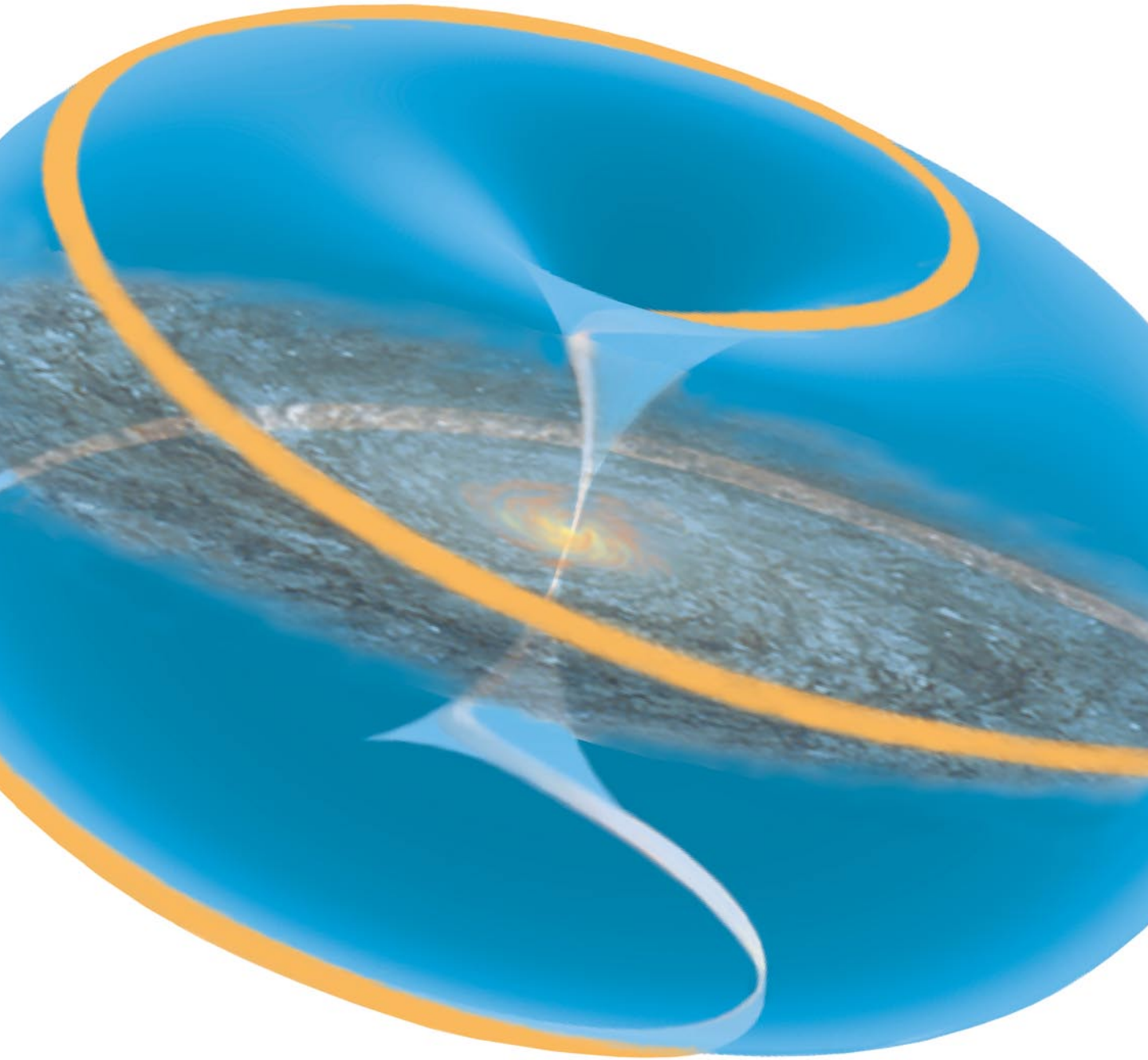
Arthur M. Young's

THEORY OF PROCESS



A White Paper by John S. Saloma

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About the Author

John S. Saloma (1934–1983) received his Ph.D. from Harvard in 1962. He was a professor of political science at M.I.T., on staff at Harvard's Institute of Politics, co-founder of the reform-oriented Ripon Society, and author of *Congress and the New Politics*. In 1974, he moved to California and directed his skills towards consciousness research, spending the last years of his life as a social analyst, teacher and author.

Introduction

For decades, there has been a ferment of interest in constructing a better theoretical framework for viewing reality. Focused largely within the "New Age" groups that comprise the consciousness movement, interest has been stimulated by enigmatic findings at the frontiers of science as well as by humanistic and ecological considerations. Future-oriented research organizations like SRI International have extended discussion of a possible "emergent paradigm" to scientific, corporate, and governmental circles. For the most part, however, the potential significance of paradigm change is little understood among leadership groups and the general public.

New Age Paradigms

The first essay introduces the reader to the search for a new paradigm. Why has so much interest been directed to this subject? What are some of the major dissatisfactions with the dominant scientific view of reality? Can further advances in science resolve these problems or is a different approach required? What progress has been made in the various attempts at constructing a new paradigm? A set of requisites for a New Age paradigm is suggested and then the case is presented for considering Arthur M. Young's theory of process as the first serious candidate.

Theory of Process

The second essay examines the historic work of Arthur M. Young —inventor, philosopher, cosmologist. In view of the increased attention that Young's ideas are bound to receive in the scientific and philosophical communities, we have felt it important that the basic concepts of the theory of process be presented in summary form readily accessible to the interested reader.

