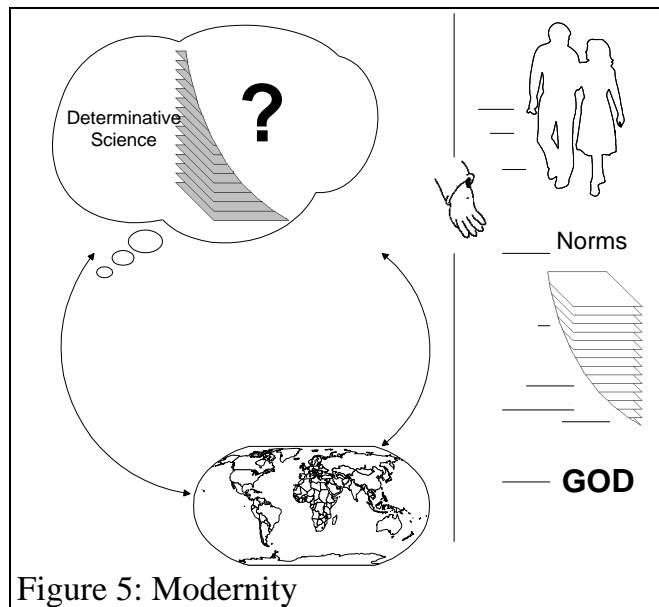


Figure 5: Modernity

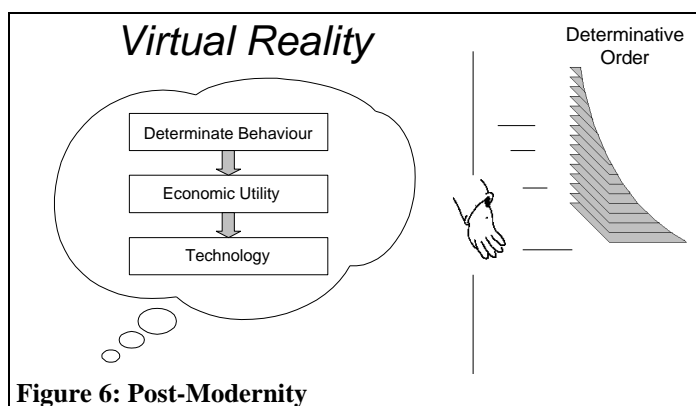
deterministic side of reality, and which pretended to be autonomous from the person. This thought could then objectively study the reality in the mechanical universe (Clark, 1974). Since God, the person and normative order had no place in a deterministic (positivistic) science, they were pushed out of science (see Figure 5), toward the right side of Aquinas' line and replaced by de La Mettrie's *l'homme machine*. Such man's morality and conscience did not issue from his soul, but from glandular secretions in his body (de La Mettrie, 1960). Banished from science, the ancient pursuit of God, the knowledge of ourselves and of norms began its intellectual decline; and without God or faith - the classical warrantors of the unity of truth - the secularised sciences began their fragmentation. Here may be found the foundations of the rigid walls that separate today's university departments.

When all phenomena, including human behaviour, was considered determined, a great emptiness appeared concerning the destiny of humanity. Determinism, as Figure 5 shows, erased a good part of our human image. How

should we live? Is there any place for individual and social conscience? What are the rights and wrongs in life? What is the end of man? Determinism sought to fill the void with its second notion: economic reductionism. Laws of economics replaced the normative order and became a sort of catechism for industrial society. Two versions of this economic reductionism exist. The earliest, laissez-faire economics and utilitarianism, was related to the work of people such as Adam Smith and Jeremy Bentham in the 18th century and provided us with capitalism. The second, Marx's economic determinism, is a product of the 19th century and of the disenchantment with capitalism. It supplied socialism. Despite the conflict between these two versions, they share the same deterministic foundation, although they have trodden through different historical paths and met with different fortunes.

Though the rise of modernity in the 18th century expelled God and the normative order from science, it did not displace them from society and from the belief of ordinary people. While industry patterned their work life, their personal life still held to the norms that existed in the pre-modern era: they continued to worship, marry and conduct their affairs guided by the old norms. The intellectual fragmentation of the educational system itself helped them divide off their personal lives from their working or intellectual lives. Within the latter, determinism reigned supreme, but Aquinas' line restrained its reign and kept religion and morals sheltered from the pronouncements of science and industry. Aquinas' line acted like a dam that retained the waters of modernity from flooding the personal lives of an otherwise modernised and industrialised people.

