Reviews

Science and Human Values in the 21st Century. Edited by RALPH WENDELL BURHOE. Philadelphia: Westminster Press, 1971. 203 pages. \$6.95 (cloth); \$3.45 (paper).

William Irwin Thompson, in an editorial essay in the New York Times of May 11, 1971, asserts:

The structure of a new planetary consciousness is definitely in evidence. ... What the new planetary consciousness indicates is that something has already happened in the collective unconsciousness of mankind. The movement of humanism that began with the Renaissance is at an end and a new ideology is being created in advance of its social need.... I would guess that the new planetary consciousness means that we are building up a larger model of reality in which religious myth and scientific fact are both simultaneously true. Clearly, this will amount to a scientific revolution as large as that of the sixteenth century.

It is this scientific and equally religious revolution, sensed by but a few of the more holistic scientists and open religionists and dimly by masses of young people in the counterculture, that is heralded and delineated in this exciting and stimulating volume, derived from papers prepared for the Pittsburgh Theological Seminary's one hundred seventh-fifth anniversary.

The titles and authors of the nine chapters will give an overview: (1) "Prophesying Human Values," by Burhoe (professor and director, Center for Advanced Study in Theology and the Sciences, Meadville/Lombard Theological School); (2) "Some Prophecies of Twenty-first-Century Technology and Religion," by Burhoe; (3) "What Is the Future of Man in the Light of the Challenge to Traditional Values?" by Harold K. Schilling (physicist and university professor at Pennsylvania State University); (4) "Biblical Symbols in a Scientific Culture," by Langdon Gilkey (professor and chairman of theology at the Divinity School of the University of Chicago); (5) "A Psychologist's View of Good and Evil and the Church of the Future, by O. H. Mowrer (professor of psychology at the University of Illinois); (6) "Science and the Quest for Human Values," by Robert L. Sinsheimer (professor of biophysics and chairman of the Division of Biology at the California Institute of Technology); (7) "A Scientific View of the Role of Religion," by Burhoe; (8) "Prophecies of a Scientific Theology," by Burhoe; and (9) "Epilogue: Twenty-first-Century Values from a Scientifically Based Theology That Creates a Common World Culture," by Burhoe.

In this book, a physicist, a biophysicist, a psychologist, a theologian, and a philosopher of science describe the mutual rediscovery by contemporary science and religion of their need for each other; and not just their need, but of the possibility of a new synthesis of science and religion in our day leading to a new, authoritative, and potentially universal source for the determination of human values around the world in the twenty-first century.

The new synthesis has been made possible by the movement in science toward a holistic view of nature and man and in religion by a deeper, more functional understanding of religious myths and their changing content as man's understanding and experience evolve. For the first time in over five hundred years, the possibility, nay probability, of a fundamental reconciliation and reintegration of scientific and religious knowledge seems imminent. Burhoe emphasizes that this will not be merely some form of mutual toleration but an interpenetration and synthesis of structures and substance.

What Burhoe and his colleagues make clear is that science without values has become a mortal threat to man's future, peace of mind, and ability to understand his place in the scheme of things. Yet values can no longer be determined apart from the input of contemporary, scientific knowledge. Values cannot exist in a vacuum. They must be grounded in reality as it is now understood by science. Also, values must be relevant to the new world and new human situations science has brought into being through technology. Some authors indicate that human values can be effectively expressed in the theological categories and archetypal imagery characteristic of and inherited from our religious and biological past. Burhoe gives reasons why this is not only possible but is scientifically to be expected. For instance, on page 144, he quotes one of the contemporary analysts of the recently developing concepts of cultural evolution as saying:

I will argue on evolutionary grounds that it is just as rational to follow well winnowed religious traditions which one does not understand as it is rational to continue breathing air before one understands the role of oxygen in bodily metabolism. I will argue that if modern psychology and social science disagree with religious tradition on ways of living, one should, on rational and scientific [apart from any religious] grounds, choose the traditional [religious] recipes for life, for these are the better tested.... I will argue as did Pascal, but on evolutionary grounds, that "the heart has its reasons which Reason does not understand," and that it is rational to follow an evolved heart in such matters.

The other authors in this book do not necessarily wholly agree with Burhoe or with one another on the importance of traditional religious ideas and "God talk," and they provide some alternative and stimulating perspectives on human values.