The theory of process can be approached at three different levels. Its basic ideas of evolutionary process (teleological thrust, fourfold reality, the reflexive arc of seven stage process, and the quantum of action representing the active principle that guides evolution) can be grasped at a general or intuitive level without a detailed understanding of underlying formalisms. Brief outlines of these ideas are provided in Appendix I of Young's *The Reflexive Universe* (see Resources, page 45). Many of the concepts have parallels in ancient philosophy and religion which the reader may recognize.

A second level of understanding is formal and rational. Serious students of Young's work quickly appreciates that they are dealing with an integrated conceptual system that will require a real commitment on their part if it is to be mastered. Unless they have been fortunate enough to have been exposed to Young's thinking directly and over a period of time, they will need to undertake intensive self-directed study of Young's published work. These

essays seek to bridge the gap between these first two levels by explaining key analytical components of Young's system.

The reader should also be aware of a third esoteric level of the theory. The formalisms introduced in Young's books and discussed in these essays have been simplified to aid in their communication. However, once one has learned the language of process theory with its precise grammar and syntax and begun to apply it to an analysis of reality, still deeper levels of subtlety and complexity are revealed.

New Age Paradigms

Science has introduced us to a physical universe that is both wondrous and magical. More than we realize, the scientific vision, supplemented by an ever more sophisticated technology of observation, measurement, and computation, has captured our imagination. We can watch computer simulations of galaxies in rotation and collision on Carl Sagan's "Cosmos," observe the transformation of a caterpillar to a chrysalis to a butterfly through time-lapse photography, take a microscopic journey through the human body in the science-fiction motion picture *Fantastic Voyage*, and visualize the jewel-like atomic lattice structure of the DNA helix through three-dimensional computer-graphic displays designed at the University of California. In opening apparently endless new frontiers for human exploration and understanding, the scientific perspective has gained an effectively unchallenged position of supremacy in governing the thought of modern Western culture.

The "scientific paradigm" is so much a part of our implicit beliefs about reality that it is sometimes difficult for us to conceive of any alternative. The constellation of beliefs, values, and techniques that undergird Establishment science are centrally concerned with "scientific method." Among these basic beliefs, virtually the equivalent of dogma, are the canons that scientific truth is independent of the observer, i.e., objective; that experimentation is the only valid or admissible means of discovering truth, i.e., the use of the scientific method—observation, quantitative measurement, repeatability or replicability of experiments; that the universe can be understood by reason and rational analysis, i.e., by resolving a whole into its parts —reductionism, etc. This view of reality which permeates contemporary science is essentially a deterministic, nineteenth-century, classical perspective rooted in the assumptions of Newtonian mechanics. Major findings of modern physics such as the observer (experimenter, participator) effect, the uncertainty principle, and quantum inseparability have not influenced the basic methodology of science.

Limitation of the Scientific Vision

In general, physicists have been reluctant to face the implications of their own findings, especially concerning the primary status and complete indeterminacy of the photon, also known as light and the quantum of action. Many years ago, Einstein rejected the quantum theory (the unpredictability of basic events in subatomic physics) on the grounds that "God does not play dice with the universe." Even now, few scientists rejoice at their discovery that, at its most fundamental level, the universe is uncertain. Fewer still admit that the discovery demands a complete reorientation of science. Yet, most physicists do acknowledge that there is a categorical distinction between subatomic and atomic physics. They recognize that the formalisms of quantum mechanics at the subatomic level can be generalized to

include the older laws of classical mechanics that explained Newton's universe; however, Newtonian physics cannot be restated to explain the subatomic realm. In this sense, physicists accept quantum theory. However, they persist in conducting theoretical and experimental research that aims at restoring rational order and absolute predictability to the universe. They seem convinced that some final fundamental particle or set of "hidden variables" will be discovered to explain the ineffable. Theoretical physics has attempted to extend the conceptual categories and experimental method of classical physics as far as possible, adopting for example stochastic or statistical measurement and prediction. And the photon is relegated to being "just another particle," thus blurring the valuable theoretical distinction that is science's crown of achievement in the quest to understand the mysteries of the universe. In fact, according to the theory of process it may be the key to the greatest unsolved mysteries of all—What is life? And what is consciousness?

Science can distinguish living from nonliving physical matter but it has no generally accepted explanation of life. Because science has adopted an objective, physical, deterministic concept of reality, life is described as an emergent property of matter and consciousness as an epiphenomenon associated with highly evolved living matter.

Physical matter has a natural tendency to move into a state of disorder and chaos, what physicists call a state of thermodynamical equilibrium or "maximum entropy." In an isolated system, all motion will come to a standstill as a result of friction, electrical and chemical potentials will be equalized, and the temperature will become uniform. This "heat death" or eventual inert uniformity of a physical system is described by the Second Law of Thermodynamics. Living matter, however, avoids this decay to equilibrium by absorbing orderliness from its environment. Higher animals, for example, feed on the extremely well-ordered state of matter in complicated organic compounds. Physicist Erwin Schrodinger described this as "an organism's astonishing gift of concentrating a 'stream of order' on itself and thus escaping the decay into atomic chaos—of 'drinking orderliness' from a suitable environment." But why and how does life arise from inert matter? Why does it constantly transcend itself in the process of evolution? The theoretical models of open complex systems and dissipative structures advanced by the physical chemist Ilya Prigogine give us more sophisticated descriptions of the life process but leave the most important questions unanswered or unaddressed.

Challenges to the Current Paradigm

There is a growing sense of the inadequacies of the scientific paradigm and scientific method for explaining major aspects of reality or for guiding human evolution. Beyond the enigmas presented by discoveries at the frontiers of science itself, there are at least four areas of concern that challenge the contemporary paradigm.

1. The anomalous data of psychic or "paranormal" phenomena continue to accumulate to the point where open-minded observers admit there is a major theoretical problem to solve, i.e., current scientific paradigms cannot accommodate, let alone interpret or explain, what is going on.

