Biography

RALPH WENDELL BURHOE: HIS LIFE AND HIS THOUGHT

IV. Burhoe's Theological Program

by David R. Breed

Abstract. The fourth installment from the author's book-length study of Ralph Wendell Burhoe's life and thought sets forth the substance of his intellectual theological program. Constructed with the intention of laying the foundation for behavior that conforms to the requirements for survival as laid down by the reality system of which we are part, it also aims to provide motivation for such behavior. The heart of the program is formed by concepts of God and soul. The concept of God grounds an understanding of a reality system upon which we are dependent and to which we must conform whereas the concept of soul gives assurance that our behavior does make a difference and that our contributions to the reality system possess an everlasting quality.

Keywoods: Burhoe; God; immortality; metaphysics of physics; natural selection; revelation; soul.

In the fall of 1964, along with the other Meadville faculty members, Burhoe was given the challenge of writing a "theological autobiography," and on 6 November 1964 he presented his paper to a faculty seminar. After tracing his development through the events that led to his joining the Meadville faculty, he wrote: "I bring with me to my professing of theology at Meadville a theology. It is not, however, a traditional theology; although I think it deals with traditional problems of theology. Moreover, it is not a finished, final, or

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fixed theology, although it attempts to deal with some final and ultimate questions'' (Burhoe 1964d, 13–14). In making this statement, Burhoe probably felt some need to justify his selection as professor of theology and the sciences and director of the theological component of the New Design. Indeed, it is remarkable that Meadville should have selected an individual who had no formal academic degrees (let alone a formal theological education), who had worked as a meteorologist and an executive officer for a secular academy of scholars. Nevertheless, Burhoe was recognized as having the vision for developing a theological research program in the light of contemporary knowledge, as well as the gifts and talents to carry out this new effort.

Burhoe had outlined the shape of this vision in his 1959 essay ''Salvation in the Twentieth Century'' (see Breed 1990). There he sketched a scientific approach to religion that would lead to the formulation of a validated and salvific doctrine—a scientific theology. That essay was a summary of the the programmatic thrust of the vision that had evolved out of his work with the American Academy and especially its Committee on Science and Values. It was in the spirit of that vision, as well as his work with the Commission on Theology and the Frontiers of Learning, that Burhoe guided the founding and development of the Institute on Religion in an Age of Science (see Breed 1991). The report of the commission conveyed the essence of his vision for a theological research program and recommended the institution of such a program, whereupon Meadville included this program in its New Design and selected Burhoe to guide its development. The possibility of developing his scientific approach to religion in the training of persons for the liberal ministry provided the opportunity and challenge to develop and elaborate the theological dimension of this thought. An examination of his work in giving shape to the theology and science program at Meadville brings into focus his theological program for developing a scientific theology—the theology he brought to Meadville.

BURHOE'S INTENTION

In general, there are two approaches to the relationship of theology and contemporary thought. The first approach liberalizes traditional Christian symbols and doctrines by adding relevant scientific knowledge to their contents (see, for example, Peacocke 1979). The Christian theological tradition provides the norms and organizing vision for interpreting the contemporary intellectual environment. In the other approach, exemplified by Burhoe, new symbols and doctrines are fashioned from contemporary thought, and the traditional

symbols and doctrines are related to or translated into them. Some philosophical position is usually adopted as the regulative norm and heuristic guide. For process theologians this is Whitehead's philosophy of organism. For Burhoe it is the positivism of such thinkers as Richard von Mises, Philipp Frank, and P.W. Bridgman, extended by an evolutionary worldview.

Burhoe says his theology is not traditional, even though it deals with traditional problems of theology. Because he intends to integrate science with traditional religious wisdom, the question of how the religious tradition functions in his theological program concerns us. Burhoe clearly identified himself as rooted in the Judeo-Christian tradition: "I have just presented an outline of a small part of the new breakthroughs in scientific understanding and appreciation of the wisdom of ancient and modern religion. And, like Saint Paul speaking to both Greeks and Jews, I, speaking to scientifically informed secularists and to traditional believers, appreciate both and at the same time seek to show that the views of each need to be brought together to yield a larger truth for the more effective communication to all mankind of God's sovereignty, love, and way of salvation" (Burhoe [1977] 1981, 22). However, he does not accord that tradition any special normative status:

> I am convinced that the scientific methods of revealing the truth about man and the source of his being or destiny are far richer than any past programs of revelation for advancing the truth or power of life. And I find already accumulated in the several branches of the sciences a wealth of ready made revelation relevant for theology, for man's understanding of his ultimate concerns. The book of nature, or the bible of nature, as some earlier theologians called it, may add to the Judeo-Christian book or bible in revealing the glory of God (Burhoe 1964d, 22).

For the most part, Burhoe draws upon the ideas of the Judeo-Christian tradition, although he wishes not to exclude other religious traditions.

Burhoe believes that both science and religion have been selected by the same nature, system of reality, or God. Since he holds to an equivalence between the revelations of religions and the revelations of the sciences, scientific pictures of reality can illumine and lend credibility to traditional religious beliefs. The sciences are used in a religious mode to unveil what the ultimate system of powers requires. They demonstrate the validity of its evolved wisdom for human survival, and what they come up with should not conflict with what the religions themselves have revealed. Rather, the sciences will fulfill and enlarge the wisdom previously selected and embodied in the religious traditions.[1]

Burhoe says his theology is not finished, final, or fixed, although it attempts to deal with some final and ultimate questions. Because scientific knowledge of the unseen realities and processes upon which life depends is continuously growing and developing, a theology based on this knowledge would also develop and grow, and, in this sense, would never be finished, final, or fixed. As such, Burhoe's theology should be characterized by an openness to the growing body of scientifically established knowledge. However, Burhoe's theological vision and criterion of life select the most promising scientific knowledge for its relevance in meeting religious needs and solving religious problems. From this perspective, Burhoe's theology can be understood as a research program that will lead to a scientifically informed religion for which a scientific theology provides the theoretical dimension, giving direction to the continued development of the program.[2]

This chapter will examine Burhoe's conception of his program in depth, focusing on his methodology for developing a scientific approach to religion and a scientific theology. Burhoe's theological program is a significant contribution toward defining the nature of the discipline of theology and science or religion and science. The following discussion will show how the areas that Burhoe proposed for investigation, and that appeared in his proposals for a curriculum, relate to the program as a whole.

Human Salvation and the Task of a Scientific Theology

Burhoe's theological program aims to restore the credibility of religion so as to make it socially effective and personally motivating in an age of science. Religion is essential for a viable human society because it informs society about the central values necessary for human life. Its wisdom needs to be translated into a modern idiom saturated with scientific concepts and pictures of reality. When this translation is properly made in terms of validated scientific concepts and theories, not only will the wisdom of traditional religion be validated but the scientific discoveries of reality will be valorized as revelatory of the ultimate realities upon which life depends.[3] Although Burhoe is compelled to justify to the theological community his conviction that scientific understanding is the best way toward a revitalization of religion, his primary concern is to provide recommendations, direction, and motivation for human welfare in our contemporary scientific age. Thus the starting point of Burhoe's program is to recast the problem of salvation in the context of the

contemporary age of science and technology. His root concern is to reconceptualize the human situation as immersed in a rapidly changing environment, largely brought about by the power of scientific knowledge to revise, elaborate, and create new technologies. Because scientific inquiry and the technological arts have become separated from religious thought and practice, a new cultural environment has developed in which religion is merely tolerated as a relic of the past or as serving the needs of those less sophisticated; it has little real significance in the mainstream of human activity.

Some might contest the claim that the Judeo-Christian religion has lost its power in the West to science, in light of the rise of such movements as pietism in Germany or the Great Awakening in America in the eighteenth century. These movements represent an interiorization of religion within the individual. While religion may continue to be an important dimension of the spiritual life of human individuals, the interiorization or subjectivization of religion has diminished its power and effectiveness in the public realm. In fact, Burhoe observed, "The ultimate danger of . . . technological power is . . . subtle and difficult to do anything about. It threatens man's very central sense of his worth, value, meaning, purpose, direction, and will to live" (Burhoe [1964] 1966a, 125–26).

Even more subtle and threatening is the "disillusionment with the traditional formulations of religious, moral, and other value-motivating belief" that has been wrought in the new intellectual environment dominated by the sciences. Without careful attention to those ultimate values embodied in traditional religions, the "ships" of human life are in serious danger of losing their rudders and keels, and without this guidance and motivation humanity will run aground, joining other extinct species on the barrier reefs of life.

