NATURE AS A COMMUNION OF SUBJECTS: THE IMPLICATIONS FOR ECOLOGICAL ETHICS OF ALFRED NORTH WHITEHEAD'S PHILOSOPHY OF NATURE

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TABLE OF CONTENTS

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ABSTRACT

Science has exerted a tremendous influence on modern thought. This occurrence has brought with it its share of benefits and problems. Science has offered humankind the growing ability to understand and master nature. This benefit has also brought with it the critical problem of environmental destruction. Within its philosophical roots, science is tied to a cosmology that has alienated humanity from its 'spiritual' experience. This includes aesthetic and theological experience. Two extremes choices are possible: either to reject the scientific cosmology or to reject 'spirituality' as central to the functioning of reality. For those who wish to include the integrity of all human experience in a cosmology, the hope of synthesizing the scientific with the 'spiritual' stands as an ideal.

The thought of Alfred North Whitehead is an attempt at such a synthesis of thought. This thesis examines Whitehead's metaphysical synthesis. It begins, in the first and second chapters, with an examination of what Whitehead understands as the problem. The first chapter deals with his description of the mechanist-materialist understanding of nature. The second chapter shows the deep problems which make such an understanding untenable. In the third chapter we explicate Whitehead's attempt at a more plausible metaphysical synthesis. Lastly, we apply Whitehead's thought to questions of ecological ethics. In this chapter we note how reintegrating the idea of a living nature occupied by things with 'inherent value' with a renewed assessment of the importance of human aesthetic and theistic experience, form together a mandate for the ethical treatment of nature.

A NOTE ON REFERENCES

AE — The Aims of Education and Other Essays (London, Williams & Norgate Ltd, 1950).

AI — Adventures of Ideas (New York, The Free Press, 1961).

CN — The Concept of Nature (Cambridge, Cambridge University Press, 1920).

ESP — Essays in Science and Philosophy (New York, Philosophical Library, Inc., 1974).

MT — Modes of Thought (New York, The Free Press, 1968).

PNK — An Enquiry Concerning the Principles of Natural Knowledge (Cambridge, Cambridge University Press, 1925).

PR — Process and Reality (New York, The Free Press, 1969).

RM — Religion in the Making (New York, The MacMillan Company, 1974).

SME — Symbolism, Its Meaning and Effect (New York, The MacMillan Company, 1927).

SMW — Science and the Modern World (New York, The MacMillan Company, 1967).

Introduction

Environmental philosophers have long warned that if life is to survive on our planet a profound shift must take place in how we see and respond to our world. One of the greatest hindrances to an effective environmental philosophy arises out of a cultural disdain for metaphysics, i.e. a positive and intellectually rigorous account of cosmological order. Metaphysics has been the victim of both the rise and the rejection of science. On the one hand, the empirical foundations of scientific pragmatism have devalued the speculative nature of metaphysics. On the other hand, there are romantic environmentalists who reject systematic rationality because the scientific system has left out too much that is important. The environmentalist hope for a paradigm shift has been crippled by its inability to produce a compelling rational scheme capable of integrating scientific achievements and romantic intuitions.

Despite repeated critiques of the mechanical-materialist doctrine of science, environmentalism itself remains crippled by the disastrous effect of this doctrine upon western thought.

The mechanical-materialist doctrine of science grew to dominate western thought three hundred years before this century began. Concerning it Alfred North Whitehead states:

> It has transformed thought and has transformed the physical activities of mankind . . . . It seemed that at last mankind had achieved the fundamental notion for all practical purposes, and that beyond it in the way of generality there lay mere aimless speculation (AI, 45-146).

One of the areas where this intellectual transformation occurred was philosophy. Science emerged out of, and consequently revolutionized, philosophical notions. In other words, science has deeply affected the path of philosophy and is itself infected with western philosophical biases. Whitehead writes that "in the infancy of science, when the main stress lay in the discovery of the most general ideas usefully applicable to the subject-matter in question, philosophy was not sharply distinguished from science" (PR, 13). This has changed, but materialist science cannot escape the fact that it rests upon debatable philosophical underpinnings.

> No science can be more secure than the unconscious metaphysics which tacitly it presupposes (AI, 154).

Whitehead finds it of critical importance to the understanding of those metaphysical presuppositions which lie at the base of our civilization, that we examine the conceptual basis of scientific practice and theory.

Whitehead viewed the scientific cosmology, which "practically recoloured our mentality" (SMW, 2), as being deeply flawed, and as having harmful spiritual and social repercussions. As the study and interpretation of natural phenomena, science has had a profound effect upon how we view nature and our place within it. The applied sciences have given us our technological ability to master nature. At the same time, the cosmology of scientific materialism has had the effect of devaluing nature and certain human experiences that find in nature both meaning and value. Devaluing the things of nature together with our cultural drive to dominate

and control has led to the current environmental crisis.

Science has vindicated both itself and rationality by its utility. Environmentalists who reject the unbelievable consequences of the materialist philosophy make a great mistake if they retreat into nature mysticism. What is required is a more comprehensive rational framework that provides an adequate framework for environmentalist ethics.

All societies and individuals require conceptual schemes to explain and order reality. The sciences of psychology, sociology, anthropology and history have provided us with an extensive hermeneutics illuminating the profound influence of collective schemes on the interplay between the one and the many, the person in process and the society in process. According to Whitehead, philosophy has an important social and intellectual role: the elucidation and critique of the schemes upon which a civilization stands. The main theme of his book Adventure of Ideas is that the existence of a vibrant civilization depends upon schemes sufficiently broad that the great social ideals -- Truth, Beauty, Art, Adventure and Peace -- achieve some intense measure of harmony (AI, 285). One aspect of such a civilization is the profundity and success of its metaphysical adventure, the adventure by which it continuously broadens and reorders its thought.

Cultural schemes serve to elicit culturally appropriate cognitive, affective and behavioral responses. According to Whitehead, they find their intellectual source in widely held, but

often implicit, ideas of cosmological order. He writes:

> In each age of the world distinguished by high activity there will be found at its culmination, and among the agencies leading to that culmination, some profound cosmological outlook, implicitly accepted, impressing its own type upon the current springs of action . . . . In each period there is a general form of the forms of thought; and, like the air we breathe, such a form is so translucent, and so pervading, and so seemingly necessary, that only by extreme effort can we become aware of it (AI, 12).

There seems to be a modern prejudice against the deliberate construction of metaphysical schemes. Historical and philosophic relativism has been supported by a widespread disillusionment with the dogmatism that usually accompanies systematic cosmologies. In our era the development of metaphysical systems is often viewed as a hopeless, unnecessary and sometimes dangerous waste of intellectual strength. Whitehead was quite aware and critical of this antirationalism of the moderns (SMW, 142).

Interestingly, this erosion of philosophic claims to truth has occurred alongside the rise of science. Though science is admittedly concerned with some aspects of life and unconcerned with others, it has tended to be imperialistic as to what might legitimately claim to be true. There is a strong force within science which claims that its endeavors are the only valid means to true knowledge. The social force of scientific thought is such as to give it "the last word about things, when all is said" (SMW, 193). Thus a speculative type of philosophy has often been relegated, along with religion, to the scrap-heap of ancient and irrelevant artifacts.

Whitehead believes that cosmological schemes are constructed

socially and individually regardless of whether they are informed by an adequate philosophy (SMW, vii). He agrees with the modern sentiment that any scheme adopted dogmatically becomes at best unprogressive and unadventurous, and at worst grossly evil (AI, 223). However, the alternatives are most likely to be either unconscious, shallow or incoherent. The alternatives consist of: unphilosophic schemas, in the sense of mere activity without self-reflection; uncritical adoption of bits and pieces of different and often contradictory philosophies; or exclusive reliance on science. The last option, faith in science, was for Whitehead the most prominent force shaping the educated minds of his era. And as we shall see, Whitehead does not think the scientific cosmology sufficient to merit such faith. Against these alternatives he maintains that it is the immensely important business of philosophy "to render explicit and -- so far as may be -- efficient, a process which otherwise is unconsciously performed without rational tests" (SMW, vii).

Environmental philosophers -- Barry Lopez, Thomas Berry, Alan Drengson, and John Cobb to name a few -- seek to replace our materialist-scientific conceptual perspective with a more holistic one. Many argue that the necessary social change requires a shift in how we perceive nature; a conceptual and spiritual shift.[1]

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[1]. For example, John Cobb in his article "Ecology, Science and Religion" writes: "A great deal is at stake. We must collectively move (and are to some extent moving) from mechanistic and dualistic worldviews and positivist and other antiworldviews to an ecological worldview" (The Reenchantment of Science. pp. 102).

This, in turn, requires an interest and respect for philosophy and religion, the theoretical and energizing forces of social change (AI, 26). The contemporary disrespect for both, then, should concern every environmentalist. The transcendence of biases inherent in our modern irrationalist conceptual order is an important 'requisite to social progress' (SMW, 193-208), if not a requisite for the continuation of life. The conclusion is that a conceptual and spiritual shift in our perception of and activity towards nature requires an appropriate and persuasive metaphysical system.

What is an appropriate metaphysical system? Whitehead quotes Henry Sidgwick:

> 'It is the primary aim of philosophy to unify completely bring into clear coherence, all departments of rational thought, and this aim cannot be realised by any philosophy that leaves out of its view the important body of judgments and reasoning which form the subject matter of ethics' (SMW 142)[2].

In short an adequate philosophy must not only be coherent and comprehensive, it must also propose ethical practices. Further, if we can take seriously Whitehead's statement that religion is the energizing moral force of social progress, then an adequate metaphysics must propose ways of being 'religious' (AI, 26). In the thought of Alfred North Whitehead not only do we find an elucidation and critique of scientific cosmological schemes, but also an attempt at the construction of a thoroughgoing metaphysical replacement for the materialist-scientific ideas he rejects.

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[2] Whitehead quotes this as Henry Sidgwick: A Memoir, appendix 1.

Lastly, in his thought we find the implications for a more ethical response to nature.

Whitehead can be viewed as having three main careers, each different but heavily interrelated. His educational background and the bulk of his career as a scholar was in the area of the mathematical sciences. Nevertheless, even in his earliest writings, such as A Treatise on the Universal Algebra, Whitehead sows the seeds of what would become his overwhelming concern with philosophy and metaphysics. His second career was as a philosopher of science. Here he took up the topic of how we can know anything, and he attempted to develop an epistemological basis for mathematics. The third career, and perhaps the pinnacle of his achievement, was his venture into metaphysics, begun tentatively in Science and the Modern World and systematically worked out in Process and Reality. Increasingly the manner of Whitehead's quest became apparent. He was a grand synthesizer; he applied information derived from scientific sources -- mathematics, biology and physics -- to questions of epistemology, aesthetics and theology, and showed how these latter issues demanded a broader and more sophisticated science than was usually recognized. Increasingly throughout his life, Whitehead seems to have been driven to describe and evaluate the content and effect of prominent scientific doctrines, and to propose alternatives.

The topic of this thesis is Whitehead's concern with how we conceive of nature and our place within it. The goal is to find a standpoint which offers an adequate metaphysical and an ethical

scheme which is adequate to environmental concerns. One criterion of adequacy is the ability of a metaphysics to understand and criticize dominant cultural conceptual schemes. The first two chapters will concentrate on Whitehead's description and critique of scientific materialism and its effects on our civilization. In the third chapter Whitehead's metaphysical alternative to philosophical, theological and scientific materialism will be set forth. Lastly, we will examine the implications of Whitehead's metaphysical system for our modern environmental concerns, focusing particularly on the ethical and religious demands inherent in Whitehead's conception of reality.

Chapter One

The Myth of Isolation: Whitehead's Description of Materialism

One cannot read the chapter, "the Romantic Reaction", in Science and the Modern World, without noticing that Whitehead profoundly disliked the materialist description of nature. Nevertheless, his respect for the genius and historical significance of the materialist ideas and their originators is equally obvious. In The Concept of Nature Whitehead states that "the first duty of an expositor in stating a theory in which he disbelieves is to exhibit it as logical" (CN, 225). Specifically concerning materialism, he states: "if we are wise, before criticizing it we will stop to admire it, and to note its essential services to science" (ESP, 251). Before we proceed to Whitehead's critique of materialism in the second chapter we must first understand what our author thought it was.

It is necessary to define at the outset the terms Whitehead used in his explication of science. The term 'mechanism' connotes the doctrine that the non-human universe is mindless, devoid of final causation, and works machine-like according to set laws. 'Materialism' is the term Whitehead uses to convey any science which assumes the primacy of a 'simply located' substance. As well, Whitehead uses the terms 'classical conception' and 'absolute theory,' both referring to the Newtonian mathematical cosmology, the culmination and systematization of materialist thinking.

I. The Origins of Materialism

The first two chapters of Science and the Modern World are "devoted to the antecedent conditions which prepared the soil for the scientific outburst of the seventeenth century" (SMW, 39). Whitehead's main concern is with the historical roots and inherent biases of science. He lists three main factors that produced this 'outburst': "the rise of mathematics, the instinctive belief in a detailed order of nature, and the unbridled rationalism of the thought of the later Middle Ages" (SMW, 39). Of the three it is the instinctive belief in a detailed order that is the most fundamental.

Whitehead raises the question of why science emerged in the West rather than in any other equally advanced civilization (SMW, 12)? His answer is that "there can be no living science unless there is a widespread instinctive faith in the existence of an Order of Things, and in particular, of an Order of Nature" (SMW, 4). Medieval rationalism and the rise of mathematics, both necessary for the development of materialism, would have been impossible without this faith.

Of course other cultures have cosmologies and thus propose types of order, but it is the novel scope of the western faith which captures Whitehead's attention. According to Whitehead, reality exposes all people to experiences of both recurrence and of contingency (SMW, 5). The experience of recurrence, the regularity of the tides and seasons, leads to faith in an order in nature. The experience of contingent, or unpredictable, events may lead to

the opposite conclusion, namely, that at the base of things is mere arbitrariness, irrationality, and inscrutability. However, experience is always dual, "Men expected the sun to rise, but the wind bloweth where it listeth . . . . Accordingly the practical philosophy of mankind has been to expect the broad recurrences, and to accept the details as emanating from the inscrutable womb of things beyond the ken of rationality" (SMW, 5).

Whitehead's question concerns why, if contingency is so obvious, the originators of science were discontented with any element of it whatsoever, seeking instead for "an order of things which extends to every detail" (SMW, 5). In short, how did the "full scientific mentality, which instinctively holds that all things great and small are conceivable as exemplifications of general principles which reign throughout the natural order" arise (SMW, 5)? Whitehead lists a number of causes, to which we now turn.

The development of mathematics in ancient Greece was necessary for science because it infused thought with a search for universal truths from which to deduce the logical order behind particular things. Whitehead names the first person who noticed a logical connection between two dissimilar groups of similar numbers as the first pure mathematician (SMW, 20). That person discovered a pervasive logical harmony in that one could abstract the postulates from bare fact so as to exhibit a patterned reasonableness of occurrences. Whitehead appreciates Pythagoras as the genius who first realized the full sweep of this general principle. The power

of mathematical explanation, in terms of exhibiting a harmony of order underlying contingent things, led Pythagoras, and later Plato, to the wrongheaded conclusion that number was more fundamental than flux.

A second cause is the contribution of Aristotle towards the emergence of empirical method. Aristotle, Whitehead states, was one born before his time, in that he was endowed with the full scientific faith in natural order (SMW, 5). His effect was to impart to the Medieval intellect "the inexpugnable belief that every detailed occurrence can be correlated with its antecedents in a perfectly definite manner, exemplifying general principles" (SMW, 12). It is obvious that without this faith the very basis of scientific induction, would have been impossible.

A third cause is found in the concepts of God within Greek and Roman thought. For the Greeks, a prominent philosophic explanation of natural order was to posit an ordering entity. Plato, for example, in the Timaeus theorizes that the activities of a 'Demiurge' account for the order in our material and spiritual world. Indeed, cultural conceptual orders throughout history have seldom existed without legitimating themselves by their description of Deity. However, in Greek and Roman philosophy special emphasis was put on the rationality of God. To discern the effect of Rome on the rise of scientific thinking Whitehead focuses on the connection between Roman social order and its perception of the Divine. He quotes Lecky who states: "'Seneca maintains that the Divinity has determined all things by an inexorable law of destiny,

which He has decreed, but which He Himself obeys'" (SMW, 11)[3]. To the Stoics, then, God is bound by His own law and acts accordingly with perfect consistency. In other words, there is an order decreed and obeyed by God which could be humanly known and socially instituted. The suggestiveness of this worldview for the foundations of scientific faith is obvious. A faith in the knowability of divinely decreed moral and social law is merely translated by science to physical law.

In the Middle Ages Greek and Roman conceptions of the rationality of God and cosmic order were married to Biblical faith. Whitehead proposes that this peculiar mixture formed the basis of the scientific faith in an intelligible natural order.

> It must come from the medieval insistence on the rationality of God, conceived as with the personal energy of Jehovah and with the rationality of a Greek philosopher. Every detail was supervised and ordered: the search into nature could only result in the vindication of the faith in rationality (SMW, 12).

Thus, Whitehead's central explanation concerning why such a strong faith in an order of things arose, is that it is an "unconscious derivative from medieval theology" (SMW,13). It was this that was ultimately responsible for the development of science.

Whitehead also points out that sometimes the connection between theism and science was not so unconscious. Maupertuis successfully discovered his theorem of least action starting with the idea that "the whole path of a material particle between any limits of time must achieve some perfection worthy of the

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[3] Whitehead's referencing of Lecky is limited to History of European Morals

providence of God" (SMW, 61). Newton wrote: "When I wrote my treatise about our system, I had an eye upon such principles as might work with considering men for the belief of a Deity;" (PR, 112).

A fifth cause was the negative contribution made by Medieval Rationalism. Its overemphasis on deduction was the intellectual failing that acted as the thesis for the production of the scientific antithesis. Whitehead notes that Galileo's mythic debate with Simplicius -- the character representing Medieval Rationalism -- exemplifies a fundamental break with Medieval thought. Simplicius uses reason to deduce results from postulated intellectual and religiously justified axioms, whereas Galileo appealed to 'stubborn and irreducible facts' discovered through experimentation and grounded in the inductive scientific method. Although opposed to Simplicius' dogmatic use of specific Aristotelian ideas, Galileo had grasped the spirit of Aristotle which was the "systematic practice of passing beyond theory to direct observation of details" (AI, 107).

Simplicius represents the fact that religious worldviews devoid of "correction by contact with brute fact" (SMW,17), have a habit of spiralling out into purely imaginative realms and dogmatically refusing to come down to earth. He is characterized as having a dogmatic disregard for the value of testing one's hypotheses. Science, in reaction to this 'airy rationality' had no concern to justify rationally its concentration on brute fact. Thus it took on the opposite pole of imbalanced thought. Galileo

found it unnecessary to ground induction in any rational way. It was this disregard for any need of rational justification that led Whitehead, interestingly enough, to describe science as "through and through an anti-intellectualist movement" (SMW, 8).