The personal experience of "separate realities" by many who have experimented with "consciousness expanding" drugs since the 1960s has only added to public disaffection with science for its failure to address such issues. Those few theorists who are concerned with the problem see the necessity of a major theoretical advance involving perhaps the convergence of quantum physics with research into human consciousness or the incorporation of concepts such as holography or synchronicity.[1] Yet decades of research into psychic phenomena have produced no paradigmatic breakthrough.

2. Existing medical and clinical models of the human being have become increasingly inadequate for the needs and perspectives of health and counseling professionals familiar with developments in such related areas as humanistic and transpersonal psychology, biofeedback and control of the autonomic nervous system, and psychosomatic medicine and holistic healing.[2] Within the consciousness movement there is an awareness of the need for a more advanced, perhaps "multilevel" paradigm that incorporates insights from these areas as well as from non-traditional forms of medicine such as acupuncture, polarity therapy, chiropractics, and homeopathy.

3. At the more general level of society and world civilization, some social analysts and futurists like Willis Harman[3] of SRI International and the Institute of Noetic Sciences have questioned the viability of the "industrial era social paradigm," the social and institutional forms and supporting belief system that have evolved given the fundamental assumptions of the scientific paradigm. The dominant values of the industrial state paradigm (i.e., the development and application of the scientific method to technological advance, industrialization through the organization and division of labor, acquisitive materialism, manipulative rationality seeking control over nature, all supported by a pragmatic political-economic value system) have generated, in Harman's view, a set of insolvable dilemmas in economic growth, control of technological innovation, economic distribution, and meaningful work and social roles. These trends appear to "require a drastic and prompt shift in the operative values of the society and a corresponding change in its institutions," i.e., a new social paradigm.

4. Finally, underlying various criticisms of the current scientific world-view is a general sense of the alienation of Western man and a lack of perspective on the human condition. Some within the consciousness movement argue that modern Western man, by allowing science and technology to become religion, has lost his connection to his spiritual source and true nature—the Higher Self. They see an urgent need to recognize and reintroduce the spiritual dimension of reality, for without this sense of direction and moral imperative humankind will remain self-alienated. Even those who are not comfortable with such an explicitly "spiritual" perspective still wonder whether questions of meaning and purpose (such as teleology in evolution) can justifiably be excluded from serious discussion by the ruling paradigm.

Paradigms and Paradigm Shifts

While these various dissatisfactions with Establishment science and the scientific value system of Western science are telling, they have yet to be articulated in any persuasive critique of the scientific paradigm per se. Majority opinion in both the scientific community and general public remains overwhelmingly committed to a scientific and technological vision of the future.

Nonetheless, the conscious search for a new theoretical framework for viewing reality, what we shall define presently as a "paradigm," has begun. Philosophers and historians of science like Thomas Kuhn (who introduced the term paradigm to popular discussion with publication of *The Structure of Scientific Revolutions* in 1962)[4] have made us self-conscious of the implicit beliefs that underlie and guide much of scientific inquiry and that in turn shape the average person's understanding of reality.

The concept of paradigm has been much overworked and abused since it became absorbed into the semi-official jargon of the consciousness movement during the 1970s. Because it is a key concept in this essay, we should examine the meaning of the term as introduced by Kuhn.

Kuhn is preoccupied with the way science per se develops, with the successive revolutions in scientific theories, the major turning points associated, for example, with the names of Copernicus, Newton, Lavoisier, and Einstein. Periodically in history, the scientific imagination is "transformed." Each of these scientific revolutions involves a transition from an old to a new paradigm. The field of theory concerned is reconstructed from new fundamentals.

Kuhn defines the term paradigm in two distinct senses. In the more general or sociological sense, paradigm means "the entire constellation of beliefs, values, techniques, and so on shared by the members of a given [scientific] community." It concerns the group commitments, often not consciously articulated, that govern the behavior of scientific practitioners. A paradigm provides a "disciplinary matrix" that guides the scientific enterprise through symbolic generalizations, shared commitments to beliefs, values, and exemplars or shared examples. From this more general constellation, Kuhn selects one element to give a second, more limited definition of the term. Exemplars provide a scientific community with concrete puzzle-solutions or modes. The young scientist acquires in effect a group-licensed way of seeing reality by working with such concrete experimental examples or by "doing science" in the approved way. Method is emphasized with philosophical questions receding to the background.

It was Kuhn's discussion of the dynamics of a paradigm change that especially appealed to a broader audience. Paradigms guided the research of "normal science." Once a theoretical breakthrough had been achieved, research became a highly directed puzzle-solving activity to fill in the missing pieces. Paradigm-based research was predicated on the assumption that the scientific community knew what the world was like. New facts or anomalies that did not fit the scientist's theory-determined field of vision were simply ignored. This strongly traditional, conservative bias of normal science was

highly functional, Kuhn argued. Such resistance "guarantees that scientists will not be lightly distracted and that the anomalies that lead to paradigm change will penetrate existing knowledge to the core." Eventually anomalies will accumulate to the point where a creative scientific mind is able to see and articulate a new theoretical explanation, a new way of viewing reality. A paradigm shift, when it comes, Kuhn suggests, is like a gestalt shift—"... it must occur all at once (though not necessarily in an instant) or not at all."

It is not surprising that the concept of "paradigm shift" should take hold in the context of the 1970s. Uri Geller and numerous other subjects began bending metal through apparent psychokinetic powers. (Skeptics and professional magicians have sought to discredit Geller as a fraud but the evidence from experimentation with other subjects remains.)[5] If metal could be distorted by the human mind, our understanding of the physics of matter and consciousness clearly needed a fundamental transformation as well. Significantly, an international network of physicists, other scientists, and mathematicians sprang up in response to this challenge.