Physicist Schilling seems to be fairly close to the editor, and his chapter concludes:

Biblical (Hebraic-Christian) religion is, I feel, in an especially strong position to make positive and creative contributions—because of its long tradition of this-worldliness, its earthiness that places high value upon the concrete in life, its orientation and thrust toward the future, and its emphases on personal and social service. Its ecclesiastical and lay leadership should therefore put itself on record as wishing to be allied with, rather than opposed to, the forces of technology as these devote themselves to the improvement of the common lot of mankind, and to the ushering in of the new world.

I believe in man and in God, and in a splendid future that will surely come if man labors with God. I cannot see a splendid future achieved without him, that is, by man going his own independent way, as though he were himself God. [P. 71]

Theologian Gilkey seems least enamored of the values of science for helping theology and religion. He is critical of salvatory myths presented in the name of science. One class of these he calls a new form of the Gnostic myth...: [the notion that] man may be on his own in a blind, purposeless, undirected cosmos; but now that he knows how to know, and is thus free to do whatever he will with his world and himself, he can at last...take control of the material flux that has produced him, and directing both his biological and his cultural evolution, master his destiny. [P. 77]

Gilkey suggests that even though this myth "is dominant among most of the intelligent men, the scientists in our culture, . . . it has several very serious flaws" (p. 79).

If nature, as secular culture sees it, is truly blind and pointless, then man himself takes on this sacral ultimacy and absoluteness, and sees himself as free and wise, as the Promethean godlet who can control history for his own ends and thus creates meaning and value ex nihilo out of the blindness of process. Such a pessimistic view of being and optimistic view of man is, we have argued, self-contradictory and unempirical, and thus doomed to collapse at the slightest breath of reality. [P. 97]

He points out that his "critique is not directed at science but at the religious mythology, the sacral aura, science has produced" (p. 79). While Gilkey is here pointing to a well-known but nonbiblical version of religious myth inspired by the sciences and prevalent in the twentieth century, this myth is not the view suggested by Burhoe or Schilling, who seem to share Gilkey's respect for the validity of the Judeo-Christian tradition and his view that "every image of man points beyond himself to an ultimate horizon of being within which that image takes its place—...a cosmic and historical myth as well as a view of man" (pp. 96-97). In fact, Burhoe goes so far as to declare that modern science as well as the Bible reveals Gilkey's "cosmic, ontological ground of hope" (p. 97): "The most scientific and credible cosmic myths about man and his destiny in my opinion tend to fit in with what theologians call 'God talk'" (pp. 176-77; see other statements below). Burhoe's God seems to be fully "natural" but nevertheless sovereign over man.

Psychologist Mowrer, however, presents a perspective of how man is motivated to the good and to shun evil "in an entirely objective, naturalistic, humanistic frame of reference" (p. 110). He notes that "human beings need help in their pursuit of goodness." While "mankind has a long history of resorting to supernatural powers in its struggle toward virtue and against evil" (p. 107), "supernatural entities and sanctions disappeared from the modern scene" (p. 109). He then calls attention to "the emergence of a new primary social institution," the "small-groups movement" (p. 111). "Personally, I think there is a good possibility that these groups represent the emerging form of the church of the twenty-first century" (p. 112).

Biophysicist Sinsheimer provides a still different perspective. His chapter opens with a statement of how science has come to deal with human values:

In time it will probably be seen as inevitable that science, which set out simply to explore the universe objectively—without the constraints of, indeed orthogonal to, the concerns of value—should have come to test in the harshest way the fabric of our values. Today it takes little vision to see that science is ready to pose to man wholly unprecedented questions of the most fundamental character which will of necessity require a reformulation and a deeper understanding of our basic moral principles.

For us in science, it is frankly still surprising to have come from a new direction upon the oldest of questions. Perhaps, as we reflect, this consequence will tell us something about the geometry of fate and the matrix of the human mind. [P. 116]

He suggests that we may and we must

seek to orient our values by reference to that holistic universe from which we came and in which we do exist—in sum, to the world of natural science.... Natural science should be able to define such quantities as the stability of a given social configuration, or the cost (in various coin—psychic, economic, hygienic) of a given action, or even to ascertain the thickets wherein diverse values mutually contradict.