Finally, the Greek notion of substance played an important role in the rise of science. Substance is defined in the Century Dictionary and Cyclopedia as "That which exists by itself, and to which accidents inhere". Democritus and The Ionian school of philosophers sought the basic substance, the final self-sufficient material, of which all things are made. To the Greek mind, the primary imaginative scheme contained four elements -- earth, air, fire, and water. Democritus propounded an atomic theory, which asserted that the ultimate substances were small bits of an undifferentiated material. At the basis of the Ionic philosophy is the intuition that all entities are made out of enduring, independent, and isolated bits of material substance.

This idea of substance found an immensely important proponent in Aristotle. According to Aristotle's logic "the fundamental type of affirmative proposition is the attribution of a predicate to a subject" (CN, 211). Aristotle then applies this seemingly obvious fact to the question of material substance. He argues that since the predicate always describes the more basic reality of the subject, and this relationship cannot be an infinite regress, there must exist "the ultimate substratum which is no longer predicated of anything else" (CN, 211).

Whitehead repeatedly points out the power this logic has

exerted on the Western mind. It is inexorably planted in our language, and its truth seems well grounded by our common-sense perceptions: a rock has a grey colour. It is also rooted in our theological and philosophical doctrines which define the human soul as an eternal and independent essence. Whitehead's attitude towards the importance of this doctrine in any understanding of materialism is clear: "The notion of the undifferentiated endurance of substances with essential attributes and with accidental adventure . . . is the root doctrine of materialism: the substance, thus conceived, is the ultimate actual entity" (PR, 95).

The science that arose in the seventeenth century, then, had a deep instinctive faith in an order of things derived from Greek, Roman, and Medieval sources. This faith gave its originators the instinctive confidence that a study of things would reveal a natural order intelligible to the mind. Nevertheless, in reaction to Medieval Rationalism it proceeded as if it needed no philosophical justification for this faith. It was also supported by a sufficient mathematical foundation. Lastly, the Greeks gave an imaginative framework with which to approach the problem of substance. Having dealt with the antecedents of materialism we will now turn to Whitehead's description of its modern scientific foundations.

II. Galileo and Newton

In his humorous and instructive essay "The First Physical Synthesis", Whitehead briefly describes some of the central figures

and discoveries responsible for the construction of the materialist doctrine. The two figures he isolates as the 'parents of modern science' are Galileo and Newton. In a style characteristic of the article he states, "Galileo was the Julius Caesar and Newton the Augustus Caesar of the empire of science" (ESP, 249). Later Whitehead prefers to call Newton the "Napoleon of the world of thought" (PR, 242). He also lists a series of 'the main revolutionary ideas' prepared by Galileo for Newton's victorious synthesis.

First, Galileo advanced the doctrine of the uniformity of the material universe. By this doctrine Whitehead means "the idea of the neutrality of situation and the universality of physical laws, regulating causal occurrences and holding indifferently in every part" (ESP, 242). Galileo upheld this principle against the Aristotelian/Medieval idea that "different regions of Nature functioned in entirely different ways" (ESP, 241). For example, the heavenly bodies acted differently from the mundane bodies, and each element acted according to its specific nature. To the Medieval mind this was fundamental to their belief in miracles, for an individually functioning region could act contrary to normality without disruption of any cosmological pattern (ESP, 241).

Although the idea of individual functions of separate regions was denied by Galileo, he did presuppose isolated bits of matter essentially separate from one another. Whitehead, referring to Galileo's answer to Simplicius in the Dialoques, argues that Galileo presupposed "mere bits of matter" in an "indifferent

neutral space" because Galileo spoke of the planetary entities "and other mundane bodies" without reference to other regions of space-time (ESP, 243,244).

Secondly, Galileo discovered the first law of motion; "every body continues in its state of rest or of uniform motion in a straight line except so far as it is compelled by impressed force to change that state" (ESP, 245). This law disturbed the conventional idea of the physical cause of motion propounded in Aristotelian Dynamics. Aristotle believed the natural state of any material body is rest, and that motion could occur only as the result of physical force. Galileo, however, reasoned that if an entity were in a state of motion, force would be required to stop it from continuously moving at a constant speed. This, of course, was an invaluable scientific advance, preparing the way for Newton's laws of motion, the science of Dynamics, and ultimately, because of the search for radial as opposed to tangential forces, the laws of gravitation.

Thirdly, through his study of optics, Galileo discovered that "light is transmitted through space from its origin by paths which may be devious and broken" (ESP, 247). This taught him that visual perception depended on light entering the eye, and that this could lead to quite illusory mental conclusions concerning the character of reality. Because of this, doubt was cast on all perception, for all sensation was peculiar to and thus, often distorted by the sensory process. For Galileo's description of this doctrine Whitehead refers us to Il Saggiatore:

> But I do not believe that there exists anything in external bodies for exciting tastes, smells and sounds, but size, shape, quantity, and motion, swift or slow; and if ears, tongues, and noses were removed, I am of the opinion that shape, quantity, and motion would remain, but there would be an end of smells, tastes, and sounds, which, abstractedly from the living creature, I take to be mere words (ESP, 248-249).

This notion took form in the doctrine of primary and secondary qualities. According to this notion, writes Whitehead:

> These Primary qualities are its shape, its degree of hardness and cohesiveness, its massiveness, and its attractive effects and its resilience. Our perceptions of nature such as colour, sound, taste and smell, and sensations of heat and cold form the secondary qualities. These secondary qualities are merely mental projections which are the result of the stimulation of the brain by the appropriate nerves. (ESP, 247)

Descartes and Locke elaborated on this doctrine in their philosophies; thus it achieved great success in the evolution of western thought.

Galileo's application of the observational method and mathematics further contributed to the formation of Western science. The importance of his focus on observation is best exemplified by his development and use of the telescope, which effectively refuted the Medieval notion of the incorruptible heavens. Galileo's concentration on measuring was a sign of the growing renaissance of mathematics. Aristotle had convinced the medieval world of the importance of classifying entities according to their qualities, so that there was little emphasis on quantification. This changed with Galileo.

Newton was a mathematical Merlin, conjuring with it a whole new cosmological scheme. Whitehead notes that the resurrection of mathematics was a return to the mathematical spirit of Pythagorean

and Platonic thought (SMW, 32). It was, however, a mathematics greatly expanded from that available to the Greeks. The Arabians had developed Algebra and the Arabic form of notation, Descartes discovered Analytical Geometry, and Newton invented the infinitesimal calculus (SMW, 30).

When Whitehead approaches Newton he has two central concerns: Newton's scientific materialism and his religious presuppositions. We will begin with Newton's purely scientific scheme, only then approaching the religious system which belonged to it.

Whitehead believes that the first priority of any philosophy of science is to discover which entities a scientific scheme presupposes (CN, 209). Whitehead lists four types of entities essential to Newton's materialism: "For him minds are actual things, bodies are actual things, absolute durations of time are actual things, and absolute places are actual things" (PR, 88). Of the four entities the latter three are the most important because they are the trinity of entities which make up bare physical existence. Let us now consider in detail each of the three main components of Newton's absolute theory.

i). Absolute, true, and Mathematical time, of itself, and from its own nature, flows equably without regard to anything external, and by another name is called duration (PR, 87).

Newton differentiates between the true and the common conception of time. Time in common experience is experienced as a relativistic construct dependent upon relations between objects or events. Newton dismisses this as a mental mistake corrected by his

doctrine of Absolute time. "Time" for Newton, "is the ordered succession of durationless instants" (CN, 221). It is immutable, meaning that the pace and order of its sequential points is the same for eternity. Time is conceived as similar to an entity, a thing in itself undisturbed by the workings of any other part of the universe. If one could extract space, matter, and mind from the universe there would still be time flowing "equably without regard to anything external".

Time, then, is not determined by perception, events or any other entities. One may routinely experience time as, for example, the rhythmic rise and fall of sun and moon, or as the set of durations necessary to satisfy a thought. Deep meditation may be experienced as timeless, or time may fly when one is having fun. Yet for Newton these experiences fail to comprehend that real temporal entity at the base of reality, relentlessly ticking away its sequence of durationless instants (t1...t2... t3...).

ii). Absolute space, in its own nature, and without regard to anything external, remains always similar and immovable (PR, 87).

For Newton the spatial entity, like time, was not obvious to sense perception. The vulgar experience of space is also firmly rooted in the perception of objects. One regularly understands space to be determined by what occupies it. Accordingly, when the object is moved the space moves with it because the object defines the space it possesses. Newton disagrees with this conception. Whitehead describes Newton's Absolute space as "a system of extensionless points which are the relata in space-ordering

relations which can technically be combined into one relation" (CN, 223). It is, then, a pattern of points ordered according to logical relations. These relations are the subject matter of geometry, and were considered adequately developed within Euclidean geometry.

Space, like time, is immutable, meaning that the spatial receptacle of all possible geometric pattern is unalterably consistent throughout eternity. Absolute space is unaffected by either matter or time. It is a separate entity, timeless and constant, forever unchanging and thus without motion. Could matter, mind, and time be extracted from the material universe one would still find mere empty space (PR, 88-89).

iii). The Nature of Matter

Populating Newton's absolute time and space are particles of matter. Matter is the aboriginal substance of which all things are made. Each particle was conceived to have a permanent independent individuality, entirely separate from time, space and other bits of matter. Particles are entirely isolated one from another such that it would be meaningful to discuss the possible existence of only one entity, a particle or a rock, as occupying a portion of space which otherwise is totally empty. All material bodies were conceived to be nothing more than configurations of these atomic particles.

The doctrine of materialism was a denial of the Aristotelian and, hence, the medieval conception of nature. As noted above,

Aristotle argued that the universal properties worked non-uniformly. These properties, earth, air, fire and water, acted according to their own natures. Fire reached for the heavens because of its fiery nature, air hovered above the earth because of its airy nature. The elemental things in nature according to Aristotle were 'causa sui' -- acting with final causes. Here nature is considered as made up of self-moving, hence living, things. As R.G. Collingwood states, "Nature, for the Greeks, was characterized not merely by change but by effort or nisus or tendency" (Collingwood, 83).

Galileo, and then Newton, demolished Aristotle's doctrine of substance moving according to final causes. According to the materialist theory the activities of a particle in space are conceived only as at rest or in motion. Newton, following Galileo, postulated that each individual bit of matter was passively forced into motion or rest by external forces. 'Force' was considered the affective power which the mass of any body exerts on other entities. One could measure this by multiplying the body's mass by the rate of change of its velocity. Thus, no particle acts according to any internal essence. It is a lifeless entity, the activities of which are accounted for entirely by efficient causes (SMW, 42-45).

What we have when we combine these three entities is the famous "billiard ball" theory of materialist science. There is an absolute neutral and empty space populated by isolated self-enduring bits of material substance flowing through the

absolute, instantaneous pathways of time. Space adds its inherent geometrical qualities which were documented by Euclid. Time adds its steady metre. Motion occurs because of stresses exerted on each bit of matter by others with which it comes into contact. Enduring things are considered mere clumps of these "blindly running" particles. Newton had reiterated and revolutionized Democritus's atomic theory which put forth that "the world is an interminable shower of atomic particles, streaming through space, swerving, intermingling, disentangling their paths, recombining them" (AI, 122). In Whitehead's own words, materialism is the doctrine that:

> There are bits of matter, enduring self-identically in space which is otherwise empty. Each bit of matter occupies a definite limited region. Each such particle of matter has its own private qualifications, such as its shape, its motion, its mass, its colour, its scent. Some of these qualifications change, others are persistent. The essential relationship between bits of matter is purely spatial. Space itself is eternally unchanging, always including in itself this capacity for the relationship of bits of matter. Geometry is the science which investigates this spatial capacity for imposing relationship upon matter. Locomotion of matter involves change in spatial relationship. It involves nothing more than that. (MT, 131-132)

Whitehead calls the essential element of the Newtonian, materialist-absolute worldview "simple location". By this term he connotes a particular way of conceiving the fundamental properties of matter and their relation to space and time: the notion that a material entity exists in one particular place in space or time or both. At its heart this worldview presupposes the conception of matter as substance, i.e., as enduring, independent, self-sufficient and isolated from other pieces of matter --

"requiring nothing but itself in order to exist" (RM, 104).

iv). The Mental Entity

Although materialism presupposes a nature made entirely of external and imposed relations between blindly running particles, few, including Newton, accounted for humanity in this way. Certainly the human body was alike to any other material object, but the mind was obviously not. The philosophical problem with Newton's theory was basically how, for example, a man like Newton could speculate meaningfully about the nature of reality when he was a mere conglomeration of blindly running particles.

The division of reality by Galileo, Locke and Descartes, into primary and secondary qualities made it clear that physical sensation was the product of complex relations between the atoms of the observer and the atoms of the observed. Materialists used transmission theories to explain the cause of perception. Perceived data were not a quality belonging to the observed but an illusion created by transactions between particles or waves, and bodily particles. Separating simply located quantities from transmitted qualities exposed a difficulty. If one were to place the human within material nature all that could be expected from mere physical transmission would be that the atoms in, say, Galileo would become agitated and accelerate. There would be a mere hurrying of particles which could tell one little about external reality and nothing at all concerning how, out of a mass of senseless particles, there could occur mental phenomena.

Newton followed Descartes, who affirmed an Aristotelian doctrine of substance as independent, self-existing entities, and who subdivided reality into physical and mental substances. To Descartes, the world of cognition was entirely separate from the world of the particle, except through the mediation of the Pineal gland. Descartes propounded that the secondary qualities did not exist in nature but were a result of the mental substance transforming mere physical fact according to its own peculiar internal processes.

v). God

Whitehead does not list God among Newton's presupposed entities, but elsewhere he leaves no doubt that God was fundamental to Newton's project.

> The whole Cartesian apparatus of Deism, substantial materialism, and imposed law, in conjunction with the reduction of physical relations to the notion of correlated motions with mere spatio-temporal character, constitutes the simplified notion of Nature with which Galileo, Descartes, and Newton finally launched modern science on its triumphant career (AI, 114).

The significance of the doctrine of imposed Law and Newton's Theism to the materialist-mechanist system needs to be considered.

"Science and technology are based on law" (AI, 111), and natural law must either arise out of the intrinsic activity of the cosmos, or be externally imposed by Deity. Law in this context means the reason behind cosmological regularity, persistent and recurrent order (AI, 109). Whitehead states that Newton's cosmological scheme affords,

> no hint of that aspect of self-production, of generation, . . . of natura naturans, which is so prominent in nature. [N]ature is merely, and completely, there, externally designed and obedient . . . . The concept in Newton's mind is that of a fully articulated system requiring a definite supernatural origin (PR, 111-112).

Newton's notion of Law is grounded in the notion of theistic imposition. Whitehead states that "Newton held the Semitic theory," which was that "of a wholly transcendent God creating out of nothing an accidental universe" (PR, 114). Newton's idea of God was that of a Grand Mechanic who, having made space, time and matter as parts, proceeded, (like Aristotle's Prime Mover,) to 'start up' the cosmic machine.

III. The Successes and Failures of Materialism

Whitehead had a great respect for the influence of materialism on the mentality of the modern age. He appreciated particularly the logic and beauty of the absolute theory of space and time. Though he found the cosmology ultimately fallacious, he did aver "that there can be no doubt, but that this general notion expresses large, all-pervading truths about the world around us" (MT, 130).

This was the secret of the materialist success: "It constructs for us a vision of the material universe, and it enables us to calculate the minutest detail of a particular occurrence" (SMW, 46). It succeeded among the educated of his time because Newton was able to synthesize various strands of prevalent thought -- the Galilean and Cartesian among others -- into an integral, comprehensive conceptual scheme that satisfied the pragmatic test. It worked. The theory allowed all manner of successful

applications and technologies.

Materialism as a cosmological scheme has permeated Western civilization, with both good and bad results. Whether one considers the realm of science, philosophy, society or the human spirit, materialism's impact has obviously been felt.

In the realm of science, materialism has proved an excellent resource for theory and technology. In reference to theory, "this triumph of materialism was chiefly in the sciences of rational dynamics, physics, and chemistry" (SMW, 60). In dynamics Whitehead lists Maupertuis' theorem of least action and Lagrange's Principle of Virtual Work as "formulae . . . worthy to rank with those mysterious symbols which in ancient times were held directly to indicate the Supreme Reason at the base of all things" (SMW 62-63). Together they found a more fundamental basis for understanding the motion of particles through space; "every particle travers[es] the shortest path open to it under the circumstances constraining its motion" (SMW, 63). Mathematical physicists had a firm foundation in Newton's absolute theory from which to understand and predict much of what went on in the universe. Lavoisier applied materialist thinking to chemistry, beginning a process which culminated in John Dalton's atomic theory. The total effect was one of profound confidence that "the secrets of the universe were finally disclosed" (SMW, 101).

Materialism's greatest success was apparent in the progressive synergism between theory, experiment and technology. Unfolding the properties of atoms and their elemental structures had a

snowballing effect on the development of increasingly complex and precise experimental apparatus, which transformed the horizon of fact and in turn allowed more nuanced theories. For example, Michelson's interferometer, a device which turned out to be a time bomb in the midst of a peaceful paradigm, could not have been made without the requisite advances in technology (SMW, 114-115).

The social significance of technology made itself felt in humankind's ability to harness ever increasing amounts of nature's power. Whitehead lists James Watt's invention of the steam engine as one dramatic use of such knowledge. But he is quick to point out that it was the pace of invention, proceeding out of a combination of new physical knowledge and the invention of the method of invention, which most effected civilization. He states, "In the past human life was lived in a bullock cart; in the future it will be lived in an aeroplane; and the change of speed amounts to a difference in quality" (SMW, 97).

In the realm of philosophy, whether philosophers accepted the materialist doctrine -- consciously or unconsciously -- or rejected it entirely, the philosophic imagination was deeply affected by materialism. The social significance of philosophy also changed, for materialist science had begun a process whereby science would displace philosophy as the approved method of understanding reality. This triumph, quite obvious today, is nearly complete.