The fascination with psychic phenomena was only one facet of a growing public interest in paradigm change. At the level of social commentary and criticism, George Leonard, former senior editor of Look magazine and author-publicist of the new consciousness movement, popularized the concept of "the coming transformation" in Western industrial society, an historic sea change comparable to the transition from tribal to agricultural society.[6] A most eloquent and moving overview of the ferment of the 1970s in such diverse areas as science, business, politics, health, education, and religion has been provided by Marilyn Ferguson in *The Aquarian Conspiracy: Personal and Social Transformation in the 1980s.*[7]

In the process of popular translation, the term paradigm lost the definitional precision of Kuhn's analysis. It was interpreted in the broader meaning of a framework of thought, a scheme for understanding and explaining aspects of reality, or even a general philosophical world-view. Underlying the loose public discussion of paradigm shifts, however, was a radical vision that anticipated an as yet undefined New Age paradigm.

Quest for a New Age World-View

In the New Age vision, humankind is seen moving inevitably toward an historic transformation to some new stage of human development and social organization that in mythic terms could parallel the impending astrological change of ages from Piscean to Aquarian. This transformation will be accompanied by a major evolutionary advance—a quantum jump in our understanding of the cosmos and man's appropriate relationship to it. Many of the anomalies and dilemmas that now confront the scientific world-view and industrial-technological society will be resolved by this new level of understanding. A major and open question about the coming transformation, however, is the degree to which humankind can or will consciously anticipate and adapt to it. A formally articulated New Age paradigm, an integrated theoretical framework in the full sense of Kuhn's definition, could serve as a map or guide to what might otherwise be a far more disruptive and painful process of individual and social transformation. The task of

constructing a new paradigm thus becomes imperative. It is the prerequisite for man's *conscious* participation in human evolution.

Kuhn argues that a reigning paradigm cannot be displaced until an alternative paradigm is conceived and clearly articulated. This is the heart of the problem. The limitations of Establishment science and the scientific method cannot be "seen" in the abstract. They can only be understood from the viewpoint of a more comprehensive explanatory framework. The clear challenge then is to define a theory that transcends current science. What progress has been made in this direction? Among those theorists who are interested in paradigm construction three broad approaches can be identified:

1. *The "emergent paradigm" of science*—a new, still largely unformulated and fragmentary world-view that some observers feel is "emerging" from findings in quantum physics, open systems theory, neurophysiology, holography, etc.[8] The assumption that appears to underlie much of this effort at synthesis is that basic scientific method can be extended successfully (i.e., without sacrificing essential understanding) to new areas such as subatomic physics and the study of states of consciousness. In other words, the findings and implications of science can be progressively accommodated by an extension of the current paradigm of the physical sciences. This approach is really the scientific paradigm in a new guise.

2. *An additional "complementary paradigm"*—an alternative interpretation of the findings and implications of the new physics, consciousness research, and other sciences advanced by Willis Harman.[9] Science has built our knowledge of the objective sense-perceived world; now another approach is required for the creation of a similar body of knowledge about "the 'other half' of human experience—inner, intuitive, noetic." The essential characteristic of this complementary paradigm, according to Harman, is "that consciousness and its contents are primary data, rather than being secondary and derivative as in the conventional paradigm. Where the conventional paradigm involves reductionist models, the complementary paradigm would add holistic models; where the first employs deterministic (or stochastic) explanations of events, the second would add teleological, purpose-recognizing explanations; where the first is little involved with matters of value and meaning, the second finds these of central concern; where the first is dominated by technology focused values of prediction and control, the second would tend to value understanding relating to human well-being, development, and evolution."

3. *An "integrative paradigm"*—a meta- (or higher-level) paradigm that provides a comprehensive framework for interpreting scientific and other categories of knowledge. Such a paradigm would relate and connect through an appropriate metalanguage the scientific paradigm and complementary paradigm projected by Harman as well as "spiritual" or mystical views of reality.

An important contrast needs to be made at this point. An integrative metaparadigm assumes a level of understanding above or transcendent to that of scientific paradigms (i.e., all the paradigms discussed by Kuhn as well as the

"emergent paradigm" of science). It should be recalled that only by separating itself from the authority and dogma of the church and by direct appeal to man's reason was science originally able to establish its own authority and since make the enormous advances that have shaped our culture. In the areas it has claimed, science has unquestionably opened our understanding of the universe, steadily expanding human consciousness in the process. And it will continue to do so. That is not the issue. The scientific view of reality, however, limits itself by the very methodology that underlies its success. That which cannot be objectively described and validated is excluded: questions about the nature of supreme being or deity, whether purposeful design is revealed in evolution, what place man occupies in the cosmos, and what is the meaning of human existence.

Elements of a Metaparadigm

The shift from the scientific paradigm to an integrative metaparadigm is a higher-order paradigm shift than Kuhn's analysis suggests or allows. What is involved are two fundamentally different ways of viewing reality. The scientific paradigm, no matter what advanced form it may take, cannot "see" the universe as a whole. The integrative metaparadigm *includes* the scientific paradigm as a sub-paradigm appropriate to the study of the objective aspects of the cosmos, i.e., only part of the whole. It accepts and incorporates the findings of science but sees the universe holistically at another level. Unlike the approach of the complementary paradigm which seeks to establish an equality of status for outer and inner knowledge (which would still leave them "separate but equal") the integrative approach posits an interpretive framework that is more comprehensive and hence superior to that of science.