A lecture to the faculty of St. Louis University provides an example of the way Burhoe portrays the general shape of his program for dealing with this problem of salvation. "The Sciences, Humanities, and Religion—Can the Three Cultures Be Reunited?" was the keynote lecture at the President's Annual Faculty Conference in September 1964. It addressed the question of the pathway to salvation in the current fragmentation crisis in our culture: "My message to you is that the traditional curriculum content of liberal education is fast becoming obsolete for life in a new age of science. The crisis is the fragmentation of our culture into two or three or more parts and a breakdown of the organic unity of our intellectual apparatus which threatens the very life of our civilization" (Burhoe 1964c, 1). Religion has been eroded by secular challenges to religious belief,

and the humanities or interpretive arts have succumbed to the same fate. "Basically, the interpretive arts are an interpretive arm of religious values, and when faith in these values fail, then the arts fall into a cry of chaos and despair" (Burhoe 1964c, 6). Because the sciences have become isolated from traditional religious concepts and images, they tend to undermine values and morality. Appealing to Arnold Toynbee and Clyde Kluckhohn, Burhoe affirmed, "No society or civilization, primitive or sophisticated, can long endure without a culture built around and integrated with a religious or value-transmitting core. If we apply this to our own society, . . . we can only conclude that our civilization is falling apart and doomed unless there is a renovation of its religious core" (Burhoe 1964c, 11).

How is this renovation to be brought about? "My proposal is that Christian scholars should be today as enterprising and flexible as the early Christian fathers, that they should become acquainted with the new 'philosophy' or worldview of the sciences, and interpret their message in its terms" (Burhoe 1964c, 14). Citing the Academy Committee on Science and Values and the work of IRAS as a promising beginning, he concluded with an appeal: "If you can feel the deep intellectual integrity and the emotional and motivational power behind such doctrines of the ground of being and man's duties and opportunities drawn from the sciences that I feel, and if you can see how closely these notions resemble some of the basic notions of the Judeo-Christian tradition, then you may wish to join with me in seeking to develop a new kind of natural theology based on the contemporary sciences" (Burhoe 1964c, 18–19). A theology integrated with the sciences can serve as the core of liberal education, because this theology would deal with the primary or ultimate values which promote life.

Toynbee's Gifford lectures, to which Burhoe frequently refers and upon whose insights he builds, paint a panoramic picture of the dynamics of religion in human history (Toynbee 1956). Of particular interest is Toynbee's perspective on the secularization of current Western Christendom and its effect on the spiritual crisis. In the aftermath of the breakdown of the ecumenical Western Christian Church, spiritual allegiance was transferred to parochial secular states. Since the seventeenth century, Toynbee notes, there has been a psychological substitute of the pursuit of technology for the passions of religious fanaticism, which introduced a spiritual crisis in the midst of a burgeoning technical mastery of the mysteries of nature as religion was replaced with technology.

Where the missionaries of Western Christianity failed (for any

number of reasons) to make converts in non-Western lands, the technology of the West succeeded, particularly as non-Westerners sought its new military techniques out of interest in self-defense. But with the new technology they were forced into new life-styles reflective of the West, and with them inherited the spiritual malaise endemic to the West. With the advent of the technical mastery of atomic power and the specter of worldwide destruction as a consequence of a single abuse of this technology, the spiritual malaise exploded into crisis proportions. Further, Toynbee hypothesized that a revulsion against science and technology might develop in the later decades of the twentieth century, comparable to the revulsion against religion in the later decades of the seventeenth century.

Toynbee's work brings to light some of the background of Burhoe's argument that humanity is besieged by a spiritual crisis precipitated by the fruits of that science and technology which have so radically changed the contours of the human landscape over the last three hundred years. Humanity needs to be saved from this new environment, with its threat to the religious yearning and sensitivities of the human spirit and, indeed, to human life. Humanity needs to retrieve and refashion its spiritual resources and treasures, entrapped in premodern traditional religious forms, in order to meet the new challenges to human life. For Burhoe, this religious revitalization is to be brought about through development of a new kind of natural theology based on the contemporary sciences. Burhoe takes the avenue Toynbee sees as more spiritually promising—the scientific study of human affairs, to illumine the role of religion in human evolution and show the validity of traditional religious wisdom.

Burhoe takes his models from evolutionary biology and applies insights from anthropology and psychology to establish the fact that religions are essential artifacts, which select, preserve, and transmit the core values in human cultural evolution. By scientifically studying religion in the context of human evolution, one can produce knowledge of those values essential for human life. A scientific theology is the theoretical formulation of those values. Theological concepts, then, receive their credibility insofar as they can be functionally related to the evolutionary process. Pursued in this fashion, theology may again become an arena for public discourse, rather than a factious enterprise concerned with parochial matters. Theology would then be dealing with public facts, whether being held accountable to the forms produced in the past by the evolutionary process or tested by its present applicability in the practices of the living religions.

The rise of Fundamentalist and conservative religious movements, especially in America, can be interpreted as responses to the loss of the effectiveness of religious values in shaping culture by retreating to traditional forms of religious expression. The interiorization of religion and its continuing effectiveness in the spiritual life of human persons does not count against Burhoe's argument, but it does raise the question whether an interpretation of religion in objective scientific terms is alone sufficient to bring about a revitalization of religion.

From a Hegelian perspective, the interiorization of religion is the dialectical counterpart to the contemplation of the universe. Turning their spiritual quest toward the heavens in a renewed contemplation of nature, natural philosophers sought to exercise their religious faith unhampered by religious fanaticism. They sought the trustworthiness of the Creator in the lawful regularities of natural phenomena, where the Creator's intentions and revelation could be found unmixed with self-centered human concerns for power and domination. They centered their spiritual quest on the radical Other —nonhuman nature. This spiritual investment in the Other, in the extreme form of Deism, reduced the human to insignificance in a deterministic, mechanical conception of the universe, and the Creator to temporal irrelevance as the utterly transcendent architect of the great world machine and its initial impetus into motion.

A romantic reaction swung 'round to pursue the spiritual quest in the radical interior of the human—the self. This radical shift in focus in the face of the threat of human insignificance in the universe, led, in the extreme of existentialism, to the denial of meaningfulness in the phenomenal external world, reducing the world to absurdity. The human self was the sole locus of order in the existential decision to live in the face of an absurd nature. The romantic reaction also brought with it the desire to reconsider human nature which blossomed into the differentiation and development of the biological and human sciences. It gave birth, in the nineteenth century, to a historical consciousness and a sensitivity to the ongoing developmental processes in human as well as nonhuman nature. With the advent of a cosmic historical consciousness, the timeworn conception of the universe as machine began to be disassembled, and the universe is becoming again an inspiring source of wonder and mystery (see Collingwood 1945).

With the rebirth of scientific cosmologies concerned with understanding the universe as a whole and constructing a theoretical conception of its history, another pathway is opening up to begin, at least intellectually, to relate God, self, and nature. A return to cosmology

via the sciences is an antidote to an overly anthropocentric Christian theology and an opportunity to recover the relation of redemption to the creation as a whole (see Tracy and Lash 1985, esp. 87–91). It may allow theologians to take their place once again in the world of concrete experience, and scientists to take up again the dialogue with philosophers and theologians in order to ascertain the proper relations among the inhabitants of our cosmic home (Toulmin 1982, 16, 272). Perhaps a reconstruction of the evolutionary history of the universe and a comprehension of the processes which are involved in its ongoing development will begin to give humans a proper perspective of the whole as an interrelated cosmic drama in which humanity has an important part to play, but certainly not the most significant role.

The recovery of our cosmic heritage and the role of humanity in an evolutionary cosmos through an integration of the sciences and religion is the primary task to which Burhoe sees that theologians and scientists must address themselves if the spiritual crisis is to be resolved with a clearer understanding of the ultimate values and purposes which will sustain and continue human life.

The Datum of Life and the Object of Theology

For Burhoe, life is the central category in his theological program, and religion is that institution of culture that provides the most all-embracing and fundamental integration of ideas and attitudes that move humans to behavior that makes life possible. It is because of its life-giving function that religion needs to be reformed and revitalized in the light of the sciences. This is the background for Burhoe's conviction that human survival (salvation) depends upon restoration of the credibility and efficacy of religion through integration with the knowledge and worldview of the sciences.