This damn burst in the 60s, sweeping away the normative order and ushering in the era in which we now live: post-modernity. Lyon (1994) identifies three elements in this era. The first is nihilism or the abandonment of all conception of absolute truth - either normative or determinative. The second is an overwhelming consumerism in a market that trades everything: electronic education, entertainment, sex, truth and religion. The third is technology and especially information technology. We shall briefly review each of these with the assistance of Figure 6.



All the sciences have their foundations firmly rooted in the normative order, even when focused purely on the determinative phenomena. This not only manifests itself in the many presuppositions undergirding each science, but also in the personal commitment of scientists to carry out their investigations with honesty and diligence. Without these norms, science could not function. The removal of the normative order in the 18th century started a process of

erosion in science; it eventually drove the determinative order itself to the right of Aquinas' line and into the very place to which modernity had first relegated the normative order. All that now remains on the left side of this line is an intellectual void; for according to Lyon, post-modernity denies any scientific legitimacy to thought or action.

Post-modernity may suggest that the final removal of all notion of order emancipates man. Yet the opposite is the case: when man disdains the idea of order, he surrenders his free will and permits the determinative order to rule completely his behaviour. Free will implies that we can consciously make some choices, but if we dismiss the normative order, there is no criterion left for choice. We are left to the whim of our determinative impulses and in a condition not unlike that of animals. Animal behaviour is purely determinate; it lacks self-consciousness and will. An animal's impulses can only be satisfied by its environment. For example, squirrels who lack shelter cannot trade their excess food with others who lack food but have spare shelter. We, however, besides having our provisions from the environment, can satisfy our impulses through the market mechanism by converting these impulses into economic utility. We can trade this utility with others to increase the level of satisfaction above the one offered by our environment. Without a normative order, the market will inevitably seek to satisfy every appetite (consumer preference). If for some reason appetites are not matched, the market will take care of inciting a new appetite by releasing an 'appetiser' in the form of persuasive advertising and marketing.

The interconnections of an animal to its environment and the limited amount of information that it has constrains its impulses. This has some very salutary effects. For instance, the difficulty of catching its prey prevents an eagle from becoming obese and from exterminating the species on which it feeds. The bird's inability to alter the determinative arrangement that constrains its own behavioural impulses endows it with a good measure of 'civility'. Man on the other hand, can call on the gigantic power of technology to satisfy his appetite through the mediation of the market. Therefore, post-modernity has handed over to technology the place that modernity had previously accorded to deterministic science. This is evident in the privileged position that technology, and especially information technology, occupies in the post-modern world, especially in the technological university and in research funding. Information technology has not only bolstered production, but has also forged the necessary consumerism by reshaping the dissemination and promotion of products in the market. It has also blended television, telephones and computers to fill in the emptiness that has been left in people's minds and lives and to supply a new type of reality - a *virtual reality* - that shapes itself interactively to the whims of post-modern man.

Even on their own, consumerism and technological domination over every sphere of life offer a rather frightening prospect to mankind, but the addition of virtual reality is even more disturbing. Under the guise of virtual reality, it was possible for Baudrillard to declare in 1991 that the "Gulf War had

not happened" (Lyon, 1994, p.52). Can we also declare that the suffering of people in Rwanda, Somalia and Bosnia has not happened either? This leaves us with nothing to prick our consciences, nothing to move us to compassion; for these things have no reality whatsoever. There is yet one more disturbing message that post-modernity has for us: by its own definition post-modernity marks the end of the road for human history. Society is crumbling into a condition where all is chaos, all relativity and incoherence and beyond which it is not possible to advance (Jameson, 1991). This completes the process through which the personal experience of God has been progressively eliminated from the intellectual life.