This distinction, which is blurred in much of the discussion, is bound to be controversial. Until it is clearly recognized, however, we cannot begin to define the requisite features of a New Age paradigm. Proceeding on the assumption that a viable New Age paradigm will be a metaparadigm, it should incorporate at least five features.

First, an integrative paradigm should be consistent with and able to incorporate and use the findings of science. Science is the essential reference point for the rational Western mind and while an integrative paradigm has a higher point of reference, it must honor the achievements and comprehend the working language of science if it is to gain any meaningful degree of acceptance in our culture. This is a sine qua non. To be relevant, an integrative paradigm must be grounded at one end in a scientific understanding of the universe. Metaparadigms of a mystical or religious nature, such as the world-views of Buddhism or Hinduism, may have considerable appeal and value within the consciousness movement but without a scientific grounding cannot be "integrative" in any deeply satisfactory sense to the Western mind.

Second, an integrative paradigm assumes and requires the development of a metalanguage that relates and makes possible communication between religious or mystical and scientific world-views. The importance and difficulty of this task should not be underestimated. We need a twentieth-century translation of dated and emotionally loaded terms appropriate to a contemporary understanding of "spiritual" and "psychic" (nonobjective) aspects of

reality. The approach of defining parallels between science and religion as in the underlying concepts of modem physics and the basic ideas of Eastern mysticism is a useful beginning. The work of Carl G. Jung concerning the archetypal contents of the collective unconscious and evolution is also highly instructive.[10] A powerful and effective metalanguage, however, must define some necessary connection between spirit and matter and also indicate their hierarchical interdependence.

Third, an integrative paradigm should address the central fact of evolution of the life process and especially of the human being, "the crown of creation." It should be able to combine the best insights from contemporary science and from mystics like Teilhard De Chardin,[11] while maintaining its own analytical rigor and interpretive power. The goal should be a breakthrough understanding of the process of evolution, including the mechanisms or means it uses up to and beyond the present stage of human evolution.

Fourth, an integrative paradigm will be cosmological in the broadest sense, dealing with the ultimate questions of the purpose and meaning of the universe. It should transcend the limits of a strictly scientific cosmology or of occult speculation to provide a modem interpretation of ancient cosmological myths and a greater understanding of man's destiny in the cosmos.

Finally, stating explicitly what has been implied in the foregoing, an integrative paradigm will establish the "spiritual" and nonobjective (in contrast to the material and objective) as the ultimate source and end of the universe, the final reference point for man's evolution, the transcendent ground of being. This is the most essential requisite for an integrative paradigm for the New Age and the one that sets a truly integrative paradigm apart from other efforts toward more comprehensive description or synthesis. St. Augustine observed "Thou hast created us for thyself, and our heart cannot be quieted till it may find repose in thee." A modern paraphrase might be that integration of our understanding will not be complete until we recognize and honor our source, the cosmic unity or whole from which all parts are created and to which they return.

These requisites—scientific literacy and understanding, a working metalanguage, a central concern with evolutionary process, a willingness to entertain the deepest cosmological questions, and an acceptance of the spiritual as the ultimate ground of being—suggest an interrelated set of guidelines for meaningful work toward constructing a New Age paradigm. Others, of course, may be defined.

To the best of our determination, the work of Arthur M. Young on the theory of process is the only serious, extant effort of paradigm construction at such a meta-level.

The Theory of Process

In his major book, *The Reflexive Universe*, Young introduces the reader gradually and in logical sequence to the basic concepts of his integrative paradigm, known as the theory of process. Throughout his work, he seeks to establish points of contact with the scientifically oriented mind, attempting to win a hearing from science as well as philosophy. Young views all major theories of cosmology not as rivals but as "partial or tentative expressions

of a unitary, universal theory leading to an ideal (and ineffable) center from which differences radiate like spokes of a wheel." "It is this faith," he remarks, "that is the cornerstone of *The Reflexive Universe*—the faith that if you follow any one theory to its ultimate limits you will get to the same center."

Though it is beyond the scope of this essay to provide a full explanation of the theory of process, we can portray the general features of the world-view provided by the theory.

The Pattern of Nature

The theory of process is first and foremost a contemporary statement of teleology—the study of evidences of design in nature or the idea that natural processes are directed toward an end or shaped by a purpose. Science excludes any suggestion of teleology, considering it a form of religious belief. Young replies that the design is there in nature to be seen by anyone who looks. Using the formalisms of the theory of process, he is able to describe the pattern he has perceived underlying the universe and evolution.

Universe as Learning Process

The theory of process asserts that the universe is a dynamic learning process rather than a static structure conveniently frozen in time for our observation. The essence of universal process is a "forward" thrust toward a transcendent goal—"forward" in the sense that the flow of time is irreversible, there is no "going back;" "toward a transcendent goal" in the sense that evolution demonstrates both direction and the property of continued self-transcendence. The manifest universe does not exist of and by itself but as part of a broader dynamic process—"self-realization," or in the words of the ancients, "so that God might come to (consciously) know himself (through experience in time)."

The physical universe has its source in and is derived from a prior or transcendent unity, a primordial unity or first cause, essentially nonmaterial and spiritual in nature. First cause is immanent as well as transcendent. By assigning a formal category to first cause, the theory is "open-ended" in the sense that it includes a box marked "unknown." No matter how much our knowledge may expand we can never eliminate this box. The best we can do is define the theoretical limits of our knowledge (as in the Heisenberg uncertainty principle and Goedel's theorem), but it is ever the nature of first cause that "it" is completely without limitation, qualification, or antecedent. No matter how vast our finite knowledge, it can never circumscribe that which is infinite.