Biological science can, I believe, do far more to clarify the issues and perplexities of value. If we can accept the stance that man is the end product of two billion years of the unbroken chain of evolution, that while he is the most remarkable evocation of the power latent in specifically organized matter he is at the same time of a piece with the waves and the particles that comprise the bulk of the universe, then I believe we will see more readily the origins—evolutionary, genetic, physiological—of his characteristic limitations, his anachronisms, his imperfections, and we will in time, learn to locate and to recognize those internal flaws which underlie his conscious conflicts.

As the science of the biologist continues to penetrate into the redoubt of the mind we shall learn how our very perception of the world is determined by the programs that decompose and reorder our sensory inputs. We shall learn how our actions are spurred or stemmed by the activity of selective centers of motivation and reward, inherited from our remote ancestors. . . The paradoxes of man . . . are in this view a consequence of his intellectual constraints and his emotional imperatives, of his crude and tentative state as the first sentient animal." [Pp. 118-20]

Sinsheimer seems to doubt that our present genetic inheritance is advanced enough to allow us to become angels, and so he suggests that, since we not only are on the verge of a technology that will allow us to change this heritage, we must become involved in transforming it. "Today the hidden part of the iceberg, the biological genetic component of human nature, is coming increasingly into view. Fortunately—perhaps inherently, at the same time—our cultural development has proceeded so far that we can soberly envision the means of remolding these innate patterns" (p. 122).

In the conclusion of this poetic chapter by a scientist we find:

It is true that we have penetrated deeply into the mysteries of matter and of life, and as we near the core of each, the truths we uncover are the more incandescent and by their light we can see to control vast powers. But in truth we are, for all the brilliance of our science and the gleam of our technology, ever immersed in darkness. Outside the flame of human knowledge, slowly expanded with effort and cost, lies the darkness of human ignorance, both without and within. We know not yet where we are or what we are. And the human effort—the effort of this fragile, so recent product of evolution—to ask and answer these questions has been, is, and will be our meaning and our purpose. [P. 131]

Burhoe predicts that during the next few decades the traditional theological and religious communities will discover the relevance of scientific knowledge for reinfusing vitality into traditional religious concepts, and that "early in the third millenium A.D. a fantastic revitalization and universalization of religion will sweep the world" (p. 166). He predicts that it will derive its ecumenicity and power from a universalized and credible scientific theology and related religious practices, "not from the politics of dying institutions seeking strength in pooling their weaknesses" (p. 166).

He asks us to look at the potentials for a theology informed positively by the sciences and to listen to the scientists who are "seers of the unseen hand that rules human destiny." Their insight and wisdom will gradually get through, he believes, to the leaders of traditional religion as "significant confirmations and extensions of their historic faiths. For in reality these scientists are declarers of what the transcendent reality will permit and what it will reject, and hence what is good or bad for each and every living being and system, and what man must do to be saved for fulfillment in higher levels of order or organization of life" (p. 167).

He makes it clear that religious beliefs that are integrated and coherent with the beliefs of contemporary science are far more likely to be credible and authoritative for modern man, if for no other reason than that man faces all kinds of problems and situations that did not exist when the traditional religions came into being, but which have in fact come out of the scientific revolution itself. Not only values, but even the God-questions will have to be expressed in terms of the realities of the scientific symbol system and world view.

In the coming religious reformation, Burhoe believes that "the central and very ancient hypothesis or theory of religions will remain and be revitalized: the God concept, the concept that there is a power (or powers) superior to man, that created him and that will in the future as it has in the past determine his destiny." "In fact," he says, "this concept is central both to theology and to science" (p. 182).

Ralph Burhoe has been exploring this new synthesis of science and religion now for more than a quarter of a century with the Institute on Religion in an Age of Science and related groups. Through their work, liberal religionists are beginning to see the outlines of some real substance for a contemporary credo, based on scientific knowledge, but expressed in traditional theological structures. This breakthrough, coming at a time when the whole of Judeo-Christianity (as well as other world faiths) is awakening and seeking an empirical and rational method of faith validation which is not reductionist and mechanistic but holistic and open to the structures of myth and unconscious, does seem to herald the possibility of the exciting rebirth of a vital and universalistic religion in our day, which Burhoe foresees.