Theological reflection is devoted to enhancing the life-giving function of religion and to providing life-giving solutions to religious problems. It does this by focusing on the reality sacred for life—its source, sustenance, and requirements for survival. A passage from his theological-autobiographical paper illustrates this point:

> In our theological enterprise, then, I think we ought to follow the lead of such men as Tillich and push far beyond them, in focusing our attention on that which in reality is of ultimate human concern, what is in fact the reality sacred for life, what it is which in fact determines human destiny, what may be the ideas and consequent practices which in fact are required to save man from degeneration, death, and despair and lead him to higher levels of purpose, hope, and fulfillment of life. In addressing ourselves to the deeper or more

abstract formulations of religious questions in a meta language, we can forget for the moment the seeming conflicts and confusions between such symbolic or conceptual systems as Christianity, Hinduism, Stoicism, Deism, Humanism, Communism, Freudianism, Existentialism, Hedonism, or Evolutionism; and begin to ask what are the real sources of the well-being of human life, its sustenance, and its salvation in an ideological framework which stands above but also includes any or all of these historic formulations (Burhoe 1964c, 15-16).

The best resource for constructing this ideological framework is the scientific evolutionary worldview and those scientifically validated theories and concepts which provide knowledge about life. The reality sacred for life, which is the object of theology and the same objective reality investigated by the sciences, selects, organizes, and validates this knowledge about life.

Burhoe's wager is that scientific knowledge of the essential nature of life will provide the best resource for guidance to full participation in life in its almost overwhelming complexity. In this wager he casts his lot with those persons who throughout human history have sought guidance for life through mystical or intellectual contemplation of nature. In the fall of 1963, at the end of his paper "New Knowledge on the Nature of Moral and Mystical Experience," he juxtaposed two quotes, one from Darwin and the other from Meister Eckhart:

The ultimate selector and imprimatur for mystical experience and the resulting moral behavior patterns is the objective reality in which man lives and moves and has his being, reality which is truly his lord and master. All that I have been saying was said a little over a hundred years ago by Charles Darwin in one sentence: "It may be said that natural selection is daily and hourly scrutinizing, throughout the world, every variation, even the slightest; rejecting that which is bad, preserving and adding up all that is good; silently and insensibly working, whenever and wherever opportunity offers, at the improvement of each organic being in relation to its organic and inorganic conditions of life."

It is interesting to note how closely Darwin's statement parallels that of the father of German mysticism, Meister Eckhart: "Know that, by nature, every creature seeks to become like God. Nature's intent is neither food nor drink nor clothing nor comfort, nor anything else in which God is left out. Whether you like it or not, secretly nature seeks, hunts, tries to ferret out the track on which God may be found" (Burhoe 1963, 24-25).

Writing about the many persons with whom he was associated at the American Academy, who shared an interest in contemporary human problems, he remarked:

Some of these men were more active in practical actions to save the world than in theoretical problems of human salvation. We worked on atoms for peace, on abolition of atomic war. But the men who were concerned with the theoretical problems of the relation of science and ethics, the problems of motivating right

behavior, and the relation between various realms of knowledge and the unity of knowledge interested me most. . . . The discussions with these groups of scientists more than the church became for me the center of what I call my religious and theological life (Burhoe 1965, G-8).

The knowledge of nature (the reality which sets the requirements for and selects life), which has become formulated theoretically in the sciences, needs to be integrated with traditional theological symbols and concepts in order to give them credibility so they can serve as renewed beacons or guidance for human life.

The essence of life cannot be understood on the basis of any particular manifestation of life, whether it be a biological organism, an individual human life, or a human culture. While these particular manifestations mediate an understanding of life, the kind of understanding Burhoe seeks to communicate is one which is applicable to the whole of life. Burhoe is intent on getting beyond these transient actualities to the source, destiny, and requirements for life itself. It is the whole evolutionary history of living organisms, including their phylogenetic history, which reveals their relative success in adapting to their environments, which is the context for theorizing about the nature of life. He is ultimately concerned with presenting a picture of life in its wholeness (and the knowledge contained in and derivable from this picture) and what it means to participate fully in life. At the beginning of his autobiographical paper he presents the following image:

I am now compelled to envisage my own development, including my theology, as a complex but continuous process reaching back in time not through just a few thousand years, but through at least a thousand thousand thousand, and in space not only to cover the terrestrial ball but into the far reaches of the cosmos whose history and reality [are] inseparable from mine and in whose cosmic program of advancing life this more immediately observable entity labeled with my name is in reality a superficial phenomenon or transient phenotype of a real self which one can contemplate from modern science as well as ancient mysticism as ultimately indistinguishable from the infinite whole or one (Burhoe 1964d, 1).

This image makes it clear that although life is the datum, the object of Burhoe's theology is the infinite whole, or one, out of which all living organisms have their source and destiny as part of the cosmic program of advancing life. In addition, one must seek to apprehend the one whose primal requirements for life must be internalized as the formative values that make life possible.

Burhoe is committed to the project of providing an understanding of life from its source in cosmic reality, through the embodied instructions for life in the genetic material and in cultural artifacts,

to life's phenotypic expression in a human individual. For this project evolutionary theory and the sciences, especially the human sciences, are critically important because they disclose the ever more intricate details of the processes of life, thereby revealing the conditions and requirements for life. Understanding the evolutionary thread of life is essential.

One might be tempted to say that this is only a scientific project, but Burhoe's primary aim is theological; the scientific character of the project supports the overarching goal: to relate all life to God as its source and destiny. To accomplish this goal, one must have a suitable picture, and the evolutionary worldview fills in the picture of the life to which God is related. Burhoe sees this as his own creative extension of the positivist program to which he owes a great deal, due to its influence on him (Burhoe 1966c).

Before proceeding to show the way in which Burhoe relates God to life and the methodological proposals (and their problems) arising from that endeavor, I must first discuss the picture of life that informs Burhoe's theological program. He writes:

> I would summarize this revelation of the sciences as saying that life is a system of order maintained in an environment that ordinarily decreases order and that the primary direction, goal, or value of life, which was established by the natural selection that is an inherent characteristic of the general environment, is to continue that order or, in the history of evolutionary development, to increase that order. . . . One could say that life was created by, and its primary goal or value is forever established by, the nature of the cosmos. . . . It is the task of all evolving systems of life to explore further routes to this primary goal as challenged by the ever changing circumstances set forth by the environment. . . .
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> . . . A wide scientific community seems to see this negentropic or order-building goal as the primary good or value of life, running as a common thread from the primitive organic chemicals to the highest religions (Burhoe 1967, 78–80).

Burhoe continues this description of the "common thread" of life through five steps of "man's history of learning to know right from wrong and good from evil": genotypic knowledge, the brain's knowledge, culturally transmitted knowledge, rational knowledge, and scientific knowledge.

Another point needs to be emphasized. Burhoe's picture of life is a creative construction painted from the vast conceptual resources of the sciences. Furthermore, it is a creative construction oriented to the service of his theological project.

> . . . If we love humanity and if we stand in awe and love before the majesty and wonder of the handiwork and purpose of the creator of life on earth, we must commit ourselves assiduously to the labors of abstracting the religiously relevant and necessary truths inherent, but not necessarily manifest, in the

revelations of the sciences. As one of our spiritual ancestors, Ralph Waldo Emerson, has said, we need not at first be concerned with writing the songs but with elaborating the vital truth; as soon as they see it the poets and musicians will provide the corresponding songs for more widespread communication (Burhoe 1964d, 24).

As this passage points out, the picture of life Burhoe constructs is an abstraction of the religiously relevant truth from the resources of the sciences. This does not mean, however, that Burhoe is launching into poetry or metaphysical speculation. Seeking to avoid the charges leveled against such endeavors as Teilhard's, he intends to remain within the arena of scientific discourse and its refining fire for winnowing out the truth.

Conceived in this spirit of openness to the sciences without sacrificing the integrity of the theological task, Burhoe's program opens the door to seeing the vital relationship and mutuality of a wide range of researchers. Scientists have an essential role in the project, because they are involved in producing knowledge which is potentially of high relevance for developing a unified picture of life, and also because they are needed to contribute to the testing of the hypotheses generated to construct such a unified picture. Theologians have an essential role in discerning the religious and theological relevance of particular pieces of scientific knowledge for understanding the relationship of life, elaborated scientifically, to God, the source and creator of life, by drawing on the vast resources of religious and theological traditions. Finally, there is the essential role of the scientific theologian (or the theological scientist) who labors creatively to construct a scientific picture of life in relation to God, venturing proposals to be tested for their validity and spiritual efficacy by scientists and theologians, as well as by all humans seeking to embody the religious life in the contemporary age.

Since there is no single text that presents the picture of life in its entirety, Burhoe ranks as a creative theoretical scientist (or, more traditionally, a natural philosopher) who seeks to unify disparate scientific knowledge into a general conception of the process of life. In this he is continuing the project of the unified sciences, which is part of the formative legacy of ideas Burhoe imbibed under the tutelage of Philipp Frank.