Young's insight into the nature and significance of the quantum of uncertainty is an essential component of his theory and one of his most profound gifts to science. Modern physics since Max Planck accepts the fact that light or action is "packaged" in irreducible quanta or units known as photons. While the energy of a photon varies in direct proportion to its frequency, Planck determined that photons in nature must always package their energy in units of action of constant invariant size. Since all chemical and molecular activity is dependent on the transmission of quanta of action from one point to another, i.e., all activity comes from photons, *the quantum of action can be viewed as the fundamental unit of the universe*. Photons have no rest

mass and no time. We observe them moving at the speed of light, which is more significant as a boundary condition of the physical universe than as a measure of the photon. They are as nonmaterial and ephemeral as anything in the manifest universe. The quantum of action also happens to be exactly the same size as the minimum uncertainty of Heisenberg's uncertainty principle, suggesting that it is equivalent to a quantum of uncertainty. Action is totally unpredictable. Science can never penetrate its mysteries.

While science balks at the implications of its own findings, Young accords action and uncertainty primary status in his cosmology as the equivalent of first cause (that which has no antecedent) or free will.

Fourfold Structure

Another principle recognized and reinstated by Young is that the physical universe has come into existence or been "generated" through a sequence of four stages, levels, or layers beginning with pure spirit or consciousness and concluding with physical matter. The "four elements" of the ancients (fire, water, air, and earth) are to be interpreted as representations of these four aspects of reality which can also be expressed formally as categories. Through an analysis of the ontology of dimension (the sequence through which the dimensionality of space and time comes into existence), four logically distinct categories can be established. They range from what is totally free and unconstrained and nonobjective to the complete constraint of the objective spacio-temporal realm.

These distinctions are not arbitrary but reflect an underlying set of divisions and associated qualities in the universe. They can be expressed visually in more than one form—for example, as coordinate axes (like the four directions of the compass) or as separate levels or layers (four separate areas on a diagram).

The theory of process demonstrates that the four basic entities of physical science (photons, elementary particles, atoms, and molecules) are an important expression of the ancient fourfold because they give access to the powerful conceptual vocabulary of modern science. Such an interface with science, it should be stressed, was not possible until the scientific discoveries of this century, most notably quantum physics. Before 1900 science did not have an adequate conceptual vocabulary to make a fourfold distinction in physics.

Now it is possible to use the language of physics and formally trace the path of light, in the expression of high-energy photons or quanta of action, as it transforms into matter. At each successive level the uncertainty of light becomes more bounded, in ways that can be precisely stated by modern physics. At the molecular level, the imprisoned light quanta retain only the capacity of "timing" in the formation and dissolution of molecular bonds. These sparks of life make possible "the turn" or reawakening of spirit and the beginning of the evolutionary phase of process. Thus the fourth level, the physical universe, serves as a pivot or turning point between the involution of spirit into matter (the descent) and the evolution of life and consciousness (the ascent).

Seven-Stage Process

After the turn, evolution—the ascent from matter—requires the mastery, control, and use of each of the levels of the fourfold structure inherent in the universe. What was first a constraint to provide determinate means for life to organize, becomes the power and freedom required for life to expand and diversify. The theory of process portrays the stages of descent and ascent through the fourfold structure as a seven-stage arc that emphasizes the reflexive nature of the universe. The final three stages are represented by the forms of life—plants, animals, and man. Young demonstrates that process requires three categorically distinct evolutions in the manifestation of life: the evolution of DNA, providing the basis of cellular organization (fifth stage); the evolution of animal instinct (sixth stage); and the evolution of consciousness in human and super-human beings (seventh stage).

The Metalanguage

Keeping these major elements of the theory of process in mind we can now get a better sense of the gestalt, the higher-order paradigm shift implied in Young's insights. Young has unlocked some of the basic secrets of evolution and cosmology. The quantum of action in the process of realizing a goal reveals the dynamic pattern of evolution, a formally explicit pattern that is used and required for any evolving system, a pattern that can help to illuminate man's destiny in the universe and instruct the process of individual and social transformation. In deciphering the universal koan of process, Young has given us a basic vocabulary, the beginnings of a metalanguage for the higher-order paradigm shift that is so urgently required at this stage of human evolution.

Proofs of the Theory of Process

The reader may wonder whether the formalisms of the theory of process are arbitrary. The only way to answer that question satisfactorily is to delve into the theory oneself. For many readers, the first and overriding proof of the theory's validity is its fit with the observable data of nature. A careful reading of *The Reflexive Universe* suggests that the theory provides an accurate description and teleological explanation of evolution. The regularity with which seven-stage process recurs in evolution is convincing evidence of a fit. A certain amount of projection is involved in any such global mapping, yet nature supplies objective support for the theory again and again. It is hard to imagine that such a pattern is a complete projection of an individual thinker.

Even more impressive is the fact that this pattern of evolution revealed by the theory of process is not just a loose sketch of development or growth but a highly complex, interrelated, internally consistent structured process. When one considers the internal constraints of the theory—seven stages constructed reflexively through four levels of reality, stages on opposite sides of the arc mirroring one another in certain essential characteristics, a hierarchy of degrees of freedom (or, inversely, constraint), fourfold analytical distinctions, etc.—one would expect the theory, if unsound, to collapse of its own weight when confronted with data of the natural world. But the data support the theory as a whole. The logically inescapable conclusion is

that Young has hit upon something fundamental. His insights into process can be a projection of the mind only in the sense that the physical universe itself reflects the same underlying structure as mind.

Any doubts about the adequacy of documentation in *The Reflexive Universe* have been eliminated by the further research into "bioprocess" by Frank E. Barr, M.D.[12] Barr has shown how the seven stages of process can be used to describe and analyze cellular organization, the core dynamics of embryology, the germ layers (ectoderm, endoderm, mesoderm, etc.), the origin of neurosecretion, muscular development, and possible stages of the central nervous system. The remarkable mapping accuracy of process theory is repeated throughout. Not only is the arc-like pattern confirmed but also the inner dynamics and interrelationships predicted by the theory. Once again we are confronted by the signature of process and further questions about its meaning. Researchers and students of the theory of process may well effect a fundamental restructuring of medical science and education before a skeptical scientific community acknowledges the significance of Young's theoretical achievement.