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Bioethics: Bridge to the Future. By VAN RENSSELAER POTTER. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1971. 205 pages. \$5.95 (cloth); \$3.95 (paper).

The author defines bioethics as "a system of human values that recognizes biological realities, the nature of man, the facts of life and the constraints imposed by the natural world." His book is a plea for a program of human survival and advancement through constructive cooperation of science and the humanities. I have long maintained that a modern understanding of man as a biological organism, in contrast with popular medieval views about his nature, is important for our ethical advancement and the improvement of the quality of life, and I have found in this book a stimulating treatment of its subject.

The author points out that biological facts are basic to the ethical values

involved in ecology and economics, and that bioethics, a new discipline, is vital to solving environmental problems such as pollution and runaway populations. The table of contents lists thirteen chapters, each of which is preceded by an abstract and concludes with a list of references.

So that the reader may have a fair idea of the scope of the book, there follow chapter titles and the author's abstracts, as directly quoted. Some of the abstracts are followed by my comments.

Chapter 1.—"Bioethics, the Science of Survival": "Man's natural environment is not limitless. Education should be designed to help people understand the nature of man and his relation to the world. The subject matter should include both the reductionist view and the holistic view of biology and should be broader than both together. Man is considered as an error-prone cybernetic machine, and 12 categories of relevant knowledge and their corresponding paradigms are presented. Man's survival may depend on ethics based on biological knowledge; hence Bioethics."

The twelve categories referred to include brief discussions of molecular structure and interaction, enzyme action, energy-coupling mechanisms, metabolic pathways, energy storage and replication, imperfections in the information system, feedback mechanisms, cellular structure, environmental hazards and physiological adaptation. Of these categories, the author regards the last of utmost importance.

Chapter 2.—"Teilhard de Chardin and the Concept of Purpose": "Teilhard was an evolutionist who foresaw a future when human research would take charge of human evolution. He sought to channel the new powers into a unified worldwide cultural community, but he did not clearly distinguish between biological and cultural evolution nor did he consider the desirability of multiple alternative evolutionary pathways."

Potter's view of purpose does not accord with that of Teilhard but, along with that of many of us in biology, is based on cybernetic concepts involving control by negative feedback processes rather than the mystique of entelechies.

Chapter 3.—"Bridge to the Future: The Concept of Human Progress": "The religious and the materialistic concepts of progress are contrasted with the scientific-philosophic concept in which wisdom is defined as the knowledge of how to use knowledge, and in which the destiny of mankind is placed in the hands of men, who must examine feedback mechanisms at biological and cultural levels."

Chapter 4.—"Society and Science": "The most important contribution science can make to society is to increase the degree of sophistication with which mankind perceives 'order' and 'disorder' in individual lives and in the long range problems of society. Interdisciplinary scholars trained in molecular biology as well as in the nature of man should be organized into groups to arrive at new ways to improve the human condition."

This is an especially interesting chapter in terms of the meaning and value placed upon disorder.

Chapter 5.—"Dangerous Knowledge: The Dilemma of Modern Science": "Knowledge can become dangerous in the hands of specialists who lack a sufficiently broad background to envisage all of the implications of their work. Educated leaders should be trained in both sciences and humanities. All the implications cannot be foreseen in any case, and all plans must provide for revision. Medical science provides many examples."

I agree that the answer to dangerous knowledge is more knowledge. An example is represented by the application of modern medicine and public health measures, especially in underdeveloped countries with their high birth rates. It is indeed ironical that the saving of lives and extending life expectancies have produced population explosions which are a form of social disease that can destroy us if not controlled. More knowledge in the form of education, better contraceptives, and recognition of the biology of man, in contrast with a theological mystique about him, must be the bases of fertility control if we are to avoid population control by great increase in death rates, as would follow a third world war with nuclear weapons. Such a catastrophe is made more likely as population pressures on environments increase. Potter and I are advocates of zero population growth.

Chapter 6.—"Council on the Future": "Dangerous knowledge was defined as knowledge that has accumulated faster than the wisdom to manage it. Present methods of coping with the gulf between scientific knowledge and political direction are inadequate. Existing mechanisms for arriving at complex decisions involving facts and values must be supplemented by a fourth arm of government instructed to consider the consequences of major research programs and to recommend legislation."