Since Burhoe's picture of life is an assumption, as well as a result of his research, it is most difficult to get hold of. It is only from bits and pieces, located in the course of his arguments on various topics, that this picture of life can be given the differentiated specificity that I have described. Nonetheless, it is because his picture of life so permeates his thought as a given totality that life can be considered to

be the primary datum of Burhoe's theological program. His criterion for judging whether a scientific resource is religiously or theologically relevant is whether it illumines the datum of life. Such scientific ideas as quantum theory, relativity theory, astrophysical theories of the Big Bang, and evolution of the physical universe have not warranted significant attention in Burhoe's thought because, in his judgment, they are too remotely related to an understanding of life.[4]

The Idea of God and the Metaphysics of Physics

Our interpretation of the way in which the idea of God, the object of theology, is the regulative and organizing principle in Burhoe's program begins with a discussion of his lectures on the "Metaphysics of Physics." These lectures, given in January 1964, during his consideration as the person to guide the theology and science component of the New Design at Meadville, were an extension of Burhoe's Meadville lectures of 1961 (see Breed 1991). They dealt with the theological agenda of Burhoe's vision, which he had outlined at the end of his "Salvation in the 20th Century."

In the first of three lectures he outlined the metaphysical basis of his program in three propositions about how the God concept is related to the new form and character being given to traditional metaphysics by contemporary physics. In the second and third lectures he discussed two additional propositions by adding to physics those implications for metaphysics stemming from biology, especially evolutionary theory. These five propositions are the core of his theological program, and we will look at their detail to see how they generated specific problem areas, to be explored, elaborated, and solved.

The selection of these propositions was based on his faith in God, for in the conclusion he says, "I truly worship this majestic cosmic reality or god. . . . For me god is not dead, but terribly and wonderfully real" (Burhoe 1964d, 724). This theocentric perspective is also at the heart of his criteria for selecting the propositions:

> The theological topics I propose to take up are not necessarily related in any one-to-one way with topics in traditional theology. I have picked them rather (1) because they seem to me to be particularly important for salvation today, and (2) because I happen to have seen a way of making good sense of them in terms of the contemporary sciences (Burhoe 1964a, 8).

The first of these criteria may be called the *criterion of religious* (or *theological*) *relevance,* and the second the *criterion of scientific connectability* (which has to do with establishing the validity of religious or

theological ideas by connecting them to validated scientific concepts and ideas).[5]

THE CONCEPT OF METAPHYSICS

A metaphysics of physics is the ground for constructing the connection between science and religion. However, Burhoe is aware of the fact that, in the criticism of logical positivism, metaphysics is often understood to be unscientific. "Today, the worlds of science and scholarship hardly recognize the term *metaphysics,* and if they do it is a bad word, to be avoided." Even though Burhoe understands and intends metaphysics to be the primary bridge-building material, because of his belief in this misunderstanding of metaphysics, he either distances himself in his writing from metaphysics or avoids the term altogether. In the lectures considered here, given largely to a private and theological audience, he directly discusses how metaphysics can be the primary material for the bridge. His intention is to revise traditional metaphysics in terms of contemporary physical concepts. In this way metaphysics could be given a new credibility, because by doing metaphysics in terms of the concepts and practices of physics, the logical-positivist objection that metaphysical statements are not empirically testable would be overcome.

Rather than reject the function of traditional metaphysics, Burhoe pursued the question "what it was that metaphysics really intended to study," and for this he turned to Aristotle.

> Following Aristotle, metaphysics was the First Philosophy or Theology, and was concerned with such things as were denoted by the terms *ontology,* meaning the real or ultimate nature of the reality underlying that which is experienced or observed; *cosmology,* meaning the ultimate order, causal connections, or processes explaining the events experienced or observed; and *theology,* meaning the prime mover or ultimate cause of the events we experience. It is only natural to suppose that any investigation of the ultimate or most general characteristics of the real natures and causes of things should lead to conceiving entities which are not directly sensible, and hence that metaphysics should come to denote the science of the supersensible, the invisible, or supernatural world. Since the time of Descartes, the term *metaphysics* also became increasingly involved with the problem of how we know, *epistemology* [emphasis added].

Physics, as extended to include the whole range of the natural sciences, "has revolutionized our notions of ontology, cosmology, and epistemology."

Because physics is the new metaphysics, revolutionizing and restoring credibility to ontology, cosmology, and epistemology, this new metaphysics can also revolutionize and restore credibility to theology:

In the term *physics,* I mean our concept of all nature as we may know it from all disciplines, and not just a narrow band of disciplines, such as geometry, kinetics, and mechanics. It includes most of what today is called *science,* which is a set of conceptual systems largely interlocking with physics, including biophysics and psychophysics.

Physics, then, extended to include the natural sciences, can serve to restore credibility by providing the connectability between the world of the senses and the world of unseen and hidden realities, lacking in traditional metaphysics (Burhoe 1964a, 3–7).

A quote from a memorandum on "Theology and the Sciences at Meadville" will help illustrate this point.

The task of integrating the sciences with religion is very complex and delicate and involves many areas of the sciences and many aspects of life and man's understanding of the nature of life. Most religions, cultures, and scientific systems have evolved to complexly integrated structures without people being very conscious of what is going on. . . .

This complexity, and the need for an integrated (internally self-consistent map or view of the way things are, the scientific equivalent of "metaphysics") worldview, if one is to be able to use the conceptual system with any reliability or effectiveness, means that a person is either required to understand or, if not fully to understand, then at least to accept some coherent conceptual system of the world and man on faith in the scientific community the way people accept some scientific conceptual system about atomic energy or moon flights. . . .

Therefore, a first requisite for a scientifically based theology is a new "metaphysics" that conforms to some coherent scientific worldview of the way things are, including man, his world, and the history or the dynamics in time of that system. Only when built upon such a "metaphysics" can one say that one has a scientific doctrine of human salvation, a scientifically informed theology. This "metaphysics" must include . . . the realm of values as well as the realm of facts (Burhoe 1969, 11–12).

For Aristotle, science concerned that knowledge which could be proved by demonstration, reasoning from wide generalities or common beliefs to particular results, according to the rules of deductive logic. Wisdom, or philosophy, concerned itself with the discernment of the proper starting points for demonstration using the method of dialectics. His *Metaphysics* dealt with wisdom, or knowledge of the most general principles and causes of things, which he called the *science of substance* or *being as such.* In a passage on the relation of the three theoretical sciences (physics, mathematics, and theology), Aristotle argued that theology is the "first" science because it deals with the highest genus of being (that which is immovable and separate). He then posed the question whether theology is universal or deals with one genus or kind of being. "We answer that if there is no substance other than those which are formed by nature, natural science will be the first science; but if there is an immov-

able substance, the science of this must be prior and must be first philosophy, and universal in this way, because it is first" (Aristotle *Metaphysics* vi.1.1026^{b}25).

With the revolutions in physical conceptuality in the beginning of the twentieth century, informed by the integration of physical knowledge in the nineteenth, the Aristotelian idea of substance, essence, or the being of a thing was transformed into the conceiving of things in terms of invariant physical constants and laws of proportional relations. The slow process of thought from the Copernican revolution (a moving earth), through Newton (everything moving in an absolute space), to Einstein (the elimination of any absolute frame of reference) has shattered the belief in an immovable first substance. Recent cosmology has likewise shattered the belief that this first substance can be thought to be separate from the cosmos, let alone considered to be a substance at all. "Evaporation" of the immovable and separate substance conceptually removed theology from consideration as one of the theoretical sciences, contrary to Aristotle's reasoning. By the beginning of the twentieth century mathematical physics had become the epitome of scientific method and the yardstick against which to measure the other sciences. The three theoretical sciences of Aristotle were collapsed into one, integrating physics and mathematics and eliminating theology. In this sense, mathematical physics has succeeded theology as the "first philosophy" and assumed the role of a new metaphysics. Under the positivist interpretation, a philosophy based on this physics will progressively isolate "an ever more comprehensive realm of thought that is kept free from metaphysics, and in which *connectible* descriptions of the phenomena vital to man are sought" (Mises 1951, 362).

By saying that physics has produced a new metaphysics upon which to base theology, Burhoe can be and has been interpreted as reducing theology to physics. This criticism is partially justified and certainly points out the dangers of such an approach; however, on at least two grounds this criticism misses the mark. First, the metaphysics (scientific myth or scientific worldview) upon which Burhoe builds is more concerned with the biological sciences and evolutionary theory than with mathematical physics (which he assumes in general but does not elaborate). Second, Burhoe engages in metaphysical thought with the intention to connect (in the positivistic sense of the term) God and the world, subjectivity and objective reality, and the facts of experience and the values that promote life.