While the first and main line of defense for process theory is its capability for mapping natural evolution, other proofs or supporting evidence should be noted. Young has developed a number of heuristic proofs or derivations of the fourfold involving for example Newton's laws of motion, the measure formulae of physics, real and imaginary numbers in mathematics, and the generation of spherical coordinates. While these may appear simple they are not trivial. Young's fourfold analysis of position, velocity, acceleration, and control, dealing as it does with the fundamental insights of Newtonian physics, is a rather profound statement. Mythology affords Young another kind of proof of fourness and sevenness, more numinous although less cogent to the rational modern mind. The most convincing proof of the fourfold remains the dependence of seven-stage process upon it.

In a similar fashion Young has collected proofs that the seven stages of process are fundamental. In Appendix II of *The Reflexive Universe* he shows from both topology and the postulates of projective geometry that seven categorical distinctions are necessary to a complete description of the physical universe.

Conscious Evolution

To conclude, all of the evidence suggests that the theory of process is a precise conceptual map of evolution and a sound theoretical base for a New Age paradigm. If we believe our findings, and can "see" in a gestalt a teleological universe moved by an active, nonmaterial principle, then we have made the higher-order paradigm shift that moves us beyond the scientific paradigm. The insights of process theory offer a powerful set of tools for advancing both science and an integrative understanding of the universe. It is probable that the answers to many of the enigmas that now confound science lie hidden within these simple yet profound insights as to how process works. Through Young's theory the universe is revealed to modern man as an open, creative process, a master game of ingenious design and marvelous complexity that now invites our full conscious participation.

Notes

1. See for example John Palmer, "Presidential Address" delivered at the 22nd Annual Convention of the Parapsychological Association, Moraga, California, August 1979.

2. Kenneth R. Pelletier, *Holistic Medicine: From Stress to Optimum Health* (New York: Delacorte Press/ Seymour Lawrence, 1979).

3. Willis W. Harman, *An Incomplete Guide to the Future* (The Portable Stanford; Stanford, California: Stanford Alumni Association, 1976).

4. Thomas S. Kuhn, *The Structure of Scientific Revolutions* (2nd ed.; Chicago: University of Chicago Press, 1970), esp. pp. 174–210.

5. John B. Hasted, "Paranormal Metal-Bending" in Andrijah Puharich (ed.), *The Iceland Papers: Select Papers on Experimental and Theoretical Research on the Physics of Consciousness*, Frontiers of Physics Conference, Reykjavik, Iceland, November 1977, Orb Foundation, London (Amherst, Wisconsin: Essentia Research Associates, 1979), pp. 95–110; For a popularized account of the "mini-Gellers" see John Taylor, *Superminds* (New York; The Viking Press, 1975).

6. George B. Leonard, *The Transformation: A Guide to the Inevitable Changes in Humankind* (New York: Delacorte Press, 1972).

7. Marilyn Ferguson, *The Aquarian Conspiracy: Personal and Social Transformation in the 1980s* (Los Angeles: J.P. Tarcher, Inc., 1980).

8. See Marilyn Ferguson, *The Aquarian Conspiracy*, Chap. 6, "Liberating Knowledge: News from the Frontiers of Science." "The Emergent Paradigm" was also the subject of an unpublished SRI staff report by Peter Schwartz and James Ogilvy in April 1979.

9. Willis W. Harman, "Implications for Science and Society of Recent Findings in Psychological and Physic Research," Cordoba Colloquium, October 1–6,1979.

10. See Aniela Jaffe, *The Myth of Meaning: Jung and the Expansion of Consciousness* (New York: Penguin Books, 1975), esp. Chap. 13, "Meaning as the Myth of Consciousness."

11. Pierre Teilhard De Chardin, *The Phenomenon of Man* (New York: Harper & Row, 1959).

12. Frank E. Barr, "Towards a Biochemical and Neuro-Endocrinological Verification of Young's Process Paradigm," September 1979, and "Application of 'Theory of Process' to Disease," January 1980.

Theory of Process

In this essay, our primary working assumption is that a high-order paradigm shift to a fundamentally different way of seeing reality is both necessary and possible at this point in history. That new gestalt has been achieved in the remarkable life work of Arthur M. Young. Young modestly claims that his vision is not new, that he has only correlated the findings of modern science with the teachings of ancient wisdom. The integrative theory expounded in his work is, he maintains, a description of how the universe works, not "his" theory. "Discovery," he remarks, "is simply being the first to see the inevitable." Young's central book, *The Reflexive Universe*, is written largely as an account of his discoveries as he applied the insights and formal analysis of process theory to the several kingdoms of nature. The book is a remarkable document in the history of science—as the personal account of a scientific visionary seeing the world in a new way for the first time.

Constructing the Metaparadigm

A new way of seeing reality, a gestalt, is either grasped or it is not. Thomas Kuhn observes that "the transfer of allegiance from paradigm to paradigm is a conversion experience that cannot be forced." A generation is sometimes required to effect the change. Young's theoretical breakthrough is difficult for many people to grasp because it incorporates projective (nonobjective) aspects of the universe such as purpose, goals, values, and motivation, which are formally excluded from or avoided by established scientific thinking.

In addition, the methodology used by Young to uncover the metaparadigm is diametrically opposed to that of modern science. Whereas science is ruled by inductive reasoning, Young found it most fruitful to utilize a deductive approach.