Whitehead considers David Hume the father of "fashionable scientific philosophy" (SMW, 4). Science is based upon the idea that by empirical observation one can understand nature. Hume's

doctrine philosophically legitimates this method by theorizing that all ideas come from the repetition of 'impressions'. These 'impressions' imprint themselves on the mind by their own force and vivacity. The production of ideas from impressions is a complex process whereby impressions become memories which can then be invoked by the mind in isolation from the impression itself. These most 'simple ideas' can then be united together by the gentle force of "Nature . . . pointing out . . . which are most proper to be united into a complex idea" (PR, 154). Thus Hume's philosophy argued quite emphatically that the only way to knowledge is by sense perception. Everything, even our most complex ideas, originates in simple sense impressions. Hume states that "if you cannot point out any **such impression** you may be certain you are mistaken, when you imagine you have **any such idea**" (PR, 157) [Hume's emphasis]. In this way, Hume's philosophy provided a philosophic basis for science's preoccupation with brute fact,

Hume's philosophy was saturated with materialist presuppositions. When Hume talks about the 'soul' and the 'impression of sensation' made upon it, he is using the subject-predicate doctrine and presupposing the Cartesian duality. The mental 'soul' was the subject predicated by the physical 'impression of sensation'.

The absolute theory is also apparent in Hume's exposition of temporal succession. He presupposes "the individual independence of successive temporal occasions" (PR, 159), when speaking of the instances when impressions are experienced. As well, Hume adopted

the atomistic bias of materialist science, asserting that "each impression is a distinct existence arising in the soul" (AI, 125).

Besides the effects on technology, materialism had other social effects.

One effect that made Whitehead uneasy was the increasing professionalization of learning. Whitehead was very much in favour of specialization as a means to social progress, but he was critical of the myopic professionalism crystallizing in society, and especially in the university (SMW, 196-199). Dialogue between areas of specialty seldom takes place. Instead, specialties get into a groove of exclusive concentration on their own narrow horizons. When the filtering down of information from one area to another occurs it often is so slow that the concepts received are outdated. Whitehead was most critical of this in the dialogue between biology and physics, where materialistic-mechanistic imaginative ideas, long since outmoded in the latter, are retained as the foremost imaginative framework in the former (SMW, 102-103).

'Romance', the free flight of imagination towards "possibilities of wide significance", is the factor which keeps education from becoming stale (AE, 30). Dialogue realizes romance; the discourse of alternative possibilities supports the drive towards schemes of increasing richness. This is what Whitehead saw as increasingly absent from the university. We can speculate that his own education, balanced between specialized mathematical

studies and his membership in the "Apostles", a club of widely different interests devoted to interdisciplinary dialogue, was responsible for this ideal of education.

Even more troubling was the wider social effect of specialization. Whitehead believes that "wisdom is the fruit of a balanced development" (SMW, 198). The result of an imbalanced education is the narrow interpretation of life according to one's specialty. Lack of breadth of understanding means that important aspects of life are left out. Of course some omissions are inevitable. Whitehead's point is that this lack of wisdom has become part of our social structure through education and the requirement of special expertise in various social roles. He is troubled by the explosion of knowledge possible through specialization, and left unbalanced by a broader, deeper wisdom.

The spiritual effects of the complete materialist scheme are a dominant theme, especially in Whitehead's later work. There are three interrelated areas where he measures this -- aesthetics, morals, and theology. At the root of all three is the deep separation of human experience from the universe we inhabit.

Whitehead was a lover of Wordsworth and Shelley, both of whom were moved by the presence in nature of "thoughts 'too deep for tears'" (SMW, 83). Yet the conclusion of materialism was that the intuitions of the poets concerning nature were illusory human productions. Scientists had described nature as a mindless mechanism, having no life, and no meaning. The only possible exceptions were humans and God, and exactly how humans constitute

an exception is philosophically problematic.

Nature was denuded of all beauty, value, sense, and purpose. According to the Cartesian system the only place these aesthetic sensibilities resided was in the mental substance, an attribute possessed solely by humans. It was the peculiar trait of that mental substance that it clothed nature, through the mediation of the sense organs, according to its own nature. In response to Galileo's belief that anything beyond shape, quantity and motion was mere words, Whitehead said:

> Thus nature gets credit which should in truth be reserved for ourselves: the rose for its scent: the nightingale for his song: and the sun for his radiance. The poets are entirely mistaken. They should address their lyrics to themselves, and should turn them into odes of self-congratulation on the excellency of the human mind. Nature is a dull affair, soundless, scentless, colourless; merely the hurrying of material, endlessly, meaninglessly (SMW, 54).

The alienation of humanity from a dead, meaningless nature meant also a denigration of the aesthetic sensibility itself. For if the object of the poet's significance dies, so ultimately must the poet. Aesthetic values, according to the materialist worldview, are mere quirks of mental substance; private, illusory, and irrelevant. Whitehead states; "the assumption of the bare valuelessness of mere matter led to a lack of reverence in the treatment of natural or artistic beauty . . . . In the most advanced industrial countries, art was treated as a frivolity" (SMW, 196).

Materialism led to "the habit of ignoring the intrinsic worth of the environment" (SMW, 196), with all its aesthetic and biospheric consequences. There was no place for the consideration

of value within science, "its materialistic basis has directed attention to **things** as opposed to **values**" (SMW, 202). As science grew to dominate the cosmological worldview of western society, values, especially aesthetic values suffered.

Whitehead deals with the effect of Cartesian dualism on morality. Descartes' dualism had close ties to medieval notions of soul and body. But where the medieval emphasis has been on the "emergent individual value of each entity" (SMW, 194), Descartes' concentration was on "the independent substantial existence of each entity" (SMW, 195). Whereas the medieval mind concerned itself with the intrinsic value of each soul within a meaningful universe, Descartes is content merely to describe "a private world of passions, or modes, of independent substance" (SMW, 195). Once again we find the description of a thing as opposed to a value.

The ultimate result of this shift of emphasis is that morality is not grounded in ideas of the inward drama of the soul with God, or in the intrinsic value of life. Morality becomes a purely private concern, dependent entirely upon the subject. The morality of industrialists, who value "self-respect and the making the most of your own individual opportunities" (SMW, 196), is the example Whitehead gives of the effect of this kind of morality. Yet our moral intuitions still cringe when we hear of the horror and destruction wrought on both the human and non-human by this "creed of competitive business morality . . . entirely devoid of consideration for the value of human life" (SMW, 203).

Finally, Whitehead briefly touches on the effect of

materialism on religion. The world created by the God of Deism was a cold, dead machine of a universe, coerced into action by decree. This, Whitehead thinks, is irreconcilable with those revelations of God's care and involvement which have occurred at certain supreme moments, especially in Jesus. Describing the spiritual effect of materialism on worship, he states: "God made his appearance in religion under the frigid title of the First Cause, and was appropriately worshipped in white-washed churches" (AI, 123).

Furthermore, materialist theology is unnecessary. Newton was a religious man who admitted to a theological motive when writing his system. Yet even Law itself, Newton's main argument for God, has been displaced as fundamental by the notion of statistical probability (AI, 114-115). As science has progressed, religion has retreated, often looking very foolish. Whitehead mourns the unresponsiveness of religious thinkers to the creative opportunity offered them in the form of a progressive science. Nevertheless, science is not without blame. Whitehead is a firm believer that religion is an area of life where profound intuitions are evoked, codified, and maintained. He believes, for example, that all education should, in a sense, be religious education, by which he means the inculcation of a profound sense of duty, a concern to make our activities count for the uttermost good, and a reverence towards the eternity in which we have miraculously found our place (AE, 23). He defines religion as

> the vision of something which stands beyond, behind, and within, the passing flux of immediate things; something which is real, and yet waiting to be realized (SMW, 191).

Part of religion is the intuition that "there is a rightness attained or missed" (RM, 59), and since this rightness, this Kingdom of Heaven, finds its source in neither social nor natural reality, religion is an individual's solitary response to this intuition. God is the lure to the realization of higher more harmonious values: "He is the poet of the world with tender patience leading it by his vision of truth, beauty, and goodness" (PR, 408).

Yet the force of materialism on the western worldview has led to the ignoring of value. Science commands the public realm and treats values as a private concern. Attention to mere private values effectively divorces the subject from contact with any universal ground for the value of its own experience. Accordingly, reverence and worship, like poetry, should be directed towards ourselves. The contemporary social fact of rampant religious and secular individualism seems a natural result.

IV. Conclusion

The topic of this chapter has been Whitehead's description of Materialism. For Whitehead the important aspects of the materialist doctrine can be listed as: 1. the bifurcation of nature into primary and secondary qualities; 2. the theory of absolute space and time; 3. bits of matter acting solely through efficient causes; 4. a complete dualism of physical and mental substances; 5. a theology which accounts for natural law and order by a doctrine of Divine imposition; and 6. the social and spiritual effects of

these doctrines.

Chapter Two

The Omitted universe: Whitehead's Critique of Materialism

In spite of the achievements of materialism, its history is one of crisis. Some of these crises were deemed unimportant. So, for example, Hume and Berkeley challenged it philosophically, on the grounds that it provided no adequate account of causality or epistemology. Also, romantics attacked its indifference to the universe of value. Other crises could not be ignored because advances in science effectively undermined its own mechanistic presuppositions. Whitehead was sensitive to the need to respect each of these crises. He sought to respond to them by developing a more complete metaphysical system. The topic of this chapter will be Whitehead's account of the philosophical inadequacies of the various strands left unintegrated by the materialist cosmology.

I. Scientific Inadequacy

In 1900, a speech at the Sir Olive Lodge boldly pronounced that the physical understanding of the universe was complete, with the exception of two minor details.[4] One minor detail, Michelson's experiment, was an anomaly which would ultimately shatter the Newtonian worldview, which had seemed so complete. (We will return

[4] Conversation with Dr A.J. Coleman, Professor of Mathematics at Queen's University.

to this shortly). According to Lucien Price the demise of the Newtonian materialist-absolute cosmology greatly affected Whitehead. Price recounts Whitehead saying,

> Now nearly everything was supposed to be known about physics that could be known -- except a few spots, such as electromagnetic phenomena, which remained (or so it was thought) to be co-ordinated with the Newtonian principles. But, for the rest, physics was supposed to be nearly a closed subject . . . . By the middle of the 1890's there were a few tremors, a slight shiver as of all not being secure, but no one sensed what was coming. By 1900 the Newtonian physics were demolished, done for! Still speaking personally, it had a profound effect on me; I have been fooled once, and I'll be damned if I'll be fooled again! (Price, 345)

The hubris of nineteenth century science collapsed because of the erosion of its fundamental principle, simple location, and the growing weight of the evolutionary paradigm.

Six developments contributed to the erosion of the doctrine of simple location: the emergence of field theory, the significance for physics of discoveries in chemistry and biology, the formulation of the theory of the conservation of energy, Einstein's relativity theory, the discoveries of quantum mechanics and, finally, the success of the theory of evolution.

Field theory interpreted fundamental reality as a continuum of physical activity permeating space, even apparently empty space. The idea of a field was developed to make sense of light and the Newtonian problem of the relations between bodies and force. Newton had accounted for light in terms of the movement of 'corpuscles', or particles, but the work of Young and Fresnel gave good evidence that light was wave-like in nature. To have waves travelling through space required that the idea of empty space be

replaced by that of a medium in which they could travel. This theoretical medium was named 'ether,' a jelly-like substance pervading all space. Field theory was further strengthened by Clerk Maxwell's electromagnetic discoveries, which required that electromagnetic occurrences permeate all space. Maxwell theorized that the ether was a field of electromagnetic activity, and showed that light waves could be accounted for in this manner. Field theory introduced the notion of a continuity underlying spatial and material reality, awakening the scientific imagination to question the ultimacy of matter. This conceptual change culminated with the description in modern physics of atomic reality as the result of underlying energetic activity.

The extension of Newtonian atomic imagery to biology and chemistry, particularly in the work of Louis Pasteur and John Dalton, contributed to the undermining of the Newtonian paradigm. John Dalton's atomic theory demonstrated that there were different kinds of matter, each with its own qualitatively distinctive ways of behaving. To account for differences in behaviour he sought and found a quantitative basis in the proposition that atoms themselves were diverse organizations of smaller particles. In biology Louis Pasteur applied ideas of atomicity to living tissue. He received and accepted the cell theory of Schleiden and Schwann, applying it to the study of bacteria, among other things. On the surface these discoveries were successes of materialist thought, yet they were also insidious. Both Pasteur and Dalton revealed a realm of minute biological and chemical entities which did not merely act out of

external relations but pointed towards the existence of internal relations. Molecules were organisms[5] which "differ in their intrinsic characters according to the general organic plans of the situations in which they find themselves" (SMW, 80). In chemistry and biology, therefore, the imaginative framework was developing which undermined the notion of the basic building blocks of nature as solid, enduring and undifferentiated matter.

The doctrine of the conservation of energy was the third novel idea to shake the Newtonian world (SMW, 100). This theory held that behind all flux and change there was a fixed and permanent amount of energy. This inverted the primacy of mass from being the cause of activity to the effect of energy[6] so that mass became just the name for a quantity of energy, a name for some of energy's dynamic effects. This doctrine, too, continued to undermine the irreducibility, substantial independence and constancy of the atom. Like the cell, the atom began to resemble an organism; it was an entity organized out of a yet more basic continuum, be it ether, electromagnetism, or energy.

Einstein's theory of relativity was a response to the anomalous findings of Michelson's interferometer, which failed to

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[5]. Whitehead uses the word 'organism' in the sense of an entity arising out of its environment with internal structure and subject to internal change. (SMW, 80)

[6]. Whitehead believes that conceiving 'energy' to refer to a material substance is a false remnant of materialist thinking. Instead he believes that 'energy' refers to "substantial activity;" the substratum is not a material but an activity. (SMW, 36)

validate the notion of an ether; without the ether the Newtonian cosmology was untenable. Newton presupposed velocity and change to be necessary facts of existence. These were obviously prerequisite for his laws of motion and gravitation. Yet his specific mathematical cosmology was such as to deny any basis for either (PNK, 2). Newton understood that external changes, such as acceleration, occurred because of stresses placed on particles by the mass and proximity of other particles. But Newton rejected the notion that particles could affect each other at a distance. This begs the question of how disconnected particles in immovable space could effect each other at all. Materialists removed this difficulty by developing theories of an underlying ether or electromagnetic substance. The ether was a means by which disconnected particles could be materially connected. These theories worked mathematically but lacked any empirical evidence, similar to the epicycles of the pre-Copernican worldview. Since Einstein they have become obsolete, and with them the absolute notion of time and space.

The absolute theory predicted that the speed of light would vary relative to the direction of the earth's movement. It was Michelson's test of this hypothesis which was the prelude to the theory's destruction. He developed an apparatus called an interferometer, whereby two rays of light could travel different distances reuniting and thus interfering with one another on a screen. Michelson had begun with the reigning scientific presupposition "that light consists of waves of vibration advancing

at a fixed rate through the ether in any direction" (SMW, 115). According to this hypothesis, when the lights struck the screen the bands of interference would be in different positions depending on the relation of the apparatus to the motion of the earth through the ether. The problem was that regardless of the position of the apparatus, there was no change. Einstein reasoned that since no sense can be made of Michelson's findings using the accepted notions of space and time, the notions themselves must be at fault.

Einstein conceived of a four-dimensional universe where space-time, a word signifying complete unification between the two concepts, was one single dimension. The only absolute he postulated was the speed of light. He made sense of the Michelson experiment by reasoning that although light travels at its own constant rate, that rate will be uniform only relative to the observer. This rate will depend entirely on the space-time system of the observer. We would expect, for example, that one measurement of the speed of light taken on two comets travelling in the same direction as the light, one going 1000 miles per second and another going 10,000 miles per second, would differ. Relativity theory postulates no difference; in both cases the speed of light would be calculated at 186,000 miles per second. Since light travels at a fixed rate relative to an observer, that observer will experience phenomena in their space-time system at rates different from those of other space-time systems.

The relativity doctrine destroyed the claim of the theory of

absolute and extensionless space and time to be anything more than a useful abstraction for certain limited purposes. Newton's theory works well to account for macroscopic effects but offers no explanation for activities approaching the speed of light.

> Newton held that material can be said to be here in space and here in time, or here in space-time, in a perfectly definite sense which does not require for its explanation any reference to other regions of space-time (SMW, 49).

The relativity theory postulates that there is no meaning to space and time apart from the time-space perspective inherent to material events. Matter cannot be understood without taking as essential its inherent spatial and temporal factors, of which it is an organization. Matter by its very nature takes time and space to realize itself. Thus time and space are derivatives of events, having no ontological status separate from physical occurrences.

The continuing discoveries concerning quantum reality further undermined Newtonian physics. In Newton's system matter was conceived as solid bodies occupying points of space. However, quantum mechanics describes particles as organizations of energy into complex structures, which could become waves when properly agitated. Experiments dealing with the effects of molecular collisions found that molecules produced 'quanta,' or discrete amounts of energy, in the electromagnetic field. The problem with these quanta is that they could be described as simultaneously corpuscular and vibratory. Whitehead states that "one of the most hopeful lines of explanation is to assume that an electron does not continuously traverse its path in space . . . [I]t appears at a series of discrete positions in space which it occupies for

successive durations of time" (SMW, 34). Conceived in this way 'particles' are not solid individual entities occupying points in space, they are wave-like organisms "of an underlying energy, or activity" (SMW, 35). Matter both exists at a specific place and stretches throughout space.

Quantum theory also began to reveal the structure of atoms. There was a nucleus of bubbling energy surrounded by electrons and protons orbiting at incredible speeds. This was no enduring bit of matter. The various orbiting entities did so because of their 'fittedness' with the character of the nucleus. And the atom could change. Electrons and protons could cease to exist, or change orbits.

The scientific advances we have dealt with to this point have shared the common feature of subverting the basic assumptions of the Newtonian worldview. Matter is an organism, an event, that cannot be reduced to its spatial extension. Both the theory of relativity and quantum physics revealed activity to be the essence of matter. For matter is durational by its very nature, and this duration is full of internal change and transformation. Yet, even though these discoveries have discredited every element of the Newtonian cosmology, they have not led to a comprehensive replacement.

Perhaps the theory of evolution offers a basic foundation upon which to reconstitute an adequate cosmological scheme. One cannot, Whitehead thinks, underestimate the enormous scientific importance of Darwin's theory of evolution (SMW, 100). Darwin proposed that

the fundamental laws applying to living species are random variation and natural selection. Because the existence of living things depends on their responses to a wider environment, any change of internal character or environment would determine a species' success or failure. Random variation was invoked as the cause of mutation, or genetic internal change. Natural selection was what Darwin called the relationship between the environment and the success or failure of a mutation.

The paradigm of evolution continued to expand, undermining any belief in a static universe. Darwin shocked society with his doctrine that humans had evolved from apes, and ultimately from the first minute living organisms. Developments in geology and geological biology discovered that life has existed on earth for millions of years, and that the earth itself was far, far more ancient than that. Fossil finds illumined a biological past enormously diverse, with cataclysmic changes in character. Astronomy, too, showed the earth to be but a moment in an even more ancient, ongoing universal evolution.