One would better criticize Burhoe for not paying enough attention to the structure of the bridge. By this I mean that Burhoe does not

give enough attention to critical reflection on the mode of rationality he has adopted for its construction, namely, that of later positivism. This may be excused, however, for one may become paralyzed by being too self-conscious in the act of building. Burhoe does not ground his concepts in discussions of philosophy.[6] Rather, he builds from assumed general concepts in a positivistically interpreted science, selecting those beliefs of scientists most worthy of speculation and most relevant to the religious problems of salvation.

Burhoe's intention is to be scientific in his method, and this means building theology out of the theoretical material of physics and biology, much as physical and biological theory are built out of hypotheses generated from and tested by empirical data. On this analogy, Burhoe's procedure is a scientific dialectic of theology with the theories and models of sciences and *not* the philosophy of the sciences, as the sciences are in a dialectic of theories with the data of experience, observation, experiments, and measurements. His procedure is to abstract credible and testable general concepts from the sciences that can be related to traditional theological concepts and to translate (or operationalize) theological concepts in terms of the abstracted scientific concepts. This puts his theological concepts at risk, because they are dependent upon the theories of the sciences, and because theories of science are open to change, theology is opened to revision. To establish the credibility of theology in relation to the sciences on this procedure is to establish the connectability of its concepts to scientific theories and models which are in principle connectable to empirical experience. Thus a theology built on and tested by physical theory is in principle connected to empirical experience and hence scientific—and, of course, vulnerable to the changing theories of the sciences.

The value of this kind of approach is that it provides an interdependence of theology and the sciences, as well as a means by which theological constructions can be tested, corrected, and grow with the sciences. There is the danger that if, for the sake of credibility, theological construction is restricted to this procedure, other methodologies may be dismissed as having little relevance or credibility for showing the relation of human experience to its sacred source, let alone exercising a critical function in theological construction. Burhoe has been criticized for not giving sufficient attention to the aesthetic and the demonic dimensions, as well as history.[7] He claims, however, to have done so. Although he has explained aesthetics, the demonic, and history in terms of natural selection, physical principles, and the neurophysiological operation of the brain, alternative approaches have not been critically assessed,

except to say in general that they are beholden to a prescientific worldview. By not critically engaging alternative forms of thought, Burhoe's program not only loses persuasiveness but also runs the risk of an outcome opposite to that intended—as pointed out by Viggo Mortensen: "Burhoe's intention of revitalizing religion by integrating God into the sciences could actually, against his intentions, lead to the abolishment of religion. When religion can be explained as a mere manifestation of brain functions, and God can be explained by genetics, then religion becomes nothing but words, words that we could just as well do without" (Mortensen 1985).

Mortensen, however, misses the essential contribution of Burhoe's theory of religion. For Burhoe, religion is never mere words; it is that aspect of culture which accumulates and transmits ultimate values for human survival. Theology may be mere words, but not religion. Nonetheless, the point still holds, for if the values of religion are conveyed to subsequent generations through words and symbols, and those words and symbols are replaced with contemporary scientific words and symbols, it could well be the case that essential religious values would be lost.

THE CONCEPT OF GOD

The logical-positivist claim that theology and metaphysics are nonsense because their statements cannot be connected to empirical experience is addressed by Burhoe's first proposition:

> Proposition 1. There is a god, if by that term we mean to designate the source of what we experience. . . . God, thus defined, is the main preoccupation of physics: to discover the source or cause of anything we experience. . . . The reality of such a God, a causal or at least correlatable system of events, is the basic postulate of physics.

God, the source of what we experience, is the reality with which we are ultimately connected in an interrelated web of events.

> The [basic postulate of physics] may be stated more or less as follows: Any event of our experience can potentially be logically related or explained in terms of other events. The postulate asserts that there is nothing which inherently forbids expanding the conceptual linkages ad infinitum until all events are bound together in a single interrelated net. This net is not broken and knows no absolute boundaries between physics, chemistry, biology, psychology, sociology, or any area of experience or observation [including history, private experiences, those outside the world we see and hear, and memory]. In a sense this net of usually invisible forces or entities connecting or interrelating the diverse elements of the phenomena of human experience, which is postulated by physics and is increasingly found in fact to be interconnected into a single whole, may be said to be today's formulation of the God concept (Burhoe 1964a, 8-9).

Formulating the concept of God in this way, Burhoe shows the deep roots of his thought in the positivistic philosophy of science represented by Richard von Mises. For example, compare the above with the following quotations from the conclusion of von Mises's *Positivism:*

> The goal of all scientific endeavor is to discover connections between observable phenomena, such that out of a partially given complex the remaining elements can be constructed in thought.
>
> . . . Progress of research leads in every sphere away from metaphysics, toward the realm of connectible scientific theories.
>
> . . . The religious systems are metaphysical attempts at an explanation of the world, undertaken for the purpose of setting up norms of behavior. We expect from the future that to an ever-increasing extent scientific knowledge, i.e., knowledge formulated in a connectible manner, will control life and the conduct of men (Mises 1951, 369–70).

Burhoe goes on to say that it is out of our experience that we have been building our knowledge, including abstract representations in language and especially those of mathematical physics. "The network of interconnection of the scientifically formulated entities and laws relating them has indeed built up a wonderful portrait of the human situation: of man and man's relation to the more immediate ground of his being in the cosmos." While physics does not provide certain knowledge about the ultimate reality, it seems "to be saying that such a God is partially but increasingly knowable. . . . To experience increasing levels of proximate knowledge which evolves cumulatively is both thrilling in its own right and fruitful in its use." This points to the context of a major problem to which Burhoe devotes extensive attention: the connection of knowledge through its evolutionary stages from the source of what we experience to the most abstract scientific formulations and the way in which this reality selects or determines viable knowledge (Burhoe 1964a, 10–11).

Burhoe judges that this concept of God is too abstract and remote from the human predicament to be of much concern to religious theory:

> The only validity of this concept may be its reality. But it is this reality which is of utmost importance, and of which we must not let go. It is upon this reality that I want to build the rational and empirical chains that bring such a god to the human predicament. . . . In fact it is the reality of the god of physics that has caused the death of other gods in populations into which education has brought the beliefs of the sciences, and this happened first in Christendom (Burhoe 1964a, 12).

In this passage we can see the basis for his later statements, in which he identifies God and nature. Consider, for example, the following passage from his "Concepts of God and Soul":

> Many will be disturbed by the seeming impropriety of my using the term *God* as the totality of the natural world rather than as a being beyond nature, a supernatural being. . . . Let me say that one can interpret the ancient usage of "supernatural" as referring to a hidden "nature" which is just as "real" as the tangible, visible world "out there" which everyone can see. Hence, "supernatural" means essentially the hidden, subtle forces not immediately obvious to common sense. During the past few centuries the changes in physics have quite obliterated this distinction between nature and supernature (Burhoe 1973, 423).[8]

This identification of God and nature, or the natural and the supernatural, "works" if nature is conceived as the interconnected web of reality indicated above. In his program to translate traditional theological and metaphysical concepts into a physicalistic (connectable) language based on the concepts of contemporary physics, Burhoe is seeking to articulate a scientific monism in contrast to the kinds of dualisms that arise when nature is identified with one side of such distinctions as natural-supernatural, nature (essence)-thing, mind-matter, subject-object, fact-value, Creator-creature. If nature is identified with only one side of these contrasts, as in many traditional views, the identification breaks down.

Burhoe's second proposition is an answer to the question of dualism. It would be better classed as a lemma, for it is implicit in his first proposition.

> Proposition 2. It should be clear that this ground of being pictured by physics is single, one, universal. There are not two or more separate networks of causality. . . . The faith that one can find a single relatively simple logical expression of the operation of the causal network is well known in the story of Albert Einstein's search for a unified field theory (Burhoe 1964a, 12).

Burhoe illustrates how this monism deals with the problem of consciousness—the estrangement of self from an objective other. He claims to have "avoided the impasse between subjective and objective by defining god and the causal network of physics as 'the source of what we experience' rather than of 'what we see' or of 'what in reality is going on out there.'" Burhoe affirms a position which embraces the alleged solipsism of the physicist P. W. Bridgman without rejecting the behaviorism of Skinner, who resolves the dualism by denying consciousness or mind. Without exhausting the concept of consciousness as the percipient subject to which experience is related, "such things as vision, hearing, feeling, emotion, love, hate, fear, etc." can be accounted for as physical processes "to

be described in terms of electrical, chemical, and related processes in the neural net that makes the brain." This idea, that the brain is the locus of human integration of the experiences, given by the "source of what we experience," and that consciousness can be described in physicalistic terms, is one of the central problems to which Burhoe gives considerable attention in his later writings. "It is interesting to see how close this is to the religious mystics who assert their oneness with and inseparability from all being or god" (Burhoe 1964a, 13).