## 5. SYSTEMS SCIENCE

We now turn to examine the position of systems science in this maelstrom of culture and thought. L. von Bertalanffy (1971) and the co-founders of systems science seek in their new science a departure from the mechanistic world view that rose in the enlightenment. They also acknowledge the multi-modal nature of order, reject the closed system view of the universe and propose an open view instead. This makes once more space for the existence of God and religion. Yet, systems scientists - in various degrees - remain constrained by the influences of modernity and by the idea of the autonomy of scientific thought. For example, von Bertalanffy (1981) deals with religion as a positive force in humanity, but also as phenomena which he can only observe objectively from the outside. For him religion is something experienced by "the esoteric few", and he seems to assume himself free from it as he analyses it scientifically. His view of man, is similar. It is, as if it were a view of man under the microscope with no explicit link to the man who is looking through the microscope.

Another systems thinker who has included religious thought in his science is Beer (1975) (Harnden and Leonard, 1994). Beer's approach to religion is syncretistic: he blends teachings from various religions - such as Christianity, Buddhism and Hinduism - within the systems framework he has constructed. There are many instances where Beer alludes to a personal conviction to religious and ethical principles - and we owe him much for introducing them into management science as badly needed humanising factors. Yet, when moving from personal conviction to scientific conception, the personal seems to be lost in an autonomous cybernetics to which religious principles are added as supporting pieces of evidence.

One of the systems scientists who has written most extensively on the issue of religion is Boulding (1961, 1970 and 1987). His work seems to be divided along Aquinas' line; part of it has a modernist detachment while the other reflects an Augustinian inclination to speak out from his faith. At times, he seems to accept the principle of the autonomy of science without question, such as when he affirms that "...[t]he love of God escapes both the test tube and the formula" (1970, p. 179), while at other times he "...long[s] for a new and

greater Aquinas, to bring together once again Grace and Truth, Wisdom and Power, Faith and Knowledge in blessed union." (p. 195) One may speculate whether it was not his longing for an Aquinas rather than an Augustine that may have hindered his efforts to fully integrate his thoughts to his religious experience. Nevertheless, we are indebted to him for his labour in bringing a humanitarian touch not only to systems science but also to economics.

One of the first major departures from the autonomy of thought made by systems science comes out of the work of Checkland (1981). His concern over the vast limitations in "hard" systems design approaches derived from engineering when they are applied to designing social systems, led him to develop a "soft" systems approach that recognises the personal aspect of design. To attain this Checkland adopts a Kantian type of subjectivism, where the normative and the religious aspects fall into a noumenal or "fuzzy" world not unlike that which lies to the left of Aquinas' line. There, rigorous or "hard" thought appears to be of not much use, and so this is reached by pooling together subjective interpretations of this "fuzzy" world into the systems design process. The danger in this approach is that it succumbs to a relativism where it is no longer possible to judge the content of such interpretations even if some of them should be detrimental to people, a fact that is acknowledged by Checkland himself. Thus soft systems design turns out to be systems science's own post-modern version.

This problem of relativism has preoccupied various systems scientists. Bergvall and Grahn (1995a and b) have attempted to complement the design process of soft systems with normative standards based on multi-modal thought. In this manner, the methodological tools of soft systems can be applied without accepting a relativistic position with regard to norms. With a similar concern in mind, critical systems thinking (Jackson, 1991) was developed as an attempt to dismiss the modern objectivity in systems thinking and recognise the subjective nature of thought, while at the same time avoid relativism. Critical systems thinkers endorse a number of commitments: critical and social awareness, emancipation and complementarism in theory practice "... by accepting that "out there" are some hard factual conditions that do not exist in the mind only." (Flood and Ulrich, 1990, p. 26) Here we have a self-reflective struggle for a "via media" between modernity and post-modernity, objectivity and subjectivity and between optimism and pessimism (Flood and Romm, 1995).

There are however two main problems with critical systems thinking. The first is that this may appear as an intellectual formula "to have one's cake and eat it at the same time". One can be subjective, but at the same time one may be objective by reaching out "toward the system's epistemological ideal" (Flood and Ulrich, 1990, p. 256). This may resemble the Augustinian/multi-modal epistemology, but the difference is this: there seems to be very little to be grasped in the systems epistemological ideal, especially to the non-academic manager or systems designer who knows nothing about epistemology. Conversely, what can be grasped from God seems to be rather significant, if we

are to judge by what people have produced out of this. In addition to this, while theology can be as abstract as epistemology to the common person, it is not a requisite to reaching God. An abundance of religious practices, including prayer and worship are practised by many with most fruitful results, including intellectual.