The emergence of evolution as a paradigm has had far-reaching implications for the understanding of humankind in relation to nature. Descartes and Newton were saturated with the Biblical view of creation and the human place within it. For them God had granted humans a soul which radically distinguished them from the rest of nature (SMW, 145). Human awareness stood over against inert matter. The notion of evolutionary process implies that cognition emerged within nature as part of its internal process;

there exists, then, a continuum between human and animal awareness. Most people assume that dogs feel real pain, that they do not simply exhibit mere mechanical responses as Descartes proposed. As Voltaire put it,

> You discover in it all the same organs of feeling that are in yourself. Answer me, machinist, has nature arranged all the means of feeling in this animal so that it may not feel? (Voltaire, quoted in Birch without adequate reference, 59)

The core of Whitehead's rejection of Cartesian dualism arises because the evolutionary evidence demands that we place human experience within the universal evolution, and no longer regard humankind as an exception. Instead of viewing human mentality as an independent and special attribute, Whitehead argues that we should view it as a highly developed factor found in some form at every level of reality (PR, 247 MT, 148-169).

Although the evolutionary paradigm offers an alternative to it, the success and prominence of mechanism exerted a profound paradigmatic influence on biology. Whitehead notes an insecurity in the discipline of biology, arising from the fact that physics was the more advanced and internally coherent of the two sciences. Biology inherited from physics the conception of material as blindly running in obedience to externally imposed and fixed laws, and affected only by external forces. All objects were mere configurations of atoms joined by blind chance. Also, the Cartesian tradition, which stripped material nature of subjective experience, left biology to study complex groups of senseless particles grouped together by chance into biological mechanisms whose existence was determined by whether they survived the

mechanics of their environment. Whitehead is critical of this influence, punning "biology apes the manner of physics. It is orthodox to hold, that there is nothing in biology but what is physical mechanism under somewhat complex circumstances" (SMW, 102). When the mechanistic paradigm was joined with the account of human evolution, the human experience of life and mind became devoid of significance. No longer could we understand the universe as pure mechanism without understanding ourselves similarly. No longer could we rescue meaning for humans without understanding our evolving universe as also having meaning.

The idea that pure chance is responsible for evolution Whitehead rejects as philosophically problematic. It rests on the materialist presupposition that the activities of physical substance lack any teleological potential. The result is that, using the materialist paradigm, mere chance mechanical occurrences are all that could be invoked as producing evolutionary novelty. This theory gains support by the great age of the universe; there has been so much time for the seemingly infinite configurations to have taken place. Whitehead rejects this notion because it is the description of an unprogressive evolution. The random change of various material configurations would produce but constant fluctuations between simple and complex configurations, and not the growth of complexity which the universe exhibits.

> Evolution, on the materialistic theory is reduced to the role of being another word for the description of the changes of the external relations between portions of matter. There is nothing to evolve, because one set of external relations is as good as any other set of external relations. There can merely be change, purposeless and unprogressive (SMW, 107).

Whitehead states that "a thoroughgoing evolutionary philosophy is inconsistent with materialism" (SMW, 107). Newton's system was a fixed system, produced and lawfully running through the unalterable will of God. In the absolute theory, the ultimate material particles were enduring and incapable of evolving. Evolution, however, taught a doctrine of interdependent relations between organisms and environments; an organism was constructed by its environment and the environment constructed by the organisms of which it is made. It proposed that there were organic processes immanent in nature which could account for her workings, and that these processes were essentially creative -- producing novelty not fixity. Whitehead viewed the marriage between mechanism and evolution as quite unstable, an instability which he sought to resolve in a higher metaphysical synthesis.

In Modes of Thought Whitehead summarizes the scientific critique of the materialist-mechanist absolute cosmology:

> the development of natural science has gradually discarded every single feature of the original common-sense notion. Nothing whatever remains of it, considered as expressing the primary features in terms of which the universe is to be interpreted. The obvious common-sense notion has been entirely destroyed, so far as concerns its function as the basis for all interpretation. One by one, every item has been dethroned (MT, 130).

Because this scientific cosmology has captured the philosophic imagination of the last three hundred years Whitehead concludes that its demise signals the need for a thoroughgoing examination and critique of its negative effects. This requires undertaking a philosophic adventure in the hopes of purging philosophy of the

effects of materialism, and reforming it in light of what was fermenting in modern science.

In conclusion, let us reiterate the points crucial to Whitehead's description of the collapse of materialism within the sciences:

> 1). Absolute time has become relative time: time is no separate entity; it is derivative from the character of actual occasions.
>
> 2). Absolute space has been discarded. There is no such thing as a spatial point. Instead space is a derivative from actual entities. Thus empty space is an impossibility.
>
> 3). The concept of matter as self-sufficient, independent, eternal, and indestructible, has been replaced with matter conceived as the product of energetic activity of a field of force; an event. Thus it is derived from the environment, an organism of environmental forces. Because it is not eternal but a dependent product of its environment, each actual entity may still be conceived as atomic but not in any way independent, self-sufficient or separate.
>
> 4). Whitehead believes that the modern discoveries concerning matter -- that there is no such thing as a separate entity -- entails the rejection of the Ionian Aristotelian and materialist concentration on substances. Instead the search for the most general and fundamental structures of material reality should concentrate on process not substance.
>
> 5). The fact that events are extensive, "that any local agitation shakes the universe" (MT, 138), destroys the basis for the substance-quality scheme. Waves, energy pulsations or any other scientific term for the extensiveness and efficaciousness of an organism make it very difficult to reveal an ontological difference between focal-point and vector transmission.
>
> 6). Since organisms overlap (organisms are produced and sustained by the environment of past organisms, and once actualized act as the environment for novel entities), the central relation should not be external relations between enduring objects but internal relations as environmental factors are organized into a novel entity.
>
> 7). Evolution has replaced static fixity as a central imaginative framework for the description of universal activity. This doctrine teaches that the fundamental relation

determining reality is a complex interrelationship between an actual entity and its environment.

II. Science and Philosophy

There are two main tasks which Whitehead believes any adequate philosophical cosmology must fulfil. First, there must be an explication, derived from concrete experience, of the uttermost philosophic generalities, and a systematizing of them in a manner satisfying the test of coherence. Second, there is the application to immediate experience in order to discover whether one has proposed merely a coherent set of falsehoods or a profound elucidation of reality. Since the time of Hume and Berkeley the philosophical problems with the materialistic -- mechanistic framework have been apparent. They both recognized that the scientific framework failed the test of rational coherence; the cosmology of materialism undermined its own methodological presuppositions. Hume noticed that a thorough application of simple location to epistemology made it difficult to explain causality. Berkeley, by taking dualism to its extreme conclusion, succeeded in questioning whether mental substance could know anything about brute physical fact. One other major problem surfaced, not in any philosophical critique, but in the complete lack of concern shown by the scientific community towards its philosophical justification.

i) Atomism and Causation: The Epistemological Difficulty

It is a test of materialism whether its formulations support

a coherent or existentially adequate epistemology. Whitehead's view is that it does not. When spatial and temporal atomism are applied to questions concerning how humans perceive and know, insurmountable difficulties arise. For a thoroughgoing analysis of the problem of empirical epistemology within the materialist framework, Whitehead turns to Hume. The crux of the issue is found with the problem of ascertaining a rational basis for causation. Things seem to occur by one thing causing another. Is this not given to us in naive perception? If this is so, does causation not provide a basis for scientific practice and its faith in order?

Hume pointed out that when temporal and spatial atomicity are applied to experience, there remains no adequate basis for faith in causation. Hume's doctrine of perception takes the absolute theory of time very seriously, concluding that all of human experience is built upon a temporal succession of sense impressions very similar to Newton's durationless instants. Like the problem of absolute time and material change, mere atomic succession of sense perception can tell one nothing about the past or the future. Hume writes:

> In a word, then, every effect is a distinct event from its cause. It could not, therefore, be discovered in the cause; and the first invention or conception of it, a priori, must be entirely arbitrary (SMW, 4).

It requires 'animal faith' to believe that a temporally located sense-impression relates to a real past (PR, 165).

Hume attempted to supply a basis for all mental phenomena with mere atomic succession of sense-perceptions. He "interpreted the totality of experience as a mere reaction to an initial clarity of

sensa" (MT, 109). Thus, for Hume, all mental reality is built upon instantaneous experiences of definite shapes and colours. Instant is followed by instant, with memory supplying the bridge whereby causal factors were made manifest within experience. However, Hume's epistemological attempt at marrying atomism and causality fails. Memory can be invoked as linking patterns of occurrence, but its content can be experienced only as a further impression temporally located in the immediate present.

Hume's critique also denies that the materialist cosmology reveals a rational basis for induction. How can one jump from one bit of information to another without presupposing continuity and connectedness in all areas of nature? Yet this is something the absolute theory or a philosophy which accepts it could not do. The configuration of matter at one instant tells us nothing about what will occur in the next. Whitehead concludes that although the scientific method is built on the method of induction and the presupposition of causation, the absolute cosmological paradigm governing materialist scientific thought did not reveal a rational basis for either (SMW, 4).

The absolute theory had well known internal mathematical inconsistencies which clearly showed its inability to explain causality. Newton's system presupposed velocity and change to be necessary for his laws of motion and gravitation. Yet his mathematical cosmology denied either (PNK, 2). There are two basic relations in the Newtonian cosmology. The "time-ordering relation between instants," is the internal sequential order of the temporal

entity. The second is the "time-occupation relation between instants of time and states of nature which happen at those instants" (CN, 222). According to these two relations, change could only be "derived from the comparison of various states of self-identical material at different times" (PNK, 1). But at a durationless instant there is nothing to be said concerning the past and the future of that particle, it is merely where it is at that instant. Consequently, there is nothing to be said concerning its "velocity, acceleration, momentum, and kinetic energy, which certainly are essential physical quantities" (PNK, 2).

"You cannot", says Whitehead, "have a rational justification for your appeal to history till your metaphysics has assured you that there is a history to appeal to; and likewise your conjectures as to the future presuppose some basis of knowledge that there is a future already subjected to some determinations" (SMW, 44). Surely the scientific community would not be content with an entirely arbitrary foundation, yet according to Whitehead they have been!

ii) Dualism

The scientific preoccupation with brute fact is particularly troubling because the specifics of the materialist scientific philosophy undermined any consistent faith in perception and mentality. Scientific practice rests on an empirical basis, yet the bifurcation of nature into primary and secondary qualities denied all but a superficial legitimacy to perception. Actual

causal nature, the hurrying of particles and waves, was contrasted with apparent nature. Apparent nature, the experience of such things as redness and warmth, while having an origin in causal nature, was essentially an illusory attribute of the mental substance. This is how science has understood the transmission theories of sound and sight. The theory of a bifurcated nature did not fruitfully render the empirical basis of human experience, a fact which led science into the paradoxical position of accounting for the structure of natural reality with a theory not at all empirically given.

The Cartesian understanding of mind and matter can give a tenuous defence of perception because of the substantial independence of mind from body. The mental substance may apprehend and filter natural reality in devious ways, but its internal gift of rationality could apply correct interpretations. In other words, mentality could realize it is dreaming, and wake up with the aid of abstractive mental methods such as mathematics and logic. The paradoxical result of this faith is "that the utmost abstractions are the true weapons with which to control our thought of concrete fact" (SMW, 32). This use of abstractions is all to the good, says Whitehead, for one cannot think without abstractions (SMW, 59), but the underlying philosophy is internally inconsistent, and only vaguely explanatory of human experience. However much Whitehead appreciates mathematics and logic, he is not in favour of inferred abstractions being used to explain away concrete experience.

Whitehead turns to Bishop Berkeley for the refutation of Cartesian dualism as an adequate explanation of perception. Berkeley adopted the central Cartesian principle of a mental substance entirely external to physical substance. The philosophic problem he addressed was how two totally dissimilar substances could interact. Instead of positing strange physical mediaries like Descartes' pineal gland, Berkeley took dualism to its logical conclusion. His answer was that they could not interact, and he responds: "When we do our utmost to conceive the existence of external bodies, we are all the while only contemplating our own ideas" (SMW, 67). Since, Berkeley believes, all we can possibly know are our own ideas, our perception of an external physical world must be considered a mere mental production. His escape from utter scepticism is to conclude that perception is a communication between God's ideas and our own. Whitehead praises the philosopher for what he perceives as a stinging critique of dualism and its ability to ground empiricism. He summarizes the essence of this critique:

> Perceptions are in the mind and universal nature is out of the mind, and thus the conception of universal nature can have no relevance to our perceptual life (PNK, 8-9).

Berkeley's insistence that positing two fundamentally separate substances leaves only mental experience open to mental understanding, Whitehead states, "is fatal to any of the traditional types of 'mind-watching-things' philosophy" (PNK, 9).

Within the sciences, the rise of physiology, especially

neurology, seriously undermined both Cartesian duality and the bifurcation of nature. The conception of mind objectively surveying nature, outside nature looking in, became increasingly untenable using scientific notions. Mentality became firmly embedded in physical organs. The brain was found to operate through complex chemical processes. As well, biology understood cognition as the product of natural evolution. A great problem arises. How can we understand the scientific faith in mentality if it is the product of a purely mechanical universe? How can a scientist claim truth when thought processes belong to the same dead, valueless, and blindly running universe as all other material processes?

Physiology also subverted the traditional bifurcation of primary from secondary qualities. Science is based on the existence of a real ontological distinction between size, shape, mass and velocity, and colour, warmth or sound. This is the foundation for the doctrine that quantification is the key to understanding nature. Whitehead notes that the bifurcation of nature is based on positing ontological priority to touch-based perceptions: "These touch-perceptions are perceptions of the real inertia, whereas other perceptions are psychic additions which must be explained on the causal theory" (CN, 228). Yet basic physiology tells us that touch was as much a transmitted perception as any other. Snipping sight and touch nerves effectively destroys each type of perception. Thus there is no clear-cut physical basis for differentiating primary from secondary qualities. The main

difference seems to be that one kind of perception is open to quantification, therefore more useful to specifically scientific abstractions. To Whitehead this is obviously an over-reliance on mathematical and touch-oriented abstractions. He states: "I revolt against this concentration upon the multiplication table and the regular solids" (MT, 75).

iii) The Faith in Order

Regardless of the inadequate philosophical basis for the scientific reliance on causality and perception, this reliance has succeeded because of them. The extraordinary triumphs of science make a strong argument for the existence of an order of nature open to rational comprehension. This is, however, perhaps the greatest danger in any conceptual scheme, that the success of the objects of faith tends to legitimize inadequate philosophical understandings of them.

Whitehead notes that a deep faith in natural order is fundamental to the existence of science. However, he insists that the conceptual scheme of materialist science has not adequately accounted for this order. Whitehead criticizes the lack of interest science has shown in the philosophic task of rationally grounding its faith in order (SMW, 17). He proposes that the roots of this disinterest in philosophy were found in the scientific rebellion against philosophical and religious rationalism. The shift from reason to the concentration upon brute fact Whitehead applauds as being a necessary corrective; however, without a

balanced synthesis it is but the other extreme form of one-dimensional thinking.

One way of rescuing scientific integrity would be by grounding its faith in order upon immediate experience. Yet as we have seen in the last chapter, Whitehead denies that mere observation accounts for the origin of or warrants for this faith. Naive experience, we will remember, discovers in life a combination of recurrence and contingency. Another more pragmatically-based possibility is that the idea of an order permeating all things is a hypothesis validated by the success of scientific practice. Whitehead, however, disagrees that the scientific faith in order was ever merely a hypothesis. Rather, it is a presupposition so necessary that science would never have existed without it. Further, Whitehead is not a pragmatist. For him practical utility is not enough of a rational justification; it merely proves that science is based upon a sufficiently wide scheme of abstraction (SMW, 18).

Regardless of the knowledge science has given us, the fact remains that for someone to have faith in observation, one must have faith in order, and in one's own perception. Science also requires faith in reason and the tools of reason -- logic and mathematics. As Whitehead succinctly puts it "No logic, no science" (AE, 161). These faiths are unaccounted for on the basis of mere observation. They are, however, the traditional topic of metaphysics.

Faith in the intelligibility of the cosmological order was not

such a problem to Newton and the early materialists, for the natural order was mechanistic, and they were unapologetic about positing that a Deity was responsible for the parts and their orderly working. God had imbued humanity with rationality, which participated in the nature of the Divine Mind. The Greek influence, whereby reason, logic and mathematical ideas had an ultimate value by association with Ultimate Reality, can hardly be overstressed. The resurrection by some scientists of the full Pythagorean faith that God is a mathematician is an expression of the faith in order. In short, Reason and logic, as Aristotle, the Stoics and the Medieval scholastics taught, were the mediators by which the divine and human mind related. The idea of objectivity is essentially a remnant of this philosophy.

Whitehead concludes that science could not have arisen without this faith in the rationality of God and His creation, as well as in our ability to participate in God's reason through our own.

> Faith in reason is the trust that the ultimate natures of things lie together in a harmony which excludes mere arbitrariness. It is the faith that at the base of things we shall not find mere arbitrary mystery (SMW, 18).

However, the dogmatic and imperialistic belief that the scientific method alone led to Truth eliminated any room for God in science. The existence of God was not empirically testable, therefore was thought to be irrelevant. This atheism, inherent in unphilosophic scientific values, was further reinforced by those physical, biological, psychological and sociological discoveries which undermined traditional religious doctrines. This leaves the dilemma of how, without an ordering entity, the scientifically

presupposed order can be rationally justified. Another problem is that without a Rational Creator who has endowed humans with a mental substance able to participate in the objective realm of divinely grounded truth, it is difficult to see how logic, mathematics, and reason can be considered trustworthy.

The loss of God as an acceptable scientific argument for the basis of natural order has resulted in the laudable attempt, an attempt in which Whitehead himself participates, to find order immanent within nature. But the rationality that presupposes this order before giving any reasons for it is no different from naive religious faith. Science postulates a natural order without substantiating its faith that there is order. The destruction of its rational religious basis has left science open to charges that it is relative and arbitrary, and that its descriptions of reality are as metaphoric as poetry. Scientific methods and conclusions hover over the waters of our civilization, creating as if from nothing.

Whitehead's criticism is that the destruction of the theological basis for the faith in order should have concerned scientists enough to undergo a thorough philosophic critique of the foundations of science. Because of this philosophic failure Whitehead concludes, science is an anti-intellectual, anti-rationalistic movement (SMW, 8). He states, "Science repudiates philosophy. In other words, it has never cared to justify its faith or to explain its meanings; and has remained blandly indifferent to its refutation by Hume" (SWM, 16).