In his third proposition, Burhoe turns to the problem of linking his "god of physics" to the traditional concept of God the Creator:

> Proposition 3. This god of the metaphysics of physics is the Creator, the source of all that is, including the living as well as the non-living. . . . By creator we mean that for any event or system of events at the present moment there is some antecedent condition which determined it (Burhoe 1964a, 14).

This proposition could be called a theorem of cosmic causality, for it connects the traditional notions of God's creativity to the physical principle of causality. Because it introduces the dimension of time, causality can be considered the physical analogue of history. "Without claiming touch with the ultimate, science today can carry several lines of the history of genesis back in time. . . . Perhaps the most important feature of this scientific quest for the ultimate ground of being is that it seems to be convergent rather than divergent." Burhoe notes the parallel of the emerging scientific cosmology with the creation story which informs the Judeo-Christian tradition (Burhoe 1964a, 14–15).

A perennial theological problem with the idea of the world as God's creation is theodicy. In the face of evil and death, how can God be considered to be a God of justice? Burhoe discusses this problem in relation to the second law of thermodynamics. If, according to the second law, life and order are doomed by the ultimate degradation of available energy, does not this imply that the cosmos of physics is no respecter of the human? In spite of the presumption that, with certain assumptions, the ultimate future of the universe may be a "heat death," there is a more positive implication in thermodynamic theory, and Burhoe quotes Harlow Shapley: "The natural emergence of living organisms in the early history of the earth now seems to have been not only possible but inevitable" (Shapley 1963, 57). He continues, "Life is not a freak element of the cosmos. The cosmos creates life. The evolution of life is a natural consequence of the cosmic realities and the cosmic laws." Burhoe also draws upon Schrödinger's *What Is Life?* to elaborate the point: Life is a natural

consequence of a cosmos ruled by the second law, although it runs counter to the direction predicted by that law. Indeed, this is one of the important arguments in Burhoe's development of his program (Burhoe 1964a, 18–21).

Burhoe summarizes the religious value of his program for a translation of theology and metaphysics into physicalistic concepts connectible with the sciences.

> In summary, the new genesis, the new creation story, tells us that life and man are created and nourished, sustained and guided by the one and only source of all that is, the almighty, unchanging, eternal sovereign of the cosmos and determiner of destiny. . . .
>
> If traditional theologians could accept the contemporary sciences and clothe them in proper religious garb or interpretations as did the Psalmists, then this new physics, this new revelation of the prime-mover, the ultimate ground of being, the eternal, omnipotent, unchanging, ubiquitous, creator, sustainer, and ruler of all that is, would be an asset instead of a liability in presenting the moral and spiritual message of salvation. God would be real again, not dead. Moreover, preachers could say "thus saith the Lord" and be listened to with the same respect accorded to the scientifically grounded physician.

Burhoe then quotes passages from Psalms 19, 1, 139, 95, and ends with: "This religious poetry is vitally true according to the metaphysics of physics; and one can resonate to the depths of one's soul as I do, hearing these words in the context of contemporary physical theory" (Burhoe 1964a, 21–24).

This first lecture shows the basic epistemological, ontological, and cosmological principles of Burhoe's theological program. The other two lectures in the series "Metaphysics of Physics" focus on his axiology and anthropology:

> In this second lecture I wish to stimulate your thinking in a not very common or well-established pattern today—a pattern which says (1) that this invisible, eternal reality portrayed by physics is the source and sanction of our moral law; and (2) that man himself is much more than the mortal corpus or the transient existential feeling that the untutored perception seems to represent; he is in reality an immortal soul or spirit, endowed by the Creator with powers, duties, and privileges in carrying on the creative process of the kingdom to come (Burhoe 1964b, 1).

The manuscripts of these second and third lectures are much more sketchy than his first, and in them he ventures into the more speculative dimension of his program, to include morals and human motivation. In keeping to his method of connecting traditional religious ideas with a physicalistic description, he must rely on the biological sciences and the more controversial concepts of the psychosocial sciences, especially those of cultural evolution. He is therefore pressed to be more of a constructive scientific theoretician,

and consequently these areas are primary in development of his program.

In "The Source and Sanction of Our Moral Law," Burhoe proposes to unify natural and moral law through his concept of God. "The Lord who guides the stars in their courses is the same who counseleth the heart of man" (Burhoe 1964b, 2). The cosmic (natural and moral) law is conceived as the set of conditions for existence and life in terms of a continuous spectrum of right and wrong choices.

> I can roughly characterize this spectrum of right and wrong choices as being synonymous with the building of living systems. Right structure or behavior produces life; wrong structure or behavior annihilates life. . . . [Kant] did not know what we now know about the building up of the moral law within by the objective, external selective agents, which codified these cosmically approved rules for feeling and behaving in the genotypes and culturetypes of men, in a process continuing throughout millions of generations and starting billions of years before anything recognizable as man appeared on earth (Burhoe 1964b, 3–5).

> Human moral and spiritual laws are a special case of the total cosmic law which has created all life and all other things in the universe (Burhoe 1964b, 17).

The physical basis for life which underlies all human values is suggested by physicist R. B. Lindsay's "thermodynamic imperative" to consume disorder (entropy), replacing disorder with order. In evolutionary theory, natural selection is the concept used to designate the "agency weeding out the unfit or taboo patterns" and thus promoting life. For B. F. Skinner, operant reinforcement resembles natural selection in selecting individual behavior patterns. Although the evidence is not yet fully clear, a similar selection process, according to invariant laws, seems to operate in cultural evolution.

> This mechanism [natural selection] is tantamount to God's will. It does the things traditionally ascribed to the gods. The important point here is that such a selector is the source of moral codes and religious beliefs. . . .
>
> That our basic cosmic reality partially revealed by physics is the source of all truth or commands defining right and wrong behavior, that this reality not only defines and teaches us this truth but enforces it with inescapable vigilance, gives our cosmic god some of the religious relevance of the Old Testament God of the Judeo-Christian tradition (Burhoe 1964b, 17–18).

This, the predominant theme of Burhoe's theological program, is illustrated by the title of a later essay, "Natural Selection and God," where in the opening sentence he says: "One of the prime elements of a scientifically grounded theology is the rebirth or renewal of credibility in an objective reality that determines human destiny" (Burhoe 1972, 30).

THE CONCEPT OF SOUL

Having discussed the external, objective cosmic law of life which both creates and sustains viable organisms, Burhoe in the last lecture, "Image of God or Soul," turned to the human locus of cosmic evolution. The human is the locus of integration of physical, biological, and cultural selective processes governed by the cosmic law or natural selection. "I want to say something about the physics of man's soul or spirit" (Burhoe 1964b, 19). The concept of soul is concerned with understanding the emotional and psychological dimensions of humanity, and most particularly hope and motivation, on the basis of something which transcends the individual human body. He referred to his 1951 paper in which he first proposed a trinitarian concept of soul as the integration of biological (genotype), cultural (culturetype), and environmental (cosmotype) factors into a phenotypic expression of a human being.

The most obvious physicalistic dimension is the genotype, which determines not only physical development but also behaviors, chief among them being those that ensure its continuance through procreation. However, immortality is not solely dependent on passing one's genes to one's children. The genes which make up the individual genotypic structure are distributed among the whole human population in a gene pool that can be described according to stochastic and statistical laws:

> My genetic elements are all over the place, not just in me. But in addition to the gene pool there are other elements of the anatomy or physical structure of the soul that also endure from as far as we can see in the distant past to the distant future, such as the culturally transmitted patterns of structure and behavior and the cosmic ground that backs the intertwined evolution of the genotypic and cultural patterns in human life. We have solid, physical grounds today for religious theories or theologies of an immortal soul.
>
> It is clear from the physical analysis that the real values or treasures in living systems are located in this hitherto invisible or unanalyzed reality that I choose to call the soul. This is the soul of a species of animals, the heart and core of every individual. This structure does not come into being nor pass away with the birth and death of the body. With the eye of a scientist one can view the succession of phenotypes (somata, or bodies as we call them) appearing and disappearing on an everlasting chain of the genotype and other components of the soul (Burhoe 1964b, 25-26).