The second problem is closely linked to the first. While the commitments of critical systems thinking are worthy and necessary as part of a normative starting point, they are by themselves not sufficient. There are a large number of other commitments that are required if systems practice is going to make a significant impact on the industrialised society in which we live and in the management that leads it. The list must be far longer, and would include such things as love, patience, forgiveness, perseverance, dedication and so on. All these are essential for human existence and activity and yet they have been effectively deleted from the dictionary of modern industry and management. Once more, reaching out for God may prove a more fruitful endeavour for commitments as is attested, for example in the fact that, long before systems science was even thought of, prophets brought to oppressed people their message of emancipation, something that was utterly foreign to the ancient world. When asked by the oppressors whence they had acquired such a bizarre idea, their answer was: "from God".

## **6. REDUCTION AND EXPANSION IN THOUGHT**

Let us once more return to Dooyeweerd's modal theory: though each modality has its unique order, there is a certain degree of correspondence or homomorphism with the order in other modalities. Thanks to this homomorphism, it is possible for us to use one modality as the symbolic representation or idiom of another to generate information and enhance our knowledge (de Raadt, 1991). For example, one can use numbers (numerical modality) to express economic behaviour (economic modality). This homomorphism provides the key to the symbolic representation of order, which in turn is ruled by the informatory modality. That is, there is a modal order of information that tells us - both in a normative and determinative way - how information can be generated and communicated. This order is studied by sciences such as linguistics, information theory, communication theory, quantitative and qualitative methods.

Information, however, is not the same as knowledge. The interpretation and evaluation of symbols according to the order of the modality that has been selected as an idiom is regulated by the epistemic modality, which is studied by disciplines such as epistemology and philosophy of science. It is this modality that contains the laws of knowledge that suggest two approaches to knowing: reductive and expansive. If one desires to understand the determinative order, then one selects a reductive method. One isolates the variables in one modality and translates them into another that has a greater proportion of determinative order and, therefore, greater potential for causal explanation. This second

modality becomes a scientific idiom that enables the manipulation of the variables in a symbolic manner and according to its own laws.

Let us consider, for example, the following question: how do carpenters determine the price of their work for doing home renovations? This question pertains to the economic modality. To explain the determinative forces that shape prices, economists, in common with other scientists such as physicists, often translate the variables under study (see Figure 7) to a modality with a greater determinative order. They usually select the numeric modality, for it best clarifies the cause and effect relations between the variables. Consequently, the relation between the variables appears in the form of a mathematical formula, such as the one shown in Figure 7. This is a simple model of the demand function stating that:

$$P = a + b D \tag{1}$$

where  $P$  = price

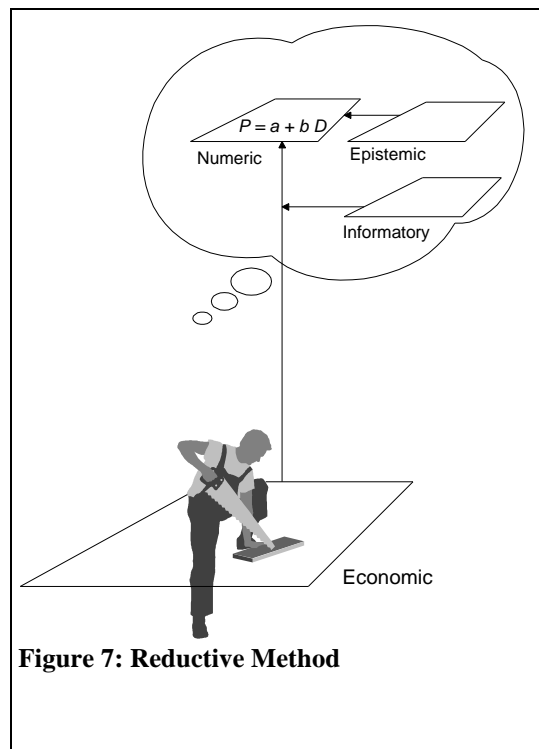
$D$  = demand for this type of work

$a$  and  $b$  = constants.