A deep faith in natural order is fundamental to the existence of science. The central scientific value, however, is its rational description of facts. The stance of science towards faith is most often an outright denial of its importance. This is done either by outspoken denigration or by a silence which implies superiority. However, that its endeavors are based upon faith need not be an embarrassment to science as long as that faith is substantiated by a coherent rational philosophy.

Whitehead's criticism of the philosophical basis of science concerns two essential problems: 1) The problem of creating an adequate epistemology using the scientific account of causality, and 2) the problem of science's irrational faith in order. His critique reveals a profound incoherence within the philosophic basis for science. Whitehead's conclusion is that the state of scientific philosophy is muddled; that the central axioms of scientific practice are not philosophically justified. Furthermore, he is intensely critical of the attitude of the scientific community to this philosophic inadequacy. Hiding behind pragmatic practice they are content with a naive 'animal faith'. This criticism does not make Whitehead an enemy of science. As we will see in the next chapter, Whitehead is deeply concerned with grounding science on a firm philosophical basis, which makes sense of induction, causation, mentality, and, indeed, the totality of human experience.

III. The Romantic Critique: Experiential Poverty

Whitehead has said that philosophy, like the successful journey of a plane, must begin and end upon the concrete ground of immediate experience (PR, 7). In Adventure of Ideas, he states:

> In order to discover some of the major categories under which we can classify the infinitely various components of experience, we must appeal to evidence relating to every variety of occasion. Nothing can be omitted, experience drunk and experience sober, experience sleeping and experience waking, experience drowsy and experience wide-awake, experience self-conscious and experience self-forgetful, experience intellectual and experience physical, experience religious and experience sceptical, experience anxious and experience care-free, experience anticipatory and experience retrospective, experience happy and experience grieving, experience dominated by emotion and experience under self-restraint, experience in the light and experience in the dark, experience normal and experience abnormal (AI, 226).

Whitehead describes the essence of the romantic reaction to materialism when he states: "Wordsworth was not bothered by any intellectual antagonism. What moved him was a moral repulsion. He felt that something had been left out, and that what had been left out comprised everything that was most important" (SMW, 77). To the romantics, science had made a disastrous landing in the realm of concrete experience. By interpreting material reality using various abstractive methods prejudiced towards quantification, materialist science had left no place for the experience of life and value within nature.

Whitehead understands, but is critical of, Wordsworth's hatred of science (SMW, 83) because Whitehead judges science guilty of what he calls the 'fallacy of misplaced concreteness' (SMW, 58). This occurs when narrow abstractive schemes are used to explain

factors of existence beyond their limits. Part of the philosophical flight is the attempt to find the widest explanatory limits which an abstractive scheme can achieve. Misplaced concreteness arises from the failure, either through ignorance or dogmatism, to test one's results against concrete experience. Science has shown a dogmatic and imperialistic attitude regarding the range of its specific abstractions. Whitehead states:

> In practice such an attitude tends to become a dogmatic denial that there are any factors in the world not fully expressible in terms of its own primary notions devoid of further generalization (PR, 8).

Whitehead accepts the romantic critique of materialistic science, that its abstract and incomplete interpretations have been mistaken for full-blooded concrete reality.

The romantics set out to challenge the scientific cosmology with the fullness of their concrete experience. The poet's experience of nature was governed by the apprehension of presences within nature, these being living and purposeful, an undissectable community where all things have in common the pursuit of individual and collective value. When Wordsworth was in nature he was a son and a brother, connected essentially with his environment. In short, his own emotional and aesthetic experience fit snugly within nature: "That is why he laughs with the daffodils, and finds in the primrose thoughts 'too deep for tears'" (SMW, 83). This is true of Shelley as well. Taken together these poets were seen by Whitehead to express the profound two-way withness of the human-in-nature; human spiritually is inextricably tied to nature, and nature resonates with even the highest factors of human experience:

including emotional and mental experience. Even though value-experiences "are part of the motive of [science's] production" (AE, 228), they are considered by science to be the 'Great Exception' in the fabric of nature. Wordsworth's response was "we murder to dissect."[7] To the romantics, the human experience of the intrinsic value and intensity of teleological activity cannot be divorced from the workings of nature.

The romantics recaptured aspects of nature which eluded scientific abstractions. They reminded their readers of the importance of values in human experience and activity, as well as of the majesty and beauty of nature. They emphasised the links between human experience of life, mentality, and value, and our neighbours in nature. With the rise of the doctrine of evolution their critique takes on added significance.

Sometimes Whitehead ponders the possibility of a reenchanted science. In Science and the Modern World he states: "Is it not possible that the standardized concepts of science are only valid within narrow limitations, perhaps too narrow for science itself?" (SMW, 84) What is required is a coherent system of generalizations which take into account all factors of existence, including those experiences illumined so beautifully by the romantics.

IV. Theological Poverty

The idea of the substantially independent and transcendent God proposed in Newton's theology, has a long history behind it.

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[7] "The Tables Turned", line 28.

Aristotle taught that God is an entity entirely untouched by the physical universe. He reasoned that since all activity presupposes a prime mover, the origins of the universe must be found in an outside cause:

> all things that are in motion must be moved by something. . . . [and] it is reasonable . . . to suppose the existence of . . . that which causes motion but is itself unmoved.[8]

To Aristotle this was the main task and reason for God's existence -- as the 'first cause' of universal activity.

The idea of God's independence from nature has often been deemed necessary if Deity is to be considered Perfect. The intuition of God's perfection is a pervasive religious notion which Whitehead takes very seriously. Aristotle argued that perfect goodness is untainted by change, or even by the apprehension of contingent things, since novel experience is equivalent to change. This is an idea which pervaded Plato's thought as well.

> Then it is impossible that God should ever be willing to change; being, as it is supposed, the fairest an best that is conceivable, every God remains absolutely and forever in his own form (Republic, Pars. 379).

Using the logic of substance-attribute, God is the final, independent, perfect, irreducible, spiritual substance.

Although this conception of Deity correlates with fundamental religious intuitions, it is at war with others. In the Bible, for example, while God is often described as above and separate from the earth, He is also viewed as immanent and emotionally affected.

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[8] The Works of Aristotle, trans. under the editorship of J.A. Smith and W. D. Ross (Oxford: Clarendon Press, 1912). Found in Hartshorne and Reese, Philosophers Speak of God, pg 61-62.

> The Lord reigns, He is clothed with majesty; the Lord has clothed and girded Himself with strength; Indeed the world is firmly established, it will not be moved. Thy throne is established from of old; Thou art from everlasting (Ps:93;1-2, N.S.V. translation).

Compare this with "For where two or three have gathered together in My name, there I am in their midst" (Mt:18;20, N.S.V.) or "Are not five sparrows sold for two cents? And yet not one of them is forgotten before God" (Luke:12;6, N.S.V).

Whitehead loves Plato for the same reason he loves Locke, because his thought is full of inconsistent but honest intuitions. Alongside of Plato's statement quoted above we should contrast it with a second:

> And, O heavens, can we ever be made to believe that motion and life and soul and mind are not present with perfect being? Can we imagine that being is devoid of life and mind, and exists in awful unmeaningness an everlasting fixture? (Sophist, Pars. 248-249)

Whitehead is not interested in explaining away pervasive religious intuitions. He requires that an adequate religious philosophy explain both transcendence and immanence without the discrediting of either. There is always the hope in Whitehead's thought that confrontation between contradictory theories and intuitions can be soothed by a more general synthesis. He always criticizes one-sidedness, therefore he criticizes Newton's transcendent theism.

Whitehead rejects Newton's view of God as the Author of Nature responsible for the production and maintenance of the cosmological mechanism, because it is "shipwrecked upon the rock of the problem of evil" (RM, 74). He turns to Hume who understood "that mechanism

can, at most, presuppose a mechanic, and not merely a mechanic but its mechanic" (SMW, 76). If God is the author of nature then he is the author of all the mindlessness, tragedy, perishing, and evil, moral and natural, in the world. The problem of a transcendent, good, omnipotent and omnipresent God has not been adequately solved in thousands of years spent analyzing the question of theodicy, and Whitehead thinks it is time to reject the problematic presuppositions.

Perhaps Whitehead's greatest difficulty with the notion of God's transcendence is that it is nearly always understood using barbaric metaphors. The semitic notion of God creating the world out of nothing necessarily means that God is omnipotent, and the worship of omnipotence, says Whitehead, has had a disastrous legacy.

> There is the glorification of power, magnificent and barbaric:
>
> > The earth is the Lord's and the fullness thereof; the world, and they that dwell therein. Who is this King of Glory? The Lord of hosts, he is the King of glory. (Psalms xxiv.)
>
> Magnificent literature! But there is no solution here of the difficulties which haunted Job. This worship of glory arising from power is not only dangerous: it arises from a barbaric conception of God. I suppose that even the world itself could not contain the bones of those slaughtered because of men intoxicated by its attraction (RM, 54).

By adopting the semitic theory Newton supports the view of the "universe in the guise of an Eastern empire ruled by a glorious tyrant" (RM, 55). Whitehead's profoundly sensitive critique claims that "the glorification of power has broken more hearts than it has healed" (RM, 55). In regards to Christianity, Whitehead simply

cannot believe that a religion which bases itself on the revelation of God's nature in Jesus can retain the glorifications of coercive power which it has.

Because of the moral and philosophical implications, Whitehead rejects the idea that God acts in the universe through coercive force; that all things obey His divinely decreed laws. The difficulties of positing an omnipotent and coercive God alongside the human experience of free-will is a difficult theological question. Also, the recent mathematical understanding of order has abandoned the notion of fixed law for that of statistical probability. The fact that given similar situations, things don't always act in the same way has taken the emphasis off coercive force and onto internal activity. To Whitehead, the only hope of resolving these problems into a coherent understanding of the God-World relationship, is by understanding God's power in terms of the Platonic notion of persuasion.

By adopting the Semitic theory, Newton introduced into the scientific cosmology inadequate theological notions. Their inadequacy made it easy to critique them, culminating in the total elimination of respectability for theological issues in our understanding of nature. God's coercive power fell victim both to the obvious moral superiority of the atheist critique, and the elimination of the need for an outside cause of natural law. By the one-sided concentration on God's transcendence the possibility of God's immanent activity has been largely ignored. Thus God's love and care for nature, and the entrance of eternal values into

the experiences of nature have been absent from the western conceptual scheme.

Whitehead holds out no possibility for an adequate philosophical or moral resolution of the God-World relationship using the traditional western conceptions.

> The notion of God as the 'unmoved mover' is derived from Aristotle, at least so far as Western thought is concerned. The notion of God as 'eminently real' is a favourite doctrine of Christian theology. The combination of the two into the doctrine of an aboriginal, eminently real, transcendent creator, at whose fiat the world came into being, and whose imposed will it obeys, is the fallacy which has infused tragedy into the histories of Christianity and of Mahometanism (PR, 403-404).

He argues that those conceptions are exacerbated by the unprogressive and unsophisticated maintenance of metaphors transplanted from barbaric epochs.

> But the deeper idolatry, of the fashioning of God in the image of the Egyptian, Persian, and Roman imperial rulers, was retained. The Church gave unto God the attributes which belonged exclusively to Caesar (PR, 404).

In the Platonic notion of persuasion, Whitehead finds a more adequate understanding of God's perfection and power. As well as being more adequate philosophically, Whitehead finds the notion of Persuasion more in line with the Christian revelation.

> There is, however, in the Galilean origin of Christianity yet another suggestion which does not fit very well with any of the three main strands of thought. It does not emphasize the ruling Caesar, or the ruthless moralist, or the unmoved mover. It dwells upon the tender elements in the world, which slowly and in quietness operate by love; and it finds purpose in the present immediacy of a kingdom not of this world. Love neither rules, nor is it unmoved; also it is a little oblivious as to morals (PR, 404).

It is also more in line with the possibility of achieving an adequate synthesis between theological and scientific revelations.

V. Conclusion

The materialist-mechanistic paradigm has failed the test of scientific, philosophic, aesthetic, and theological adequacy, yet its tenets continue to form the imaginative framework with which the western mind surveys reality. In theoretical science, the proposition of separate physical substances has been replaced by that of process, activity, and the inseparability of the fabric of the universe; the web of becoming. Philosophical inadequacies undermine the argument that causality and epistemology can be understood in terms of the relations between separate entities. Dualism -- separating mind from matter, secondary from primary qualities, experience from process and causality -- fails the tests of experience and coherence. And science has been subverted by its lack of concern to substantiate metaphysically its faith in order and rationality.

The radical differentiation between facts and values has bifurcated human experience and separated humanity from nature. This has proved philosophically inadequate, as well as aesthetically and spiritually troubling. Lastly, by first postulating a transcendent and coercive mechanic-God, and eventually by keeping a derogatory silence on theological matters, science has undermined the potential civilizing force of a rational, adventurous, invigorating and benevolent spirituality.

Commonly the response to conceptual inadequacy is for critics to retreat into what has been left out, and for defenders to dogmatize and explain away. What is required is the continuous

process of honest reflection on and reordering of, thought; attempting to understand and appreciate diverse perspectives and intuitions, and facing inadequacy with a spirit of humility and adventure.

Chapter Three

Whitehead's Metaphysical Synthesis: A Communion of Subjects

There have been many voices in the last hundred years bemoaning the effect of materialism on the way we view and treat nature. There have been few, however, who have attempted to develop an adequate replacement. Too often critics resort to antiquated or mystical solutions that would resacrilize nature at the expense of rationality and science. Such an approach is blind to the obvious value of the culture of rationality. Whitehead believes that a synthesis of rational science and romantic intuition is preferable to the one-sidedness of either perspective, and that it is the role of speculative metaphysics to effect this synthesis into a harmonious cosmological scheme.

For Whitehead, an adequate metaphysical synthesis must entail reordering scientific, philosophic, romantic and theological thought. Within the sciences an attempt had to be made to tie together the various emerging strands of thought concerning natural reality. Philosophically a more adequate account of natural order, induction and causality had to be provided. Aesthetic intuitions could no longer be relegated to a secondary status within our cosmological framework. The romantic experience of nature as living and purposeful had to be embraced as a valid intuition. Finally, a more comprehensive and adequate theology was required.

In this chapter Whitehead's cosmological scheme will be examined in light of its synthesis of scientific, philosophical, romantic and theological thought. The key concept that brings these elements together is Whitehead's explanation of 'actual entities', the ultimate real things that constitute nature. Because Whitehead's language in describing these actual entities is technical and difficult to grasp, the method of this paper is to work gradually towards a full understanding of actual entities through a discussion of the central differences between Whiteheadian and materialist thought. These differences can be understood in terms of a shift from staticity to process, from the molecular to the holistic; from external to immanent law; from a doctrine of external relations to one of internal relations; and from a coercive to a persuasive notion of God's power.

I. From Staticity to Process

There are two seemingly antithetical human intuitions regarding the ultimate character of nature -- endurance and flux. Human experience of space and time is at the root of these intuitions (MT, 101). In our experience of space we are confronted by enduring things -- rocks, pencils, people. In our experience of time, these enduring things undergo change and transition. The belief that endurance is more basic than flux was responsible for materialism's emphasis on static entities. Materialism did away with flux by conceiving time as an enduring and unchanging thing. So one could imagine time as existing independent of space. Yet,

as we have seen, this made it impossible to explain flux adequately. It is fitting, therefore, that the concept of time was largely responsible for materialism's demise. Whitehead's metaphysical scheme opposed the central materialist presupposition of static entities. Whitehead does not disregard the intuition of endurance but he strongly asserts that the flux of things is an ultimate generalization upon which his philosophical system is based (PR, 240). Flux, or process, is at the very heart of Whitehead's concept of an actual entity.

If we conceive of the universe as a vast network of interrelated parts and wholes -- cells making up organs, molecules making up cells, atoms making up molecules -- an actual entity is the ultimate irreducible microcosmic part to which all wholes are reducible. Unlike the materialist account of ultimate particles as enduring and inert bits of matter, actual entities are dynamic processes, that grow, mature and perish. "An actual entity is a process, and is not describable in terms of the morphology of a stuff" (PR, 54). An actual entity has causal efficacy and is a product of the causal influences. Parts and wholes mutually influence each other such that the whole enters as a cause into the production of the part and the interrelations between the parts make up the whole. The order derived from the mutual determination of part and whole is responsible for our experience of endurance, which masks the radical flux underlying the order. Take, for example, a coffee cup, which endures for a relatively long time. Yet if we were to view it under an extremely highpowered

microscope, we would perceive no apparent basis for its endurance.

Contemporary science deals with causality strictly in terms of cause and effect. It has no real concern with the process by which cause is transformed into effect. From Whitehead's perspective this overemphasizes the objective, external aspect of the causal process and neglects the internal process. "[It] examines the coat, which is superficial, and neglects the body which is fundamental" (MT, 154). Whitehead conceptualizes the causal process within actual entities in terms of "data, process, issue" (MT, 93). Data is simply the actual world which exerts a causal influence, informing the actual entity. The issue is the final effect of these causal influences, which in turn causally influences the world as a datum. Process is the internal, subjective transaction by which causes realize their effect. The actual entity is the internal process where the causal influences come together, it is the issue, or the product, of those causes, and as such it is the datum which will have a causal influence. So in Whitehead's terms, materialist science deals with data and issue, which objectify reality, leaving out the internal process, or transition, by which the data is transformed into the issue (MT, 96). For Whitehead the concept of actual entity is a way of understanding the whole causal process.

Whitehead's notion of actual entities takes into account the discoveries of quantum physics. The character of fundamental

physical entities is in no way static. Paradoxically, these entities can be viewed as both waves and particles, or more technically as both vectors and scalars. A vector is a discrete causal force, a transmission of energy, which is neither physical nor particular; a scalar is an organization of vector energy into a physical, particular form. The emergence of scalar form, which Whitehead calls 'concrescence', is a product of vector transmissions. Whitehead conceives of the nature of actual entities as rhythmic and pulsating. It is rhythmic like a wave, the crest of which is the scalar form and the trough the vector transmission. It is pulsating, for the vector transmissions 'build up' to the formation of a scalar form, which spends itself in the release of a vector transmission. The vector transmissions are the data, the building up and emergence of a scalar form is the process, and the release of a vector transmission is the issue. So the process which constitutes reality is a continuous rhythm from data through process to issue.

In light of the theory of relativity Whitehead understood time to be derived from the durational nature of actual entities. Rather than conceiving time as something real, as something exerting a causal influence, Whitehead understands time to be an effect or an epiphenomenon. Our experience of time is derived from two things: the duration of the transition from data to issue, and the rhythmic succession of actual entities. Whitehead expressed the temporally extensive quality of actual entities by speaking of

them as 'actual occasions', which implies the durational period of an actual entity 'becoming', or coming into existence (PR, 94). Similarly, in human experience, time is commonly experienced as the duration necessary for something real to occur such as a thought or a feeling. Whitehead is unapologetically returning to this "vulgar" notion of time, which Newton had rejected (PR, 88). The latter notion of time is illustrated by the art of animation, in which the appearance of change and movement is but a succession of still frames. The former is time derived from internal experience. The latter is time derived from our experience of the external world.