On this view, one must give up the idea of some traditional views of immortality that there is a continuation of consciousness after the death of the body: "For physics there is no continuation of the consciousness, the feeling, the sensing, the seeing, the thinking, the satisfactions of life apart from the bodily base that produces [these effects]. The disembodied spirit doesn't exist. . . . Our immortal

spirits, although quite invisible and intangible, are nevertheless embodied and real'' (Burhoe 1964b, 27).

In conclusion, he says,

> In this picture is revealed to us the apparatus that motivates our basic concern for the welfare of the species, a value we hold dearer than the lives of our bodies; that motivates our strivings to bring about the will of the Creator as well as provides our basic understanding and our deep respect for our Creator's eternal laws, which in fact are built into our very being—created in his own image, as the old Genesis said (Burhoe 1964b, 28b).

> I hope that some of you see some validity in my suggestion that one can build up a religiously relevant doctrine of soul on these revelations of reality from physics, a doctrine which has the psychological, emotional, and motivational equivalents of the older religious metaphysics which we have had to call obsolete and inadequate for informed people in today's world (Burhoe 1964b, 29).

For Burhoe, the soul is the everlasting stream of life, a stream of viable information from which individual organisms receive their heritage and to which they contribute their naturally selected patterns for life. By selecting individual organisms for their viability, nature is ultimately operating on the soul to fashion the evolution of humanity. It is for this reason that a number of problems have an essential place in Burhoe's program.

Methodologically, the problem of the fact and value distinction is important. Burhoe devotes much attention to arguing the idea that values are a class of facts, provided by selective pressures for viability in a specific environment. Values are theoretically comprehended in terms of a system of laws which describe the way in which the conditions of a specific environment regulate the evolution of life, the development of individual organisms, and the maintenance of living systems. Values are conceptually apprehended in terms of symbols which represent the accumulated information about the requirements of the environment for viability. Also, values are accumulated in the genotype, and socially learned values are accumulated in the brain. A living organism may be ontologically considered to be the expression of a viable set of values which determine its being, what it is, and how it functions in its environment. Developing this concept of value as a class of facts is essential to affirm that the scientific study of values is not alien to scientific inquiry and that a scientific study of religion is both possible and necessary because the phenomenon of religion is the source of ultimate values for human life.

A second set of problems deals with the connection between physical laws and the organic locus of their applicability. To warrant the claim that God is the creator of life, Burhoe needs to show how

physical laws conspire to produce the values they inspire to ordain the creation of ever more complex ordered entities and living organisms. There cannot be some kind of vital force that creates life in the midst of nonliving stuff which is not itself explainable in terms of physical laws. Life must be shown to have continuity with the same principles which regulate the nonliving processes.[9]

A third set of problems has to do with the interaction of genes and culture. How far do genes (structural elements of the individual genotype encoded in DNA molecules) determine the behavioral and social patterns of humans, as well as other animals and living systems? Does the development of a culturetype (composed of transmitted memories of such behaviors and social patterns) react with the gene pool of a particular culture, thereby changing the stochastic and statistical distributions of genes in it or modifying the expression of genes in patterns of greater viability? Burhoe quotes a suggestive passage from B. F. Skinner in this regard: "Cultural practices which are advantageous will tend to be characteristic of the groups which survive and which therefore perpetuate those practices. Some cultural practices may therefore be said to have survival value, while others are lethal in the genetic sense" (Burhoe 1964b, 16). This set of problems is especially important in the subsequent development of Burhoe's argument that religions are an essential component in human evolution.

A related problem concerns the hypothesis (which Burhoe later advances) that belief in God promotes the selection of those patterns of human behavior which make civilization possible:

> The religious gods of the life-explaining myths are themselves the naturally selected symbols which effectively motivated within the brain structures of those times the suitable response patterns to the realities that were in fact the creators and determiners of human destiny as now understood scientifically (Burhoe 1979, 156).

Although this idea is elaborated a decade later—after Burhoe was introduced to such research as that of George C. Williams through his association with Donald T. Campbell—its germ was already present at this time in relation to his operational definition of moral law:

> By moral behavior I mean behavior that is commonly designated as right or wrong, good or bad, especially as the behavior may involve relations with other persons. The moral character of behavior is often considered to be accented when it involves the sacrifice of some goals of the actor in order to achieve the goals of others, and is the more sharply accented the more aware the actor is of this situation and the greater his sacrifice (Burhoe 1963, 2).

Burhoe's hypothesis raises a number of scientifically interesting questions. Can a belief in higher gods have a significant enough influence on either the gene pool or on the mechanisms of selecting social behavior patterns to warrant the viability of the hypothesis that such a belief increases altruism to nonkin individuals? What kinds of adaptive advantages would such a belief give to a human population? In the evolution of different cultures, what would account for the different contents of this belief in higher gods? Are some of these beliefs more adaptive than others?

More to the point, however, is a note in his "Cosmic Evolutionary Creation and Christian God":

> This hypothesis is crucial for my account of human nature since, without symbiosis of the human gene pool with an independently selected but highly coadapted culturetype, and the role of religion in bonding the gene pool to the culturetype, *Homo* could not have become altruistically cooperative beyond close kin, and hence civilized (Burhoe 1984, 246).

The heuristic guidance toward the clear articulation of this hypothesis is rooted in Burhoe's faith in God as it is here expressed in his "Metaphysics of Physics." If God is the source of what we experience; if this source of what we experience is a single, universal network of causality of which we are an experiencing subject; if the source is the antecedent condition which determines the present; if life is not a highly improbable accident, but is the natural consequence of the cosmic reality and its laws; if life, and especially human life, is created, nourished, sustained, and guided by the one and only source of all that is, the almighty, unchanging, eternal, sovereign of the cosmos, and determiner of destiny; if this God is the source and sanction of our moral law and the selector of the right patterns for life; if the human is an epiphenomenon of the soul of life created by God in the evolution of living systems governed by natural selection, an epiphenomenon appearing and disappearing on an everlasting chain of the genotype and other components of the soul; and if identification with this soul motivates our basic concern for the welfare of the species, a value we hold dearer than the lives of our bodies; then belief in this God should make a difference in human evolution. If it could be shown that belief in God has had an essential role in human cultural evolution, we would be warranted to say that belief in God today will make a difference in human life. For Burhoe, belief in God, conceptually formulated in terms of the contemporary scientific worldview, will make a difference. The salvation of one's soul depends upon our respect for, discernment of, and abiding by the eternal laws or will of God.

This hypothesis, that belief in a transhuman reality or god, cultivated in the evolution of religions, has made human civilization possible by culturally transforming inherent genetic selfishness, puts religious belief in God at risk.[10] If, upon careful scientific analysis, such a hypothesis (or revision of it) cannot be confirmed as a possibility, then not only would disconfirmation count against the hypothesis but also would bring about serious doubt as to the efficacy of any religious belief in God.

In summary, then, the metaphysics of physics shows clearly the concept of God to which Burhoe related his exegesis of the scriptures of the sciences and around which his integration of religion and science was organized into a scientific theology. In brief, Burhoe's concept of God can be stated as follows: There is one God who is sovereign over the whole universe, and the purpose of the human is to recognize this God as "lord and master" and to spend all one's days in discovering and applying what God indicates must be done if one is to have life and more abundant life.

NOTES

1. This argument was clarified by Burhoe's response to an earlier draft, expressed to the author in a memo of 31 March 1988.

2. The concept of a research program is drawn from Imre Lakatos (see Lakatos 1978). According to Lakatos's methodology, the great scientific achievements are research programs. In the history and philosophy of science, he asserts, the basic unit of appraisal should be, not an isolated theory or a conjunction of theories, but a research program. Such a program has a *hard core,* which is metaphysical in character and by provisional decision is irrefutable, and a *positive heuristic,* which defines the construction of a belt of auxiliary hypotheses that interpret known facts or predict new ones. A research program is progressive as long as its theoretical growth anticipates its empirical growth. It becomes stagnant when its theoretical growth lags behind its empirical growth.

3. In his 1977 response to critics of his "Lord of History" essay (Burhoe 1975), Burhoe affirms that his enterprise centers in his effort to valorize scientific understanding in religious terms and to validate religious understanding in scientific terms (Burhoe 1977, 374).

4. This is not to suggest that they remain outside the scope of his project, for he has recently admired the work of Eric Chaisson in elaborating this relationship, as he admired the work of Harlow Shapley and George Wald (see Chaisson 1979). Nonetheless, he is skeptical of cosmological theories of the origins of the universe and their usefulness for theology, because of their speculative character and lack of empirical confirmation.