This equation isolates the phenomenon by representing the economic variables as numbers. Figure 7 shows the informatory modality regulating the representation of the value and the desire for the carpenter's work in terms of  $P$  and  $D$ . Given that the greatest degree of determinative order is found in the numerical modality and the ease with which numbers can be manipulated, mathematics is bound to be a favourite among most scientific methodologies, including economics.

Yet  $P$  and  $D$  are only numbers; we need to refer to the epistemic modality to realise that these numbers and the equation cannot exhaustively specify the economic dimension of a

carpenter's work, for the economic modality is highly normative. The carpenter also needs to understand the normative order that is involved in the economics of carpentry. It may be that a large demand combined with a tight supply of carpenters has led to a price that only those with high income can afford. Others, such as young couples with modest incomes and growing families, may not be able to pay, regardless of their needs. The carpenter ought to set a price not only according to the economics of cost, supply and demand, but also considering the tight economic circumstances of his customers. In employing

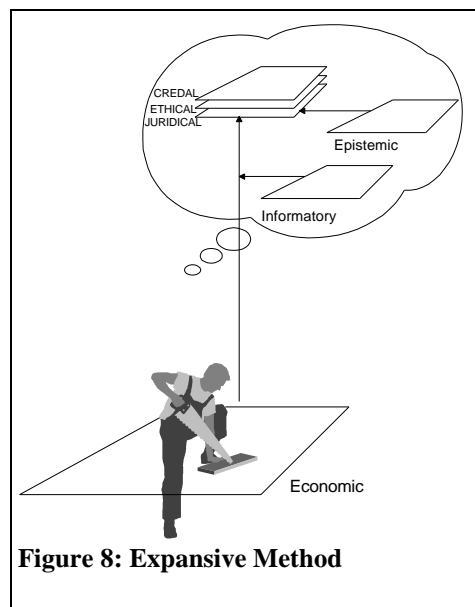


**Figure 7: Reductive Method**

the word *ought*, we have shifted our discussion to the normative side of this business. Here one needs a different epistemological approach; one must move upwards, from the more simple modalities to the more complex ones, as the carpenter is doing in Figure 8. His thought now becomes encircled by the, juridical, ethical and credal modalities.

Norms are highly interconnected. They do not become evident by scrutinising them in isolation but, on the contrary, by observing them as they affect other things: eating an apple is not wrong in itself, it is only wrong if the apple has been stolen from someone else's tree. However, taking the apple may not be wrong if a person is starving and the owner cannot be found. To understand the normative significance of an action, one must search for its implication upon other things. This is almost exactly the reverse process of isolating variables to understand the determinative order. To understand the normative implication of charging a price, the carpenter needs to move upwards to another modality that is more normative than the economic - such as the juridical. This modality provides a fuller picture of how his actions affect other people. It shows him that he must balance his own needs with the needs of his customers and that a just price should reflect this. A just price may still be beyond the reach of his customers, and he may have to go further into the realm of ethics to find how he should act. The ethical modality is the realm of love, and as love often demands self-sacrifice, one needs a deep motivation to enter it. Such encouragement is found in God's own love. God's love is - as we have already argued - a matter of personal experience, but that does not exclude that our understanding of such an experience cannot be enhanced by the study of theology which focuses on the credal modality, the most normative of all modalities and the one that provides the most ample stage upon which we can scrutinise the consequences of our actions. Hence, it is the ultimate modality in which we can resolve normative issues. This often shows in our discussion about norms; we usually preface them by words such as - "I believe that..."

This makes theology's relationship to the normative order somewhat analogous to the one between mathematics and the determinative order. Like mathematics in the determinative order, theology is pivotal for understanding the normative order. However, theology should not replace our personal dialogue with God. Its task is to expand its scope and make it more mature and profound, so that we do not limit in our minds God's sphere of interests to the Sunday school picnic and the health of the parishioners. On the contrary, theology makes us appreciate the breadth of God's involvement with



humanity and the universe including the composing of symphonies and the test tube in the laboratory.

Thought, therefore always combines these two methods of understanding - expansive and reductive. Each method enriches and improves the other at every modal level in a manner similar to the interaction between faith and reason promoted by Augustine (see Figure 1). One should subject every reduction, as illustrated in Figure 7, to a critical evaluation by an expansion such as that depicted in Figure 8. Conversely, every new knowledge gained through reduction should polish and enhance our expansive thought.