II. From Molecular to Holistic

One of the main environmentalist critiques of the materialist paradigm centers upon its description of natural entities as molecular and individualistic. Decrying this as an alienating and false abstraction, most environmentalists affirm nature to be 'holistic', an interrelated system of organisms and environments[9]. Indeed, the study of systems and their interrelations is firmly grounded within the science of Ecology. Whitehead's description of natural relations is in full accord with such a viewpoint.

Modern science speaks of a continuous 'field of force', which Whitehead refers to in Process and Reality as the 'extensive

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[9] See Theodore Roszak's Where the Wasteland Ends and Person/Planet, Neil Evernden's The Natural Alien, Alan Drengson's Shifting Paradigm's, and Bill Devall and George Session's Deep Ecology: Living as if Nature Mattered.

continuum'. The field is fundamental, and processes are derived from the dynamics, the vector transmissions, of this field. Physical contiguity is no longer a necessary factor in expressing the relations between entities, rather things are so interrelated that "[a]ny local agitation shakes the whole universe" (MT 138). Where Newtonian physics struggled with how isolated individuals could be related, the problem now is to understand how isolated individuals can exist given the more fundamental continuous field. What is the relationship between distinct individual things and the comprehensive unity of the field?

Early in his thought Whitehead described the holistic character of nature through his 'method of extensive abstraction', which provided a way of analyzing things as an overlapping of whole and part. Through the effect of the whole on the part, the part participates in the order of the whole, and the whole is constituted by its parts. For Whitehead the extensive continuum is "a complex of entities united by the various allied relationships of whole to part, and of overlapping so as to possess common parts . . ." (PR, 82). No part can be understood without reference to its relationship to the whole.

In Science and the Modern World Whitehead ceases using the concepts of part and whole. Here he speaks of an actual entity as an 'organism' in contrast to its 'environment'. In the concept of an actual entity as an organism Whitehead accepts in a limited way the materialist claim that the fundamental things are individual and independent. The term 'organism' conveys that an actual entity

is a convergence and organization of vectors, the causal influences of its environment. Whitehead defines the concept of environment from the standpoint of an actual entity; it is the totality of causal influences, or vector transmissions, that inform the actual entity -- its datum. It follows that an environment, as cause, exists in the moment preceding the becoming of the actual entity, as effect, just as the crest of one wave precedes the trough and crest of the next. The actual entity's immediate contemporaries do not exercise any causal influence on this organization, and in this sense each actual entity is an isolated individual, the unique product of its own history (PR, 145). Materialism was not wrong, then, merely guilty of the fallacy of misplaced concreteness: in a spirit of dogmatic finality, it had abstracted the final atomic things, ignoring the web of relations in which they live and move and have their being.

The idea of an organism is suggestive of a centre of activity, which Whitehead would speak of as a subject. The subject is in part the effect of environmental influences, and in part a contributing cause of this organization. The subject's contribution is a matter of the selective appropriation and harmonization of these influences. The appropriation of influences is selective in that some are not admitted to the emergent organization. The grasping of environmental influences is what Whitehead calls a 'positive prehension' and the exclusion he calls a 'negative prehension'. Prehensions are the means by which environment, the whole world of antecedent actual entities, by

their vector transmissions, are appropriated into the character of the subject. If we were to draw a diagram of the most basic form of prehension we would have the following.

This is a simplification in that it shows the influence of only one actual entity on another, when in reality the environment is the wealth of all antecedent actual entities. Each actual entity exerts a number of influences. A, for example exerts x, y and z. Only y is positively prehended by B as n, while m and o are negative prehensions of x and z. The final actual entity is a product of how it takes into itself the various forces exerting themselves upon it. The part is constituted by the influences, both in their positive contribution or in the fact of their exclusion, of the whole of its environment.

The relationship between organism and environment is what Whitehead calls a 'nexus'. A nexus is: "Any such particular fact of togetherness among actual entities" (PR, 24). The diagram above, for example, is a diagram of a nexus. A nexus expresses the interrelatedness, the togetherness, of part and whole, organism and environment. This is the foundation for a holistic view of nature.

Any object revealed in human perception -- a stone or a tree -- is a nexus, or society. Every society interrelates with the actual entities and smaller societies of which it is made up, as well as with the broader societies, its environment, of which it is a part. A tree, for example, is a complex organization of living and non-living parts into a functioning whole. It, in turn, is one society in the ecosystem of a forest, and ultimately of the Earth. Whitehead would call a tree a 'democratic society' because there exists no regnant occasion -- no central governing focal point -- regulating the actions of the various parts. A mammal, on the other hand, has a regnant society, its central nervous system, as part of its organizational whole. Whitehead calls this a 'monarchial society'. When a society is monarchial it can be considered an analogue to an actual entity.

Human individuality must be seen in the context of an interaction with its broader environment. Yet human individuality, as a monarchial society of actual entities, is an analogue of the individuality of an actual entity. "[T]here is a unity of the body with the environment, as well as a unity of body and soul into one person" (MT, 161). Our experience reveals our individual separateness, both mentally and physically, from our environment. Overemphasis on this factor has led to dualistic substance theories such as we find with Descartes. Whitehead had no wish to separate human individuality from the tapestry of natural order. Consequently, Whitehead emphasizes the unity, the inseparable integrity between mind and body and environment.

> But neither body nor soul possesses the sharp observational definition which at first sight we attribute to them. Our knowledge of the body places it as a complex unity of happenings within the larger field of nature. But its demarcation from the rest of nature is vague in the extreme (MT, 161).

Evolution has shown that present human physiological structure is the result of a long process. Sociology and psychology teach that our experience is implicated in our genetic and cultural inheritance. In all these instances our physical, mental, and even spiritual experiences are products of our involvement in the world around us.

At the physical level we find ourselves firmly and inextricably embedded in our environment, as a part within a whole. In this way our human individuality is but an expression of the relationships between part and whole that pervades our own existence. Atom, molecule, cell, organ, body, environment -- this is the expanding series of overlapping parts and wholes, the societies within societies that we are and of which we are a part.

At the quantum level we continually share energy and atoms with our environment. From Whitehead's perspective the whole of the antecedent actual universe is implicated in what the body is in the present moment. "In principle, it would be equally true to say, 'the actual world is mine'" as it would be to say my body is mine (PR, 92).

Whitehead's holism embraces a fundamental comprehensive unity without sacrificing the significance of individuality.

III. From External to Immanent Law

Whitehead's allegiance to the spirit of a scientific approach to nature is exemplified in his commitment to a doctrine of immanent law. As we have seen, Whitehead finds the materialist doctrine of imposed external law to be fraught with scientific, aesthetic and theological problems. This way of thinking "constitutes the great refusal of rationality to assert its rights" (SMW, 92). The appeal to extrinsic causes for that which is apparently inexplicable is contrary to the nature of rationality, which seeks to achieve full understanding. Whitehead would rather we "search whether nature does not in its very being show itself as self-explanatory" (SWM, 92).

His affirmation of immanent natural law is implicit in his notion of the 'ontological principle'. The ontological principle affirms:

> That every condition to which the process of becoming conforms in any particular instance, has its reason **either** in the character of some actual entity in the actual world of that concrescence, **or** in the character of the subject which is in process of concrescence . . . . This ontological principle means that actual entities are the only **reasons**; so that to search for a **reason** is to search for one or more actual entities (PR, 29).

In other words, the doctrine of immanent law means that the natural order is an expression of the character of the real things which comprise nature (AI, 111-112).

Whitehead realized that a doctrine of immanent law required embracing a paradigm of nature's relations very different from the absolute-mechanistic theory. He was also searching for a scientifically legitimate unifying framework that would combat the

process of fragmentation within the sciences. It seemed plausible to him that the doctrine of biological evolution provided such a framework (SMW, 93, 107). Whitehead applied the evolutionary paradigm to account for all of nature's activity and order. Order proceeds from the continuously evolving relations between organisms (SMW, 108).

> The modern evolutionary view of the physical universe should conceive of the laws of nature as evolving concurrently with the things constituting the environment (AI, 112).

The ontological principle clearly explains natural order as the product of an evolution of organisms. There is the environment of many actual entities, and there exists the one entity in the process of organization.

Whitehead's commitment to an evolutionary paradigm is also exemplified in his notion of 'creativity.' In response to the ultimate question "why should there be anything occurring; why not nothing?" Whitehead answers:

> 'Creativity' is the universal of universals characterizing ultimate matter of fact. It is that ultimate principle by which the many, which are the universe disjunctively, become the one actual occasion, which is the universe conjunctively. It lies in the nature of things that the many enter into complex unity (PR, 25-26).

This creative process constitutes the essential character of nature. It would be a misunderstanding if creativity, the 'universal of universals', were understood as an externally imposed law. The word is merely Whitehead's general and abstract philosophical description of the character of actual entities and the relations between them. Creativity is not a 'thing' which exerts influence but simply the dynamic of the process itself.

Creativity is the immanent tendency of the environment to give rise to a novel organism -- and every organism is novel, a unique constellation. Were it not for this drive within nature there would be void.

IV. The Actual Entity: From External to Internal Relations

Fundamental to any scientific cosmology is its description of the types of entities found in nature, especially the basic building blocks, and the relations which hold between them. To the materialist all relations are based on contiguous forces applied to senseless particles. Among Whitehead's many reasons for disagreeing with this is that it is based on a doctrine of external law, a doctrine long discarded within the sciences. Science presupposes that natural order arises out of immanent operations, but it has never fully separated itself from its materialist roots.

To Whitehead a doctrine of immanent law requires a doctrine of **internal relations** between whole and part, organism and environment.

> The doctrine of Immanent Law is untenable unless we can construct a plausible metaphysical doctrine according to which the characters of the relevant things in nature are the outcome of their interconnections, and their interconnections are the outcome of their characters. This involves some doctrine of Internal Relations (AI, 113).

The reason why causes have the effect that they do, the reason why environmental influences elicit the specific character of the organism, is to be found in two things: the totality of environmental influences, and the synthesizing activity internal to

the individual subject. Whitehead approaches the registration of environmental forces in terms of the internal experience of the subject. The objective external influences which enter into the subjective experience of the organism Whitehead speaks of as 'feelings' (PR, 54). Whitehead understands actual entities to be 'drops of experience', whereby the external world is 'felt' by a real subject. Through such a doctrine Whitehead attempts a thorough synthesis of the romantic intuition that nature is alive, with the findings of modern science.

Newtonian cosmology described "a dead nature [that] aims at nothing" (MT, 135). Also, the strict separation of mind from body deprived the physical stuff of nature of purpose, life and the experience of value. Whitehead believed "that neither physical nature nor life can be understood unless we fuse them together as essential factors in the composition of 'really real' things whose interconnections and individual characters constitute the universe" (MT, 150).

Whitehead's concept of an actual entity as a concrescence provides a way of reconciling the physical aspect of nature with purpose, life and value. Concrescence is simply the genetic process that is the actual entity coming into existence. No distinction can be made between concrescence and actual entity. That is, we must not think of an actual entity as a static thing that results from the process of concrescence, for an actual entity is the process itself. "[W]hen we analyze the novel thing we find nothing but the concrescence" (PR, 243).

Concrescence can be analyzed by isolating various phases. These Whitehead calls "(i) the responsive phase, (ii) the supplemental stage, and (iii) the satisfaction" (PR, 245). The third stage, the satisfaction, is merely the outcome of the first two stages. It is not important for our purposes to analyze this further. In the first two stages of concrescence, romantic and scientific accounts of nature are synthesized.

i). The Responsive Phase of Concrescence: Physical feeling, causal efficacy and scientific endeavour

The ontological principle requires that a philosophic basis for scientific practice be found in the nature of actual entities and their interrelations. In his description of the responsive phase of concrescence Whitehead attempts to provide a philosophic basis for the scientific faith in causality and epistemology as well as its partially correct emphasis on deterministic relations operating according to efficient causes.

"In the primary stage of concrescence an actual entity prehends the antecedent environment, the influences which constitute the foundation of its nascent individuality" (PR, 176). It prehends the environment solely through 'simple physical feelings'. A simple physical feeling is a vector transmission. It is a causal influence, or issue, stemming from one actual entity and experienced as datum by an emergent novel entity. These feelings are not neutral but carry a specific 'feeling-tone', or emotive quality. In other words, these transmissions of energy are not qualitatively indeterminate; they bear the imprint of their

source and so inform their destination. Through simple physical feelings the dead objective world of the past transmits itself into the living present.

A doctrine such as this is precisely what is necessary for the notion of causality to find philosophic support. Simply put the cause must flow into the effect so that the cause is present in the effect and the reason for the effect be found in the cause. Whitehead states:

> A simple physical feeling is an act of causation. The actual entity which is the initial datum is the 'cause,' the simple physical feeling is the 'effect,' and the subject entertaining the simple physical feeling is the actual entity 'conditioned' by the effect. This 'conditioned' actual entity will also be called the 'effect' . . . . Therefore simple physical feelings will also be called 'causal feelings' (PR, 276-277).

The cause positively prehended loses none of its characteristics. Its message is preserved in the effect. It becomes the effect.

Simple physical feelings with origins in the settled past operate in the manner of efficient cause. In the responsive phase the efficacy of the environment is the sole determining factor in the character of an actual entity. If concrescence were to consist solely of this responsive phase, all causality would be strictly deterministic, simply conforming to the causal influence of its environment.

The past imprints itself upon the present and through it influences the future. This continuity between past and present is the basis for our perception of varying degrees of permanence. This permanence is explained by the concept of reproduction.

In the world there is nothing static. But there is

> reproduction; and hence the permanence which is the result of order, and the cause of it (PR, 278).

The reproduction of the cause in the effect is the basis for enduring order in the universe. Reproduction is the basis for faith in the efficacy of the past (causation) and the predictability of the future (induction).

But what of human perception? We have shown that materialistic science not only failed to account for causality but also that its philosophy could not account for the human perception of causality. Hume made quite clear that perception of mere sensa provides no basis for causation or induction.

Whitehead argues that Hume's epistemology is flawed by its singular concentration on what Whitehead calls 'presentational immediacy' to the exclusion of 'causal efficacy'. Hume based all mental phenomena on the succession of sense-perceptions. He "interpreted the totality of experience as a mere reaction to an initial clarity of sensa" (MT, 109). This clarity of sensa is what Whitehead calls presentational immediacy. When we visually perceive in the mode of presentational immediacy, we experience an environment made up of definite shapes and colours. Whitehead considers perception of sensa to be the most definite in human experience but also the most superficial and trivial (MT, 108). Indeed, it seems very strange that the depth and breadth of human experience could be derived from the perception of a mere succession of colours and shapes.

Our sensory organs and memory mediate the causal force of

environmental and mental data. This is experience in the mode of causal efficacy, that is, as the effect of antecedent causes. The human organism prehends the environment because of causal efficacy. "For example, we see **with** our eyes, we taste **with** our palates, we touch **with** our hands, etc" (PR, 197). In a primitive way we also perceive the well-being or dis-ease of our bodies. As a society in itself the eye prehends its datum, and the effects of that prehension are felt as datum in the consciousness of the perceiver. The final result is vision, but vision derived from a bodily function which is itself informed by the causal environment.

The idea that all perception begins with physical feelings derived from the datum disqualifies presentational immediacy from both ultimacy or primitiveness. It is not primitive, for although we may experience the immediacy of sense data very clearly, it is shaped by the vague primitive feeling tones which are determined by the settled past. In this we have a more holistic account of the perceptual process which provides a basis for our experience and conceptualization of causality.

ii). The Supplemental Phase: Life and Mentality

In the responsive phase, causality was understood on the basis of simple physical prehensions, and therefore this phase was deterministic. This is the realm of physical science. In the second, the supplemental phase, another type of causality is introduced, in which romantic intuitions of purpose, life and value find expression. The purpose of this section is to examine

Whitehead's account of purpose, life and value at the very heart of nature.

To understand purpose in nature we need to consider the organism's interaction with its environmental influences. There are two basic aspects of an actual entity. It has both a physical aspect and a mental aspect. Whitehead speaks of these as 'poles'. The physical pole is that which feels simple physical prehensions, and therefore is strictly determined. The mental pole was posited as a way of overcoming determinism, for it is open to causal influences other than simple, physical, deterministic ones. It is called 'mental' because the only analogue we have for it is to be found in human conscious experience. The operations of the mental pole, however, do not necessarily imply cognitive experience.

> Mental activity is one of the modes of feeling belonging to all actual entities in some degree, but only amounting to conscious intellectuality in some actual entities (PR, 71).

Human consciousness is but one highly developed expression of a principle, a mental principle, which pervades reality. To understand this principle, the mental pole, we must examine Whitehead's notions of 'eternal object', and 'conceptual prehension'.

Working from human experience, our knowledge of objects is mediated by ideas, which inform our awareness of physical reality. For example, our perception of a red rose has a physical source, the flower, and a mental source, for awareness of the flower as 'red' and as a 'rose' is informed by something other than just that particular flower. The activity of the mental pole is called a

'conceptual prehension', that is, the awareness of an idea or concept. Whitehead avoids speaking of ideas or concepts, however, for such terms imply human cognitive awareness. (Conceptual prehension does not necessarily imply the prehension of 'concepts' in any cognitive sense). He speaks of 'eternal objects' to convey a more universal notion of mental information. So the actual entity prehends two kinds of objects: physical objects, the source of simple physical feelings, and eternal objects, the source of conceptual prehensions.

By 'eternal' Whitehead does not mean something that exists forever. He uses the term in its meaning of atemporal, or outside time. Whereas concrete particular things perish, the informing idea, the eternal object, is independent of the particular thing. A particular rose may wilt, but the notion of a rose is not implicated in the fate of any particular rose. "A colour is eternal. It haunts time like a spirit. It comes and it goes. But where it comes, it is the same colour" (SMW, 87).

We have seen that two kinds of causal influence are operative in the emergence of the actual entity, physical and conceptual prehensions. Both are present in every actual entity, and play a part in determining its character. What becomes is a synthesis of these influences. There is a significant difference between them in that the physical prehensions must be felt, while specific conceptual prehensions can be selectively excluded. This selectivity implies an element of self-determination in the actual entity, and this is the basis for the possibility of novelty. The

character of the actual entity reflects those conceptual prehensions which have been admitted and excluded. Because each conceptual prehension, whether it positively includes or negatively precludes an influence, that influence is a potential to determine the entity's character, to lend it a definite quality or form. Therefore Whitehead calls this causal influence, the eternal object, a pure potential.