Chapter 7.—"The Role of Disorder in Human Activity and Thought": "The instinct to combat disorder is a basic drive which leads to the formation of organized religions and scientific disciplines. But disorder is built into both inanimate and living systems, and without it life and culture would be impossible. Understanding the nature and function of disorder can help us to be rational about irrational events. Primitive religions may need to be revised and revitalized in the light of increasing knowledge about disorder."

Chapter 8.—"The Role of the Individual in Modern Society": "The possible analogies between biological and cultural evolution are discussed using the DNA molecule and the idea or concept as the least common denominators in the respective systems. Seven principles of optimum environment are elaborated with emphasis on adaptive functions. Individuals generate biased ideas which may be improved by multidisciplinary evaluation in groups composed of individuals that are competent in one or more disciplines."

Chapter 9.—"Intracellular Responses to Environmental Change: The Quest for Optimum Environment": "Walter Cannon's book on the wisdom of the body drew from French and German physiologists of the late Nineteenth Century and was written in 1932 without any knowledge of cellular metabolism or the wisdom of the cell as manifested by changes in enzyme concentration. Adaptation is the key to biology and may be evolutionary, physiological, or cultural. An optimum environment would not be constant but would provide an optimum range and frequency of change in the environment."

Some basic concepts of feedback control (homeostasis) of physiological processes may be found in Cannon's 1915 book, Bodily Changes in Pain, Hunger, Fear and Rage, and Claude Bernard's dictum that freedom of action depends on control of constancy of the internal environment was put forth over a hundred years ago as an important physiological principle. Norbert Wiener's development of cybernetics in the early 1950s greatly extended our knowledge and appreciation of the importance of feedback controls.

Chapter 10—"How Is an Optimum Environment Defined?": "Physiologists, molecular biologists, and geneticists must combine with humanists

to build a society that can help each individual steer a course between too much leisure and information overload. Genetic capabilities can be fully expressed only in the presence of an optimum stress or level applied discontinuously. Environmental physiology should emphasize the genetic basis of individuality and the physiological basis of adaptation by individuals."

Chapter 11.—"Science and Biological Man": "Major advances in health are based on knowledge that can be applied to populations. Such knowledge is available to a vastly greater extent than it is being used; but if the knowledge were used without concomitant birth control, the results would be catastrophic, since the world population is already out of control. The question of whether mankind can be improved by biological evolution or by physiological and cultural adaptation is discussed and the latter two are favored."

Chapter 12.—"Biocybernetics—the Key to Environmental Science": "Biocybernetics is the science of feedback relations between the living and nonliving components of the ecological system. This science must be developed and mastered if a livable world is to survive. There is a divergence between the ecological viewpoint and the economic viewpoint, but this divergence must be resolved. Animal populations tend to oscillate because of feedback relationships, but the human population is increasing exponentially. Survival parameters should be identified and monitored, and zero population growth should be a world objective."

Chapter 13.—"Survival as a Goal for Wisdom": "Wisdom may be defined as the knowledge of how to use knowledge for the social good. The search for wisdom should be organized and promoted in terms of the survival and improvement of the human species. Humanistic biologists should be organized into interdisciplinary scientific research and development groups with survival as their first goal. Societal competence may be defined as a function of wisdom and knowledge. The cyclic interplay of competence, environmental control, complex needs, and, finally, decreased competence is used to describe the problem of survival. Humanistic biologists need to develop a bioethical credo to encompass the significance of mortality, random suffering, and the future."

As may be seen, this book of only 205 pages covers a wide territory. Those unacquainted with modern biology will find some of it tough going. However, most of it can be read by them with profit.

Potter is to be congratulated on reviewing important ideas current among biologists and presenting original ideas of his own in a stimulating fashion.

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Biology and Ethics. Edited by F. J. Ebling. Symposia of the Institute of Biology, no. 18. London: Academic Press, 1969. 145 pages. \$6.00.