Furthermore, the combined reductive and expansive thought is not autonomous, but takes place within the elements Figure 3. That is, the thought of the carpenter is an integral part of his person and of his experience of the cosmos and of God. Thought, no matter how scientific and abstract, exists within their context and for the deeper human enjoyment of these. If, as Boulding has suggested, "the conceptual framework of economics....and the practical questions on which it impinges are concepts which inhabit a self-sufficient realm of their own, and seem to have nothing to do with the realm of discourse in which we discuss God..."(1970, p. 187), then this is due to our doing. We have, of our own volition, secularised and de-personalised science at our peril. We can only blame ourselves for a somewhat dull and empty science, chained to industrial self-interests and normative chaos.

What about a carpenter who is an atheist? Are norms beyond his reach? Even an atheist carpenter would have to recognise the inescapable religious foundation of his thought and norms. For he is indebted to the rest of humanity for his ability to think. No matter which culture we consider, it has historically linked its thought to its religious experiences. Thought is a part of our person, and we almost invariably seek to understand ourselves as the image of God: "To seek God is to seek man." (Boulding, 1970, p.194). The atheist carpenter practices his religion by proxy.

The inclusion of an epistemic modality among the modalities defined by Dooyeweer reflects the difference between rationality in a modern sense and rationality in a multi-modal sense. People often think that reason is purely determined by the logical modality, some even consider them as synonyms. This is a very dull and narrow minded reason. Perhaps it is due to this that others conceive irrationality as a necessary ingredient to put colour in an otherwise sterile intellectual life. Irrationality, however puts confusion in people's mind, not knowledge. It may also make people unable to discern between a healthy practice of religion and the dogma of fanatic fundamentalism as seen in tele-evangelism, sectarian groups and other practices that have rapidly spread with post-modernity. Multi-modal thought, on the other hand, includes the logical modality simply as another useful idiom - like the numeric modality - for thought. The laws of thought and science are not placed in the logical modality but in the epistemic modality. Here, human reason stands as much more than mere logic, it embraces the whole breadth of intellectual activity: a piano concerto by Mozart's or one of Rembrandt's paintings is as

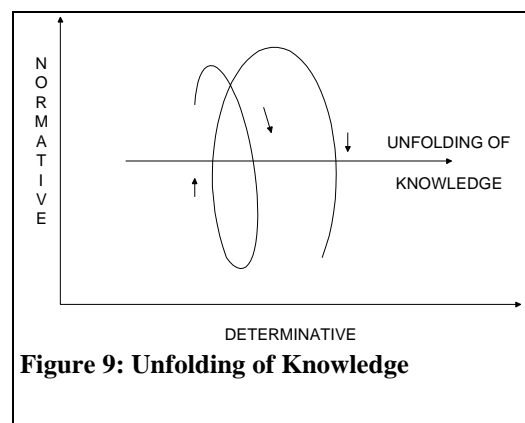
much the work of reason as Einstein's theory of relativity. The first two rely more on the aesthetic modality as an idiom, the latter relies more - but not exclusively - on the logical and numeric modality. Reason viewed as such will grab hold of the best fitting modality as an idiom, depending on the object of it's thought and will make this a rich intellectual experience.

It should also be a personal experience. If we maintain that reasoning is not autonomous, but is bound to our person, this binding works in both directions. Reason is only useful when it transforms us. Ethics, for example, is useless unless it guides our personal lives. Without this, ethics is simply a coded list of nice things to do that end up not being done. The same applies to any discipline of knowledge, be it theology or mathematics. For even mathematics, without a personal commitment, is no more than an empty game. Science remains part of personal knowledge (Polanyi, 1973), and only as such will it enrich and makes us better people.

However, multi-modal reasoning is not just about systems thought, it is also about systems practice. Applications to informatics (de Raadt, 1989 and 1991, Winfield et al., 1995), systems design in general (de Raadt, 1989; Bergvall and Grahn, 1995a and b), information systems design in particular (de Raadt, 1995) transport (van der Stoep, 1995), welfare systems (Hanson and de Raadt, 1995) and ethics (Strijbos, 1995) are first efforts aimed at helping us to regain control of this our post-modern technological civilisation and to manage our lives.