Since there is selection between eternal objects, two questions arise: what does the selecting, and on what basis does selection occur. For Whitehead there is no preexisting subject, which exists before concrescence and which could be responsible for the selecting. The subject emerges through the process of an actual entity coming into existence. Yet there must be a dynamic within the emergent actual entity towards becoming a determinate subject. This dynamic is what selects among prehensions. It must have its own intrinsic guidelines, its own qualitative standards, by which it selects. Whitehead calls this dynamic within a concrescence its 'subjective aim'. "This subjective aim is this subject itself determining its own self-creation as one creature" (PR 86). The subjective aim is the germ of life, freedom and novelty within nature. It tends toward the achievement of some determinate synthesis. The process of concrescence is the integration of only those factors in the datum which harmonize with its aims.

We have mentioned that prehensions are not neutral, that they bear a specific quality of information. **How** this information is

felt, what Whitehead calls the 'subjective form' of the prehension, is governed by the subjective aim. This is the basis of attraction and aversion, good and bad, beauty and ugliness implicit in the experience of all natural entities. Whitehead quotes Bacon against the materialist doctrine of matter being fully determined by external relations, and advocates a return to the Baconian perspective:

> 'It is certain that all bodies whatsoever, though they have no sense, yet they have perception; for when one body is applied to another, there is a kind of election to embrace that which is agreeable, and to exclude or expel that which is ingrate' (SMW, 41).[10]

The experience of attraction and aversion, good and bad, demonstrate that the subjective aim is guided by a drive towards specific qualitative principles. Whitehead defines two principles: harmony and intensity, or less abstractly beauty and adventure. We have spoken of the actual entity as an organization or synthesis of environmental influences. Whitehead speaks of this process of organization as an aesthetic synthesis. The aesthetic synthesis is the movement within the actual entity towards integrity guided by the principles of harmony and intensity. In any particular actual entity the kind of harmony and intensity it seeks is a reflection of its unique history. Using human experience as an analogue, two different people might respond to the same situation differently because of their unique histories; given a dangerous situation one might fight and the other flee. Both are seeking a specific kind

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[10] Whitehead tells us that this quote is from the opening of Section IX of Bacon's Natural History.

of harmony or intensity, survival or excitement, but they do so each in his or her own manner. They are both acting because of their own private ideals. The private ideal is the organism's subjective aim.

Just as nature is purposeful, it is also living. Already in our account of purpose we have dealt with the two central factors in Whitehead's definition of a living nature. These factors are self-creation and self-enjoyment. The self-creative element of an actual entity is its aesthetic synthesis guided by its private ideal. The self-enjoyment is merely the process of appropriating environmental influences. As we have seen the subjective form of these prehensions is qualitatively felt by the emerging subject. Experience in and of itself, whether of good or bad, is what Whitehead means by self-enjoyment.

Finally it needs to be recognized that the experience of value pervades nature. The process of concrescence is a process of valuation. This process is one of an organism appropriating data according to its subjective aim. The subjective aim is not neutral but has a drive towards definite value. This drive is the seed, so to speak, from which the subject grows. "To be an actual entity is to have a self-interest" (RM, 97). This is what Whitehead means in saying that the organism has value for itself.

The realization of the subjective aim depends upon the influences derived from its environment. The qualitative feel of a prehension, its subjective form, depends on its relevance to the

subjective aim. In turn, what the actual entity becomes exerts an influence which is not neutral, but will have positive or negative impact in its role as datum. This is the value of organisms for each other.

In none of these cases does the experience of value necessarily occur cognitively. Rather value as the experience of relevance that pervades nature, is implicit in each and every prehension. The conscious awareness of values, simply brings this value to light:

> Our experience of actuality is a realization of worth, good or bad. It is a value experience. Its basic expression is -- Have a care, here is something that matters! Yes -- that is the best phrase -- the primary glimmering of consciousness reveals, something that matters (MT, 116).

We are consciously aware of our intrinsic value, and the significance of the choices, the selections, of those around us, as well as the relevance of our choices for others.

V. From Coercive to Persuasive Force

We have seen in the previous chapter that traditional western theology has tended to conceive of God as an external coercive force, governing the natural order. This notion presented a theological problem for the dilemma of theodicy. It presented an environmental and social problem as a model of coercion and domination. It was a problem as science came into its own and made extrinsic causes unnecessary. Whitehead sought a concept of God, which would take seriously spiritual experience and significant religious intuitions and which would make sense within the

framework of the scientific vision of the world.

Whitehead's own attitude to his definition of God was not one of dogmatic certainty. He states:

> There is nothing here in the nature of proof. There is merely the confrontation of the theoretic system with a certain rendering of the facts. But the unsystematized report upon the facts is itself highly controversial, and the system is confessedly inadequate. The deductions from it in this particular sphere of thought cannot be looked upon as more than suggestions as to how the problem is transformed in the light of that system (PR, 405).

In short, Whitehead's philosophic theology is a humble endeavour to understand God according to the requirements of his system. Whitehead does not attempt to reduce religious intuitions to physical, sociological, or psychological causes. Generally, he argues that religious intuitions, especially those themes common to all religions, are so pervasive as to demand respect for their integrity. Thus, he treats religious experience as a fact to be accounted for (RM, 84). This is not to say that Whitehead does not accept that religion sometimes arises out of cultural and psychological sources. He is especially aware that any specific doctrines belonging to some religions but not others, are very suspect (RM, 84). Nevertheless, Whitehead strongly advocates that there are religious themes which are in evidence throughout the diversity of religious experience.

Whitehead's account of actual entities seeks to be universal. Thus, the "description of the generic character of an actual occasion, though there is a specific difference between the nature of God and that of any occasion" (PR, 130). So Whitehead says that God is the "chief exemplification" of the character of an actual

entity (PR, 405).

In Whitehead's system the mental and physical poles of an actual entity become the 'primordial' and 'consequent' poles of God's nature. We have seen that the eternal objects are mental causal influences, the potentials to determine the character of the emerging actual entity. According to the demands of the ontological principle -- that all elements of reality must be derived from an actual entity -- the existence of potentials must be grounded in an actual entity. These eternal objects have their causal source in the mental or primordial pole of God.

> Viewed as primordial, he is the unlimited conceptual realization of the absolute wealth of potentiality (PR,405).

God is the 'harmony of harmonies'; the perfect harmonization of all eternal objects. The primordial nature of God is both transcendent and immanent. It is transcendent in the sense that it is not causally influenced by the world, but immanent in that it is felt as a causal influence in the world.

In God's primordial nature we find the object of religious intuitions which stress divine perfection, aesthetic harmony, incorruptibility, immutability, and impersonalness. This is the ground for the intuition of "an essential rightness of things" lying at the heart of reality (RM, 40). Whitehead believes that the essence of religiosity occurs when

> In its solitariness the spirit asks, What, in the way of value, is the attainment of life? And it can find no value till it has merged its individual claim with that of the objective universe (RM, 59).

The primordial nature of God acts within Whitehead's system as the

principle supporting the crucial religious intuition that there is a standard of rightness, which is attained or missed and against which all achievements can be judged.

Whitehead points out the limitation of the primordial nature: it is deficient in consciousness and experience of the world. Consciousness and experience of the world occur within the physical pole of God -- the consequent nature. The consequent nature prehends the world: "He shares with every new creation its actual world; and the concrescent creature is objectified in God as a novel element in God's objectification of that actual world" (PR, 407). For Whitehead God is aware of all things and shares the experiences of all things as a companion (PR, 407).

The consequent nature satisfies the religious intuition of an immanent and personal God. Because the consequent nature shares in the experience of the world -- God is immanent. The Gnostic text, "Cleave the wood and I am there," is interpreted by Whitehead, not in the pantheistic sense that the tree is a fragment of God, but in the sense that God's experience pervades each actual entity.

God is personal because His feelings are not merely conceptual or devoid of emotive content, as is the case with the primordial nature. Because He prehends the world in his consequent nature and is an aesthetic harmony in His primordial nature, God feels the world in relation to His intrinsic harmony. Thus, He feels intensely the good and the evil, the advances and the tragedies, of all actual entities.

God, for Whitehead, is not omniscient in the traditional

sense. His prehension of actual reality is complete. Also, His primordial nature, as embracing all eternal objects, fully comprehends all the potentialities that could possibly be realized in the future. Nevertheless, although God's understanding of the settled past and the eternal objects is perfect, God cannot possibly know how the actual future will unfold. In the sense that God knows all that can possibly be known -- perfect knowledge of what is actual and potential -- God is omniscient. There has always existed the theological problem inherent in positing both an omniscient God and a free universe. Whitehead's solution is to halt God's knowledge of all but a conceptual understanding of reality in the specious present, which is indeterminate by reference to the real freedom of each actual entity.

Neither is God omnipotent in Whitehead's system. God's power in the universe comes through the persuasive force which the primordial nature exerts. He cannot override the real freedom of actual entities in their subjective 'decisions'. By this doctrine Whitehead seeks to dispense with what he perceives to be the negative side of religion, which is the worship of power and the interpretation of all reality, including evil, as the direct effect of God's activity. His solution to the problem of theodicy is to infuse all of reality with freedom and evolution, while retaining God's conceptual harmony and emotive companionship.

God's persuasive force acts on the world as the lure toward aesthetic synthesis, the realization of the organism's subjective aim. The urge for harmonization and intensity of experience is the

gift God infuses into the character of things. "God's immanence in the world in respect to his primordial nature is an urge towards the future based upon an appetite in the present" (PR, 37). This urge is not given without divine 'guidance'. God's perfect aesthetic synthesis informs the actual entity in its prehension of physical fact. Just as eternal objects such as 'red' and 'rose' inform awareness, so also do such as objects as 'beauty', 'goodness', and 'truth'. Every actual entity conceptually prehends this harmony as it relates to the physical data. The eternal objects are graded in relevance so that ugliness is inferior to beauty. Thus, the subjective aim is derived from a hybrid prehension of the primordial nature of God, hybrid because it is both conceptually felt in the mental pole and directly related to the physical feelings derived from the datum.

God's relationship to the world has two dynamics. By his primordial nature he sows the drive toward intensity and harmony of feeling, the result of which is then reaped in experience by God's consequent nature. "His aim for [each actual entity] . . is depth of satisfaction as an intermediate step towards the fulfilment of his own being" (PR, 125).

VI. Conclusion

Through his doctrine of an actual entity, Whitehead attempts to harmonize elements of existence derived from the spectrum of human experience. His goal was to provide science with a rational ground for its pursuits while integrating aesthetic and theological

factors within a more comprehensive cosmology. By doing so Whitehead's metaphysics offers an alternative to the proposition that reality is devoid of life, value and the imprint of God.

Chapter Four

Relationship Rejoined: Whitehead's Metaphysics as Foundation for Ecological Practice

Increasingly throughout his work Whitehead concerns himself with the effect of conceptual schemes on western civilization. In particular he focuses on the effects of the reigning scientific paradigm on human thought and action. In this thesis the first two chapters were dedicated to Whitehead's explication and critique of the materialist-mechanistic paradigm which molds our understanding of humanity and nature. One of Whitehead's concerns is the spiritual repercussions caused by the inadequacy and incoherence of scientific philosophy. It is not so much what has been explained by science which is problematic, it is what has been left out: a process that Whitehead calls the fallacy of misplaced concreteness. The third chapter elucidates Whitehead's attempt at a more comprehensive philosophy, one that synthesizes scientific knowledge with aesthetic intuition. This chapter will examine the relevance of Whitehead's philosophy of nature, in light of its implications for an environmental ethic.

The environmental crisis has arisen partly because of the desacralizing influence scientific concepts have had on how we perceive nature. However, since Whitehead wrote before environmental issues became prominent, specific concern with ecological problems is largely absent from his work. He was interested in the radical spiritual difficulties that arise when

romantic intuition is dismissed. The environmental crisis is implicated in these difficulties. By taking the romantics seriously, Whitehead's philosophy addresses the spiritual problems at the heart of the crisis and provides a foundation for an adequate ethic of nature.

Whitehead's relevance for environmentalists is three-fold. First, he provides a philosophical foundation for the argument that nature contains inherent value. Second and third, he provides both a theological and a sociological rationale for the development of an ethic of care that embraces all of nature.

Philosophy is necessary as a rational source of unity within community. Any ethical system worthy of allegiance must base itself on a coherent and comprehensive philosophy. The alternatives are blind dogmatism or mere subjective relativism. Environmentalists must be concerned with the importance of philosophy if their beliefs are to be anything more than mere personal preference.

Whitehead is critical of the modern tendency to define philosophy as a purely subjective activity. He blames this tendency on the rise of science:

> [T]he bias towards history on the part of the physical and social sciences with their refusal to rationalise below some ultimate mechanism, has pushed philosophy out of the effective currents of modern life . . . . [Philosophy] has retreated into the subjectivist sphere of mind, by reason of its expulsion by science from the objectivist sphere of matter (SMW, 142).

Science has marginalized anything that cannot be objectively

proven. Through its mystique and utility, science is commonly viewed as the sole source of objective knowledge. One of the most troubling problems with this is that the lost respectability of philosophy has meant a corresponding degradation of those issues which depend upon it, most important of which is ethics. A thoroughgoing subjectivist philosophy lacks any normative basis for ethical action beyond, perhaps, tolerance. Whitehead's metaphysics aims to avoid subjectivism. Because he understands the potential dangers of an objectivist philosophy, Whitehead neither regards dogmatism as a respectable quality, nor does he assume that his philosophy is the final word: "Our reasonings grasp at straws for premises and float on gossamers for deductions" (AI, 72). Respect for the limitations of human reasoning, the necessity for constant progress in pursuit of understanding and formulation, as well as a deep faith in the continuity between reason and reality, together constitute the spirit in which Whitehead writes. His endeavour depends, by his own admission, on whether it succeeds in formulating reality adequately -- adequate to the fullness of human knowledge, experience and intuition. Through his attempt at an objective philosophy Whitehead provides us with a normative framework for ethical action.

I. The Ethical Problem and the Integrity of Nature

The materialist paradigm undermines any intellectual basis for ethical relations with nature. It has desacrilized nature, and by implication humanity as well, eroding the foundation of ethics.

Materialism understands fundamental physical substance to consist of static and enduring particles obeying external laws: "Nature is a dull affair, soundless, scentless, colourless; merely the hurrying of material, endlessly, meaninglessly" (SMW, 54). Nature is mechanical, without mentality, purpose, life or inherent value. One does not treat machines according to ethical considerations, which are commonly attached only to things which feel and experience, things with which we have something in common. In other words we apply ethics to entities with 'inherent value' -- things which have a value in and for themselves.

Separating mind from nature was the means by which the early materialists rescued human value from nature. However, it has been the overwhelming conclusion of science that all aspects of humanity are part of nature. A problem arises: exactly how can we rescue human meaning and value from a meaningless and valueless nature? Whitehead describes the implications of this view as follows: "Each molecule blindly runs. The human body is a collection of molecules. Therefore the human body blindly runs, and therefore there can be no individual responsibility for the actions of the body" (SMW, 78). And since the mind is the expression of a physical process, there is no escape from the conclusion that it blindly runs as well. The consequences are clear; the activities of the body and the mind are meaningless.

At present there exists an uneasy truce between the opposing conceptions of humanity put forth by the scientific worldview and by humanism. On the one hand, we have reached a point in civilized

thought where the treatment of people strictly according to instrumental values is repellent. On the other hand, the cosmology of mechanistic-materialistic science posits no basis for such morality. This tension is dealt with in a practical but incoherent way by applying one standard to mute nature and another to the human realm. The scientific worldview halts at the foot of humanism. Because of this, nature is handed over to a kind of abuse that humanity escapes. Inherent value has been attributed solely to humans and this has been accomplished only with the highest disregard of philosophical integrity. We escape simply because we refuse to be consistent. We are unwilling to live with the consequences of a uniform materialist worldview. Whitehead believes that this radical inconsistency accounts for much that is half-hearted and wavering in our civilization (SMW, 76).

The conclusions of science, which undermine the experience of value, also cast doubt on the scientific enterprise. Take for example the following quotation by Joseph Krutch, describing the spiritual desolation inherent in the mechanistic message.

> The universe revealed by science, especially the sciences of biology and psychology, is one in which the human spirit cannot find a comfortable home. That spirit breathes freely only in a universe where what philosophers call Value Judgments are of supreme importance. It needs to believe, for instance, that right and wrong are real, that Love is more than a biological function, that the human mind is capable of reason rather than merely of rationalization, and that it has the power of will and to choose instead of being compelled merely to react in the fashion predetermined by its conditioning. Since science has proved that none of these beliefs is more than a delusion, mankind will be compelled either to surrender what we call its humanity by adjusting to the real world or to live some kind of tragic existence in a universe alien to the deepest needs of its nature (Griffin, 6-7).

Krutch's argument is self-refuting. He states that the revelations of science are rationally trustworthy. However, the same science reveals that humanity is incapable of reason, only mere rationalization. If we are incapable of reason, if our search for truth is futile, then science must also fail. Science cannot stand without the conviction that experience conveys reality, and this conviction cannot stand apart from the premise that nature and humanity share a common rationality. And if experience conveys reality in a manner that is rationally accessible, why should it not also convey reality in a manner that is aesthetically accessible. As Whitehead says,

> Faith in reason is the trust that the ultimate natures of things lie together in a harmony which excludes mere arbitrariness. It is the faith that at the base of things we shall not find mere arbitrary mystery. The faith in the order of nature which has made possible the growth of science is a particular example of a deeper faith. This faith cannot be justified by any inductive generalization. It springs from direct inspection of the nature of things as disclosed in our own immediate present experience. There is no parting from your own shadow. To experience this faith is to know that in being ourselves we are more than ourselves: to know that our experience, dim and fragmentary as it is, yet sounds the utmost depths of reality: to know that detached details merely in order to be themselves demand that they should find themselves in a system of things: to know that this system includes the harmony of logical rationality, and the harmony of aesthetic achievement: to know that, while the harmony of logic lies upon the universe as an iron necessity, the aesthetic harmony stands before it as a living ideal molding the general flux in its broken progress towards finer subtler issues (SMW, 18).

Because the integrity of science is fused with the integrity of human experience, Whitehead is profoundly concerned with ending the separation between science and the affirmations of human aesthetic and ethical experience.

That the chord of human experience sounds from the depths of nature is a prevalent intuition of the romantics. Wordsworth wonders at the communion of mind and nature that constitutes creation. Shelley delights in the community of nature in which humanity shares.