The British proclivity for applying reason to ethics is borne out in this volume. This penchant becomes both the strength and weakness of *Biology and Ethics*. On the one hand, the book is a marvelous progressive statement of the historical and cultural factors in value formation. The empirical,

descriptive analysis is quite brilliant. One scans the spectrum of moral action from the self-sacrificing march of ants into a fire, the predatory behavior of cats, the bisexuality of the free martin, the eating habits of Zambian children, to a woman facing kidney transplantation. We are given the impression that we are dealing with the same reality in continuum. This is precisely the weakness of the symposium. The sequence from animal ethology to sociohistorical analyses of man does not pave the way for a logical move to normative ethical considerations regarding the quality of human life. There is a methodological confusion between mores and ethics that muddles the book. If mores and values are vulnerable to descriptive analysis, ethics, as the normative philosophic process of reflection on values, is not; unless, of course, you equate empirical human ethology with ethics.

If one keeps this reservation in mind, this volume can be used very profitably. The 1968 Conference of the Institute of Biology anticipated the great concern that is now emerging regarding ethics in the life sciences. It is very clear that some of the most urgent ethical dilemmas facing our civilization in coming decades will be in this field. The physicists developed conscience and conscientious commitment in the terrible sequel to Hiroshima. The life scientists now seek to form an anticipatory ethic. There are the corresponding journals, institutes, fellowships and all the rest. The London symposium convened scientists and medical clinicians for this meeting. An economist, historian, lawyer, and demographer were added. Although very improbably it would have helped steer the ship, it is strange that there were no ethicists aboard.

The volume falls into three parts. The helpful introduction is followed by an excellent statement by ethologist A. Chance, which reaches for a biological definition of ethics. His plea for a broadened ethical context which would consider organism and environment is basic to the book. Following an anthropoligical, historical, and legal account of values, D. A. Pond, a London psychiatrist, perceptively raises the question: "Guilt and Responsibility—Feelings or Reality?" Here one finds crux of the symposium. If values are subjective, historically conditioned creations, can one speak normatively? It is to this issue that I will return, following a brief summary of the book's remaining contents.

The volume then proceeds to consider a variety of illustrative ethical problems in biology. These are excellent treatments of profound and widely discussed problems. Bisexuality, abortion, organ transplantation, genetics, overpopulation, environment, and biological warfare are discussed by seven distinguished scientists. The arguments have two strengths in common. Each problem is scrutinized with critical, scientific analysis. Objectivity does not yield prematurely to passion, as is so common in the discussion of these issues. But, second, each essay gains power by its willingness to venture an affirmation of human meaning and value. M. F. A. Woodruff's essay, for example, reaffirms his desire for more humane legal and ethical sensitivity around the issues of tissue donation and definition of death, so that extremis life might be saved.

I return now to the issue of guilt and responsibility. Many ethical concerns in medicine pivot around this point. Let me illustrate: Recently, a physician colleague and I met with one of the world-renowned cardiovascular surgeons in our center. The issue for discussion was a sizable financial

grant to the medical center for either an ethics program or the most needed medical facility or program. He was asked to make a priority judgment. The discussion focused on the question of knowledge and responsibility. His point was that the major need today is to push back the frontier of scientific knowledge. We stand today at the threshold of what may be great insight in several areas, including heart disease, cancer, mental illness. Man's knowledge in these fields is just in its infancy. Modern scientific-clinical medicine only has a forty-year history. The ethical imperative today is to know and understand.

The discussion then moved to the responsibility that knowledge brings. In most areas, we cannot bear the responsibility of our present knowledge. Just as we know what makes for peace yet cannot secure it, we know the requirements for health and well-being, but cannot provide it for the earth's present family. The question of our time was posed by Marshall Nirenberg of the National Heart Institute: "Are we wise enough to be so smart?"

Dr. Pond says: "Man is not responsible for the weather." What if man comes to discern the secrets of nature and to develop the techniques of weather modification? Where then is his responsibility? Perhaps the impending San Andreas fault catastrophe, the East Pakistan flood, the Iranian earthquake are man's responsibility, just as the plague became man's responsibility after the pasturella pestis bacillus was isolated.

Human responsibility in the life sciences today is titanic. In all the areas treated in this volume, man is gaining the capacity to play God. He must be reminded of the great truth Hammarskjold records in his *Markings* (Alfred A. Knopf, 1964, p. xvi): "If you fail, it is God, thanks to your having betrayed Him, who will fail mankind. You fancy you can be responsible to God: Can you carry the responsibility for God?"

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