These efforts are modest not only in size, but also in terms of the predicament of the human race to which we have referred earlier. The distinction between normative and determinative knowledge allows us to add some further detail to this. The pattern of humanity's behaviour through history shows that while we have increased our understanding of the determinative order with time, the same has not been true about our understanding of the normative order. Men and women today live with an enormously greater degree of scientific and technological sophistication than people five hundred years ago. Yet they may display no greater knowledge of love, justice or beauty than their earlier counterparts. One may say the same about science. Scientists in the twentieth century know extensively more than their counterparts five hundred years ago, but they may not be much wiser regarding the normative order. The normative reflections of Plato, Augustine and other ancient scholars are as relevant today as they were in their own age. This is not true, however, about their knowledge of chemistry or the movement of the planets.

This constancy of our normative knowledge is a good thing. It allows the normative order to direct the development of human knowledge and action in the determinative order, in a



**Figure 9: Unfolding of Knowledge**

similar manner to a ship's compass directing the course of the ship. While the ship is in motion, it is important that the compass remains pointing to the north; only thus will it be able to guide the ship to its destination. Likewise, we may regard the normative order as mankind's compass piloting it to its destiny.

Sadly, while mankind's determinative knowledge has accumulated, its normative knowledge has been rather volatile. The path of human knowledge has been somewhat like a spiral (see Figure 9). Along the horizontal axis determinative knowledge moves forward with time, yet along the vertical axis normative knowledge oscillates like a pendulum. At times, it surges upwards, at others it plunges into decline. We have already alluded in the above that while the technological and power of humanity has increased exponentially, there is no evidence that as people we have become any better. All we can see is that at times in history we improve, only to recede in the next generation. Thus, any form of systems thought and practice - not matter how sound - should have no grounds for optimism within the span of history. One must move beyond history to gain, not optimism, but hope. For even though hope seems a rather long term affair, it has nevertheless a very salutary effect when mixed with our thoughts.

## 7. CONCLUSION

Our investigation having come now to an end, we must sum up our findings and address the questions posed at the beginning of this paper. We have found, firstly, that the secularising force that took over science during the enlightenment had its root not so much in scepticism, but in the autonomy from God and man that much of Greek philosophy conceded to thought and rationality. This autonomy was in conflict with the Hebrew view of thought, a conflict that was carried on in the later history of Western thought. At times, this leaned towards the personal side and at others, towards the autonomous side. During the enlightenment, autonomy became automata, that is, a deterministic and mechanistic view of the universe took hold of science. God, the person and normative thinking were exiled from science.

Secondly, the normative void that was left by enlightenment science was filled by economic utilitarianism that arose about the same time. From then on norms within economics and industry became closely linked to money. The progressive expansion of modernity beyond the walls of industry and academia and into our private lives has reached consummation in the age of post-modernity. This is an age of crisis: both the foundations of normative and determinative knowledge are now foundering, tossing our society into normative chaos and intellectual confusion. Meanwhile industry and technology have fully moved into the driver's seat of our private and working lives and lead our world.

Thirdly, we have exposed the fraudulent nature of autonomous thought and rationality, and the unwarranted optimism that this injects in us. We have advocated for a recognition that thought is linked to our person and to our

experience of God and of the universe and proposed a broad multi-modal rationality instead of a narrow purely logical one. Science must also recognise the tragic predicament of humanity in history: while our determinative knowledge and power seems to have progressively increased, our normative knowledge and behaviour has tended to oscillate. This dismisses any optimism for the future of mankind that is based on an autonomous rationality. Furthermore, if we wish to learn about the determinative order, it is a good idea to read the latest research reports, but if our aim is a normative understanding, it is wise not to neglect the reading of our spiritual and intellectual ancestors, for they in turn, did the same. We end therefore, with a quote of such an ancestor, who in turning to his own ancestors found that:

...those who are praised as having most closely followed Plato, ... and who are said to have manifested the greatest acuteness in understanding him, do entertain such an idea of God as to admit that in Him are to be found the cause of existence, the ultimate reason for the understanding, and the end in reference to which the whole of life is to be regulated. (Augustine, *The City of God*, VIII-4)

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