5. Cf. Philipp Frank's scientific and philosophical criteria of truth (Frank 1957, esp. 18).

6. For example, see Capek 1961; Koyre 1957.

7. See the articles by W. Widick Schroeder, John Miles, Donald Musser, and Philip Hefner in the March 1977 issue of *Zygon: Journal of Religion and Science.*

8. Also see Burhoe 1966b, where he first formulates this interpretation, or translation, of the concept *supernatural.*

9. Burhoe found the key for solving this set of problems in a paper by J. Bronowski (1970).

10. I must note here that, in saying this, I have extrapolated the implication of

Burhoe's hypothesis in the context of his thought. That God makes a difference is a controlling belief for Burhoe, grounded in his faith in the "Lord of History." Scientifically, Burhoe makes the more modest claim that religion plays the significant role in bonding the human gene pool and an independently selected culturetype in a mutually symbiotic relationship, with the human organism as the locus of this symbiosis. The human brain is the operational locus of the coadapted information in gene pool and culturetype. In the brain, these two sources of information are integrated to produce adaptive behaviors to meet the requirements of the environment for viability. Natural selection of behavior over time produces the mutual coadaptation of the two sources of information to the requirements of the larger environment. Religion has played an essential role in this process of coadaptation, without which humans could not have become sufficiently altruistic (beyond close kin) to have become civilized into cooperating, large social units of genetically unrelated individuals. I also point out that Burhoe himself differs with the more hard-line sociobiologists, represented by E. O. Wilson. For Wilson, culture is determined by epigenetic rules rooted in the rules that govern the natural selective mechanisms of a gene pool. For Burhoe, culture is a separate "species" from biological *Homo sapiens,* and the natural selective mechanisms in cultural systems are different from those that operate on the genetic systems.

REFERENCES

Aristotle. 1941. *Metaphysics* vi.1.1026^{b}25. In *The Basic Works of Aristotle,* ed. Richard McKeon. New York: Random House.

Breed, David R. 1990. "Ralph Wendell Burhoe: His Life and His Thought: II. Formulating the Vision and Organizing the Institute on Religion in an Age of Science (IRAS)." *Zygon: Journal of Religion and Science* 25: 469–91.

———. 1991. "Ralph Wendell Burhoe: His Life and His Thought: III. Developing the Vision among the Unitarians, 1954–1964." *Zygon: Journal of Religion and Science* 26: 141–67.

Bronowski, J. 1970. "New Concepts in the Evolution of Complexity: Stratified Stability and Unbounded Plans." *Zygon: Journal of Religion and Science* 5: 18–35. Paper presented to the American Association for the Advancement of Science, Boston, 27 December 1969.

Burhoe, Ralph Wendell. 1963. "New Knowledge on the Nature of Moral and Mystical Experience." Paper presented at a conference on "Technological Change and Human Values," sponsored by the Center for Continuing Liberal Education at Pennsylvania State University, 4–6 December. Typescript.

———. 1964a. "The Lord of the Cosmos." Paper presented at a colloquy on "The Metaphysics of Physics: Theology and Physical Theory," Meadville Theological School, 13–14 January. Typescript.

———. 1964b. "The Lord of Mankind," in two parts: "Source and Sustainer of Man" and "Image of God or Soul." Papers presented at a colloquy on "The Metaphysics of Physics: Theology and Physical Theory," Meadville Theological School, 13–14 January. Typescript.

———. 1964c. "The Sciences, Humanities, and Religion—Can the Three Cultures Be Reunited?" Paper presented at the President's Annual Faculty Conference of St. Louis University on the general theme, "The Liberal Component of Undergraduate Education at St. Louis University," Pere Marquette State Park Lodge, Grafton, Ill., 11 September. Typescript.

———. 1964d. "A Theological Autobiography." Paper for the Façulty Seminar, Meadville Theological School, 6 November.

———. 1965. "Science and Liberal Religion." Paper presented at a conference on "Liberal Religion and the Sciences," the Unitarian Universalist Lake Geneva Summer Assembly, Lake Geneva, Wis., 4–10 July.

———. 1966a. "The Impact of Technology and the Sciences on Human Values: What Will Man Seek When All That He Values Is His by Automation?—The

Dreams of Joseph and Jacob." In *Automation, Education and Human Values,* William Brickman and Stanley Lehrer. New York: School and Society Books. Paper presented to the seminar on "Work, Leisure, and Education in a Changing Industrialized Democracy," Center for Continuing Education, Pennsylvania State University, State College, Pa., 3-5 June, 1964.

———. 1966b. "Commentary on Theological Resources from the Social Sciences." *Zygon: Journal of Religion and Science* 1: 93-96.

———. 1966c. "Scientific Cosmos and Sacred Theos." In "Sketches of a Theological Structure Developed in the Light of the Sciences." Papers prepared for the Faculty Seminar, Meadville Theological School. Mimeo.

———. 1967. "Five Steps in the Evolution of Man's Knowledge of Good and Evil." *Zygon: Journal of Religion and Science* 2: 77-95. Paper presented at the 1965 IRAS Star Island Summer Conference.

———. 1969. "Theology and the Sciences at Meadville." Chicago: Burhoe Archives, 21 September. Mimeo.

———. 1972. "Natural Selection and God." *Zygon: Journal of Religion and Science* 7 (March): 30-63. Paper presented to the CASTS seminar, 27 April 1970.

———. 1973. "The Concepts of 'God' and 'Soul' in a Scientific View of Human Purpose." *Zygon: Journal of Religion and Science* 8 (December): 412-42. Paper presented at the Symposium on Science and Human Purpose, IRAS, Rensselaerville, N.Y., 25-30 October 1972.

———. 1975. "The Coming of Scientific Theology and Religious Revitalization." Paper presented in the symposium, "Prospects for Religion in the Next Quarter Century," Second General Assembly of the World Future Society, Washington, D.C., 2-5 June.

———. 1977. "What Does Determine Human Destiny?—Science Applied to Interpret Religion." *Zygon: Journal of Religion and Science* 12 (December): 336-89.

———. 1979. "Religion's Role in Human Evolution: The Missing Link between Ape-Man's Selfish Genes and Civilized Altruism." *Zygon: Journal of Religion and Science* 14 (June): 135-62. Paper presented to the Sociobiology Symposium. American Psychological Association, Toronto, 29 August 1978.

———. 1981. *Toward a Scientific Theology.* Dublin: Christian Journals.

———. 1984. "Cosmic Evolutionary Creation and Christian God." In *Cry of the Environment: Rebuilding the Christian Creation Tradition.,* ed. Philip W. Joranson and Ken Butigan, 218-52. Santa Fe: Bear & Company.

Burtt, Edwin Arthur. 1957. *The Metaphysical Foundations of Modern Physical Science.* Rev ed. New York: Doubleday.

Capek, Milec. 1961. *The Philosophical Impact of Contemporary Physics.* New York: D. Van Nostrand.

Chaisson, Eric J. 1979. "Cosmic Evolution: A Synthesis of Matter and Life." *Zygon: Journal of Religion and Science* 14 (March): 23-39.

Collingwood, R. G. 1945. *The Idea of Nature.* Oxford: Clarendon Press.

Frank, Philipp. 1957. *Philosophy of Science: The Link between Science and Philosophy.* Englewood Cliffs, N. J.: Prentice-Hall.

Koyre, Alexandre. 1957. *From the Closed World to the Infinite Universe.* New York: Harper & Row.

Lakatos, Imre. 1978. *The Methodology of Scientific Research Programmes.* Philosophical Papers, ed. John Worrall and Gregory Currie, vol. 1. Cambridge: Cambridge Univ. Press.

Meland, Bernard. 1967. "For the Modern Liberal: Is Theology Possible? Can Science Replace It?" *Zygon: Journal of Religion and Science* 2 (June): 166-86.

Mises, Richard von. 1951. *Positivism: A Study in Human Understanding.* Cambridge: Harvard Univ. Press.

Mortensen, Viggo. 1985. "Beyond Restriction and Expansion: A Possible Model for Relating Science and Religion." Paper presented at the Science and Religion Symposium. Seventeenth International Congress of History of Science, University of California at Berkeley, August.

Peacocke, Arthur. 1979. *Creation and the World of Science*. Oxford: Clarendon Press.
Shapley, Harlow. 1963. *The View from a Distant Star*. New York: Basic Books.
Toulmin, Stephen. 1982. *The Return to Cosmology: Postmodern Science and the Theology of Nature*. Berkeley and Los Angeles: Univ. of California Press.
Toynbee, Arnold. 1956. *An Historian's Approach to Religion*. London: Oxford Univ. Press.
Tracy, David, and Nicholas Lash, eds. 1983. *Cosmology and Theology*. Concilium: Religion in the Eighties Series. Edinburgh: T. & T. Clark, and New York: Seabury Press.