> To noble raptures; while my voice proclaims
> How exquisite the individual Mind
> (And the progressive powers perhaps no less
> of the whole species) to the external World
> Is fitted -- and how exquisitely, too --
> Theme this but little heard of among men --
> The external World is fitted to the Mind
> And the creation (by no lower name
> Can it be called) which they with blended might
> Accomplish -- this is our high argument.
> (Wordsworth, Prospectus to The Recluse, ln 62--71)

> Earth, ocean, air, beloved brotherhood!
> If our great Mother has imbued my soul
> with aught of natural piety to feel
> your love, and recompense the boon with mine;
>
> I wait thy breath, Great parent, that my strain
> May modulate with murmurs of the air,
> And motions of the forests and the sea,
> And voice of living beings, and woven hymns
> of night and day, and the deep heart of man.
> (Percy Shelley Alastor; or, The Spirit of Solitude, ln 1-4, 45-49)

Separating human values from nature, as Krutch does in surrendering them as delusions, ultimately reduces human experience and endeavour to meaninglessness. Either values pervade nature or human meaning and reason are lost. The loss of human value is as unacceptable to the integrity of science as it is to poetic intuition.

II. The Relevance of Whitehead

Environmentalists who intuit nature as inherently valuable

require a comprehensive metaphysical framework which synthesizes their intuitions with those elements of the dominant worldview which retain their validity. The alternative is either to adopt whole-heartedly the dominant values or to be labelled as irrational fools.

The attribution of value solely to humans has allowed us to treat animals and other natural entities in terms of their mere instrumental value, that is with reference to their capacity to satisfy our desires. This practice, unconscious or not, is very widespread. Today, for example, many environmental ethicists base their arguments on how the mistreatment of nature fails to serve human interests or welfare. Endangered species are saved so that we can look at them. We recycle so that we do not have to live beside, look at, and smell, dumps. We seek to halt the depletion of the ozone because it will give us skin cancer or flood our major cities. We combat acid rain because dead lakes hurt tourism. Arguments based on enlightened self-interest may be commendable, but they are entirely anthropocentric.

Ethical arguments based upon enlightened self-interest are never very trustworthy. In his book <u>The Natural Alien</u>, Neil Evernden writes that environmentalists who base their arguments on enlightened self-interest ensure their own failure whenever self-interest can be perceived as lying elsewhere (Evernden, 10).

> Therein lies the fatal weakness of the so-called ecology movement. In seizing arguments that would sound persuasive even to indifferent observers environmentalists have come to adopt the strategy and assumptions of their opponents (Evernden, 10).

Whether environmentalists adopt this method because they have been indoctrinated fully into the prevalent worldview, or because it is expedient to do so, the modern disrespect for aesthetic experience and the assumption that nature has no inherent value are perpetuated. The modern worldview, and the scientific paradigm which largely shaped it, have combined to trivialize the poetic, value-laden, experience of nature.

The defiance of accepted premises of reason or right is always met by a pressure to conform. Those activists who steadfastly maintain the relevance of aesthetic intuitions are seldom met with threats of violence. The current tactic, ridicule, is much more subtle. To avoid such ridicule, environmentalists often revert to arguments that are conventionally acceptable. Evernden writes:

> [T]he most effective means of discrediting them has been to brand them as impractical and emotional--in contrast to their sober, rational critics, of course. The implication has been that there is no real foundation for their claims, or at least none beyond the pathetic minds of the nature-lovers themselves . . . . Given their derogatory image as effete and sentimental fools, it is understandable that environmentalists have pounced on any line of argument that cannot be dismissed as merely subjective (Evernden, 7).

Such ridicule is to be expected when mere intuition confronts a pervasive conceptual scheme fundamentally at odds with it. If intuition is to resist ridicule, it needs to ground itself in something that is not 'merely subjective'. Philosophy provides such a warrant.

One is tempted to seek refuge from the pressure to conform not in the dryness of philosophy but in the immediacy, the vivacious power and emotional intensity of intuition. There is a certain

truth in Wordsworth's words:

> Books! 'tis a dull and endless strife:
> Come, hear the woodland linnet,
> How sweet his music! on my life,
> There's more of wisdom in it
> (The Tables Turned, Lines 9-12)

However, without the painstaking labour of grounding intuition in a rational scheme, any cause based solely upon it is doomed to be labelled as irrational and sentimental. Whitehead provides a comprehensive conceptual scheme which grounds aesthetic intuition in such a way that it is not 'merely subjective'.

Such a scheme must harmonize aesthetic intuitions with valid aspects of the inherited worldview, a worldview within which they seem anomalous. This is the task of metaphysics, a task Whitehead repeatedly asserts to be critical if social change is to occur.

> [P]hilosopic systems with their ambitious aims at full comprehensiveness, are not useless. They are the way in which the human spirit cultivates its deeper intuitions. Such systems give life and motion to detached thoughts. Apart from these efforts at coordination, detached thoughts would flash out in idle moments, illuminate a passing phase of reflection, and would then perish and be forgotten. The scope of an intuition can only be defined by its coordination with other notions of equal generality (AI, 144).

Living requires the cultivation of intuition, a clarifying, a gathering together, a coordinating of the new with what has already been established. Philosophy is this clarifying, gathering and coordinating. Most significant for philosophy are those intuitions which reveal the general structure of reality. Only through such coordination can insights generate practical and social momentum.

> In the end nothing is effective except massively coordinated inheritance. Sporadic spontaneity is composed of flashes

> mutually thwarting each other. Ideas have to be sustained, disentangled, diffused, and coordinated with the background. Finally they pass into exemplification in action (AI, 64).

When profound intuitions are ignored by an entrenched conceptual order it is the role of philosophy to integrate them in such a way that they become culturally meaningful. Theoretical philosophy can provide the conduit for energetic spiritual and social progress.

Whitehead's system, as we have seen in this paper, shows where the clear logical fallacies are found inherent in scientific philosophy and practice. His great knowledge of the internal problems and progressions of mathematics and physics, allowed him the rare ability to criticize science from within. Beyond criticizing science, Whitehead also attempts the grand enterprise of a speculative metaphysical system. By doing so, he provides the environmentalist with a rational scheme that, by adopting the whole of experience as its data, harmonizes scientific and aesthetic perspectives. Environmentalists are provided with both a thorough critique of what they oppose and a rational basis for what they represent.

Through his doctrine of the genetic character of an actual entity, Whitehead provides a philosophical basis for a spiritual and ethical relationship of humankind to nature. All actual entities are self-producing. As we have seen, the doctrine of internal relations -- of prehension directed by the subjective aim towards aesthetic synthesis -- offers a description of living, purposeful, value-laden experience pervading nature. The

subjective aim of an actual entity guides how an actual entity comes into existence. This reinstatement within nature of valuational, purposive action, is critical if inherent worth is to be maintained.

Whitehead's doctrine of internal qualitative 'feeling' (all things are in a sense 'drops of experience') amounts to a philosophic substantiation of intuitions put so beautifully by Wordsworth in poems like Lines Written in Early Spring.

> Through primrose tufts, in that green bower,
> The periwinkle trailed its wreaths;
> And 'tis my faith that every flower
> Enjoys the air it breathes.
>
> The birds around me hopped and played,
> Their thoughts I cannot measure--
> But the least motion which they made,
> It seemed a thrill of pleasure
>
> The budding twigs spread out their fan,
> To catch the breezy air;
> And I must think, do all I can
> That there was pleasure there. (Lines 9-20)

All actual entities have 'self-enjoyment' in the sense that they prehend the environment in light of their own aim toward intensity and harmony.

These two aspects of an actual entity, self-production and internal experience, together constitute Whitehead's definition of 'life'. In his metaphysics all of nature is living. Humans are highly developed, but their experience of value is shared by nature. Certainly there are non-living societies of actual entities, like rocks for example, but anything with unity of experience is living.

The importance of attributing life to nature is fundamental to

an ecological spirituality and ethics. Because we apply ethical considerations to living, purposeful, experiencing entities, Whitehead's philosophy provides us with a unique ethical opportunity. Charles Birch puts it this way:

> Is not our neighbour all that participates in life? If so, the implication for ethics is revolutionary. If the needs of neighbours stretch beyond human need, so does the reach of love (Birch, 73).

For Whitehead everything in nature is essentially a value for itself and others. If it has value for itself, which anything alive must have, then it has inherent value. The deliberate attribution of inherent value to all things requires that humanity be careful in its treatment of the earth. It is not only ours but the property of all things that inhabit it: all things are our neighbours.

In his book Where the Wasteland Ends Theodore Roszak speaks beautifully of the spiritual implications of a reenchanted view of nature. He asserts that **we know** another human is a subject with inherent worth, and then continues:

> But now suppose this ability we have to find something of ourselves in people should be expanded, so that the same personal transaction occurred with animal and plant . . . Suppose that ability began to reach out further still, discovering a reality of inventive pattern and communicable vitality even in what we once regarded as the dense, dead stuff of the world . . . Suppose the whole of creation began to speak to us in the silent language of a deeply submerged kinship . . . Suppose, like the child, the "superstitious" savage, the rhapsodic seer, we even felt urged to reply courteously to this address of the environment and to join in open conversation . . . Suppose . . . instead of reading human characteristics into nature, we realized that nature has read human characteristics into **us** . . . Suppose, in brief, we came to understand in the depths of us what Blake means when he announces

> I'll sing to you to this soft lute, and shew you all alive
> The World, when every particle of dust breathes forth its joy. (Roszak, 162-163)

In Whitehead's philosophy we find the theoretical framework for just such an ethical spirituality.

III. The Environmental Implications of Whitehead's Theology

As we have seen Whitehead is very critical of the traditional conception of God as Divine Tyrant, transcendent from nature, and eminently real. In Sallie McFague's book Models of God, she calls this traditional conception the 'monarchical model'. "In the monarchical model," she writes, "God is distant from the world, relates only to the human world, and controls that world through domination and benevolence" (McFague, 209). The appropriate religious response to nature in this model is to treat it with mere instrumental value. Concern is addressed to pleasing the transcendent king, regardless of or -- more often than not -- at the expense of, worldly allegiances. Hearts and actions are to be directed toward the true reward with God in heaven -- worldly life is to be sacrificed for eternal life. In terms of ethical practice the monarchical model has had the effect of instilling either a militarism which views the apocalyptic demise of this world favourably, or a totally passive trust in God's complete and benevolent control (McFague, 211).

Those religious environmentalists who adopt a modified form of this model, point to the various misinterpreted biblical passages which demand, not a conquering, but a relationship of stewardship

towards nature. This is helpful, since religious activity and worship is married with care for the earth. Nevertheless, the stewardship argument is still prone to the dangers inherent in the monarchial model. It may give no place to the inherent worth of the experiencing entity itself, basing ethical practice simply on the value of pious obedience to God's commandments. Another danger is the transference of value to entities only because God made them. Here God is the sole value. As we shall see, commitment to nature because of the worship of God is one of the most profound implications of Whitehead's philosophy, but viewed alone it is prone to the dangers of misplaced concreteness.

The alternative model which Whitehead puts forth is pan-en-theistic.[11] This doctrine holds that God is in the world, in the sense of experiencing with all entities, but also transcends the world, in that God is one entity. Whitehead's distinction between the primordial or mental pole of God and the consequent or physical aspect, is the key to understanding his pan-en-theistic differentiation between God as separate from the world, and God as immanent in the world. To express the pan-en-theistic view of God, McFague uses the metaphor of the world as 'God's Body'. Our own experience is made up of the many, which are the various organisms and societies which make up our body, and it is one whole, the complete person to which we give a proper name. In Whitehead's metaphysics God's separate unity is found in His primordial nature,

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[11] I am indebted for both my understanding of this term and its application to Whitehead to Charles Hartshorne and William L. Reese's Philosophers Speak of God.

which is the perfect harmonization of eternal objects; the source of valuation. This pole persuades us towards ever higher realizations of value. It influences the world but is isolated and so is not influenced by it. If God were merely primordial, God's deficiency would be analogous to a human mind devoid of sensual experience. But God is not simply primordial. The consequent pole is how God feels the universe, its advances, its tragedies, its satisfactions and its perishings. It is, if you like, God's sensitivity. Just as our sensitivity pervades our body, and our body is the medium of our experience, even so God's sensitivity pervades the universe and is the medium of divine experience. In this sense the universe is God's body.

The implications of this conception of God for religious worship are far reaching. Viewing the world as God's Body entails a radical care for ourselves and the earth. Human life, our modes of thinking, acting, and feeling, are **felt**, by God; they form the content of God's experience. If God's experience arises from the experience of all entities, then it follows that loving God demands care for the experience of other entities. For example, if the experience of a chimpanzee is part of God's experience, then giving it a frustrating life and painful death amounts to creating suffering for God. In Christianity the implications for an environmental theology of the cross are suggestive. The sufferings of nature (as well as of humanity) are vividly symbolized in the evil and tragedy of God's suffering on the cross. Religious worship, within this model, entails the realization of those values

which bring to ourselves and God the most profound deep harmonious experiences.

However, one will not find in Whitehead's philosophy an agenda for equality between what has traditionally been called the higher and lower forms of life. In a sense one can speak of 'higher' and 'lower'. Whitehead believes that the universal process, because of the effect of God, aims toward the production of more complex forms of life, and toward a richer, more intense experience. Humans, then, who have evolved to require the taking of life to preserve their own, have a right to do so. But, says Whitehead, "the robber requires justification" (PR, 125). By this I take Whitehead to mean two things. First, the robber needs to justify his humane treatment of what he kills. Has she/he treated the life form with a respect for its own specific experience. The treatment of animals within the corporate farm structure is an obvious example of where a mechanistic view of animals leaves us. Whiteheadian principles would support a system which allows these animals to fulfil the requirements their instincts put upon them.

Second, the robber needs to justify his/her own approach to life. One's level of spiritual development must justify sustaining one's own life at the expense of the life of other entities. Part of this demand requires a serious understanding of the implications of one's existence, an understanding which provokes reverence, the sense of indebtedness to life, and the profound duty to make our lives worthwhile. It is inherent to Whitehead's theory that a person's responsibility to God and life is to develop harmony and

intensity of experience for as many of nature's creatures as possible.

To Whitehead, reverence for the universe entails reverence for the community of individual actual entities of which God is the most important. Reverence for life and God requires a commitment to attain the highest aesthetic ideals. But there is also the moral requirement that one's ideals be harmonized so as not to hinder the development of other individuals. Evil, says Whitehead is when entities are either at cross purposes or when a higher value is destroyed by its more primitive environment (RM, 94). Though always imperfectly realized, the duty of religious or ethical people is to minimize evil and to maximize the quality of experience of both God and the individual. The way this is accomplished is through the pursuit of beauty.

IV. The Significance of Beauty

With our shrinking globe and expanding knowledge, we have profoundly increased the power and pace of how humans effect, and are effected by, things. This is not, of course, entirely beneficial. It is difficult to predict how our actions will affect things and to promote wise policies. These difficulties are compounded by the lack of a widely held and deeply felt ethic of care in our civilization. Whitehead's concept of beauty conveys the significance of such an ethic for the quality of civilization we enjoy.

The production of a vibrant beauty is for Whitehead the

measure of a civilization (AI, 252-272). Beauty occurs when:

> the whole heightens the feelings for the parts, and the parts heighten the feelings for the whole, and for each other. This is harmony of feeling (AI, 268).

Beauty is harmony between the parts and the whole that sustains them, a harmony that produces intensity of experience for its members. Qualitative gradations in beauty and between types of beauty depend upon the level of massiveness and intensity achieved (AI, 253). Massiveness is the breadth of region which is harmonized. For example, harmony within oneself or one's family is less massive than harmony between nations. Intensity is the qualitative measure of how a whole affects the parts which contact it. As a work of art is a whole that integrates its parts, and so evokes a more intense experience, even so a society is beautiful to the extent that it integrates its members in such a way as to intensify their experience. As intensity keeps the whole from blandness, massiveness mitigates the potential for immorality. Nazi Germany satisfied the demand for intensity, but it failed in respect to massiveness. The level of contrast it produced for non-Aryan members of its own society as well as for other nations vastly outweighed the level of beauty it attained.

Imperfect harmony reflects unintegrated, discordant factors. They are usually felt as evil, either because they seem harmful, or they challenge the adequacy of the achieved harmony. The response is either to adventure into discord with the hope of the expansion of beauty -- the growth of massiveness -- or to conserve what has already been attained. Whitehead's judgement concerning the

alternatives for civilization is obvious.

> No static maintenance of perfection is possible. Advance or Decadence are the only choices offered to mankind. The pure conservative is fighting against the essence of the universe (AI, 274).

> Even perfection will not bear the tedium of indefinite repetition. To sustain a civilization with the intensity of its first ardour requires more than learning. Adventure is essential, namely, the search for new perfections (AI, 258).

An intense, vibrant civilization depends upon continual growth in the breadth of region harmonized.

The great advances in our civilization, many of which have lately been achieved because of science, have led us, sometimes beneficially but often not, into a profound discord with nature. However, we are now faced with a dangerous environmental situation. Our search for various harmonies and intensities of experience has often been bought at the expense of the experience of our neighbours in nature. Any conservative response to our situation promises not mere social decadence, but also ecological decadence on a vast scale. Although obstacles to change vastly outnumber those facing the dilemmas with a spirit of adventure, there can still be heard the growing voices for a conceptual shift towards integrating our achievements with an ethic of care towards nature. As Whitehead remarks,

> We see here the first stage of the introduction of great ideas. They start as speculative suggestions in the minds of a small, gifted group (AI, 15).

Care is an especially important civilizing factor. It is a crucial harmonizing element. The environmental destruction exemplifies the need for an adventure in broadening our region of care. Beauty

flourishes when evil is overcome with a more expansive harmony. A progressive society must broaden its artistic, conceptual, emotive, and scientific order outward in the spirit of adventure. In such a way we may yet heal the evils we are inflicting on nature and ourselves.

V. Conclusion

Those environmentalists who realize that a shift in our conceptual scheme is necessary to abate serious ecological and spiritual difficulties are certainly correct. Thomas Berry writes of the need for a new spirituality:

> We need a spirituality that emerges out of a reality deeper than ourselves, even deeper than life, a spirituality that is as deep as the earth process itself, a spirituality born out of the solar system and even out of the heavens beyond the solar system (Birch, 155).

It is not realistic to hope that such a profound change in how we think and act can occur without philosophical substantiation. The culture of rationality is too strong and has proved itself too useful to be overcome by mere intuition. Nevertheless, the validity of those intuitions must be maintained if our civilization and the earth are to survive.

In Whitehead's thought we find an important philosophical adventure into regions of human experience disastrously ignored by our prevalent worldview. It offers a rational framework for an ecological ethics based on the inherent value of nature. It also persuasively argues that care for the earth constitutes a critically important religious and civilizing advance. A

Whiteheadian spirituality recognizes not only the inescapably interpersonal and social dimension of our individual lives but also that in life there is a communion with the earth, a communion with God, and a communion with God through the earth.

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