Deduction is the deriving of a conclusion by reasoning (inference) in such a way that the conclusion necessarily follows from the premises. For the problem of discovering a comprehensive cosmology that encompasses the findings of science, Young found that his premises were, of necessity, "first principles." His discussion of ontology, especially in his essays, constitutes some of his most original and important work and deserves thorough study. (Two key essays, "A Formalism for Philosophy" and "Constraint and Freedom: An Ontology Based on the Study of Dimension," are fundamental to an understanding of the theory of process. These are available in the collection of Young's major essays, *Which Way Out? and Other Essays.*)

By ontology Young means the "universal and necessary character of existence." Ontology is a field of metaphysics concerned with the nature of being or *kinds* of existence. What can we discover, Young asks, by working

from first principles? How does the universe come into existence? How is our objective, physical reality generated? An essential part of his approach is to interrogate the theory. "I have to trust the system to get any instruction from it," Young states. "I kept the same theory and made it talk to me. I forced out of it the reasons for its structure."

Such a deductive approach does violence to the sensibilities of objective science which foreswore any such guidance by first principles when it rejected the authority and theology of the church. Deduction guarantees the truth of the conclusion provided only the premises are true; but who is to decide on the truth of the premises and how? For science the answer is scientific method and induction. Induction moves in the opposite direction from deduction. It is the act, process, or result of reasoning from a part to the whole, from particulars to the general, from individual facts and experiments to universal theories and laws. To guide his research the scientist advances hypotheses which must survive testing (and which it should be noted come from the scientist's intuitions and not from the raw data). Scientific method may thus be defined as the program or policy of making hypotheses for the purpose of induction. The scientist, denying an authoritative system of first principles, must still rely on tentative hypotheses. Young has succeeded in identifying valid universal first principles and correlating them with modern science. The revolutionary implications of process theory lie in its power as a framework for asking and answering questions that lie beyond the specialized and fragmented interests of current science. In so doing it is able to assimilate and use the research findings of contemporary science on a comprehensive scale.

The Dynamic Universe

The concept of "process" is the single most overarching and inclusive term in Young's theory and a good starting point for a systematic consideration of his ideas. Process is a description and an interpretation of how the universe works. Young uses the term interchangeably with "time-structure," suggesting an underlying and definable dynamic. Process is initiated by a purposive, goal-seeking thrust, an initial venturesomeness that pushes it ahead. At its most fundamental level, the universe is a process put into motion by purpose, analogous to a learning experience. Ancient cosmologies speak of God wanting to know himself, seeking to actualize that which was only potential. This same undeniable thrust toward actualization is the essence of what Young means by process.

Thus, Young recognizes both "first cause" (in the guise of purpose) and a teleological (directed toward an end) design in nature, two admissions to theory that modern science has scrupulously avoided. Since at least Sir Francis Bacon, science has limited itself to the consideration of secondary causes, rendering itself a partial theory of the nature of reality. Young's aim in the theory of process is to achieve a comprehensive theory or metaparadigm that includes and is thoroughly consistent with the best science but which is capable of dealing with nonobjective, nondefinable aspects of reality beyond the accepted limits of science.

Young's investigation of how process works led him to some profound insights into the nature of reality. At the most general level, process or

time-structure exhibits several features. It incorporates "the arrow of time," the basic asymmetry of time, always moving ahead from the past through the present into the future. Young rejects the assumption of relativity theory that time is dimensionally interchangeable with space. The fundamental irreversibility of time must be included in any basic cosmological statement.

Process is defined as a series of actions or operations taken to reach an end. Process, accordingly, Young concludes, must have direction, build on itself, and use means to attain its goal, these means being determinate or predictable if they are to be effective. The free, initiating, creative play of purpose needs fixed laws, constraints, and a deterministic framework through which to realize its goal. Young's process paradigm deals expressly with this interplay of freedom and constraint.

Fourfold Reality

Young has discovered a specific pattern, an explicit design to process that repeats itself again and again in nature. The "structure" of "time-structure" has four categorically distinct aspects. Two of these aspects are objective while two are nonobjective or projective. Young devotes much of his second book, *The Geometry of Meaning*, to an exposition of the fourfold.

The importance of the discovery of fourfold reality to the construction of a New Age paradigm cannot be overemphasized. Science assumes that reality is monistic, i.e., that there is only one kind of ultimate substance. Mind, for example, is generally viewed as an epiphenomenon of the brain, not as part of a basic dualism in nature. New Age thinking, on the other hand, tends to accept a dualistic or loosely defined multidimensional view of reality, making a distinction between objective and nonobjective reality. Physicist David Bohm's contrast of explicate and implicate order points in this direction as does Carlos Castaneda's popularized teaching of "a separate reality." Young alone, however, has seen the power and necessity of a fourfold analytical interpretation of objective and projective reality. In order to function, universal process requires not one but two dualisms, two pairs of opposites that mediate each other.

The concept of fourfold reality is the formal entry into the theory of process. Unless one grasps it the full power of Young's insights and the formal integrity and validity of the theory will be missed. This is a major stumbling block since the concept is so totally foreign to most scientifically conditioned, rational thinking.

Why four and why only four? Young attempts to answer the question in several ways. Possibly the most accessible explanation is found in his example of the learning cycle (see Figure 1). This example is important because it emphasizes the unitary and cyclical nature of reality which, when analyzed, is broken down into four parts. It is essential to remember in the following discussion that Young views process as a unity, a dynamic potency whose division into aspects creates a tension between the parts. This is a cosmological principle of the first order: the parts are preceded by and derived from the whole and can only be understood with reference to the whole. The reductionist approach in science, in contrast, assumes that the parts are fundamental.

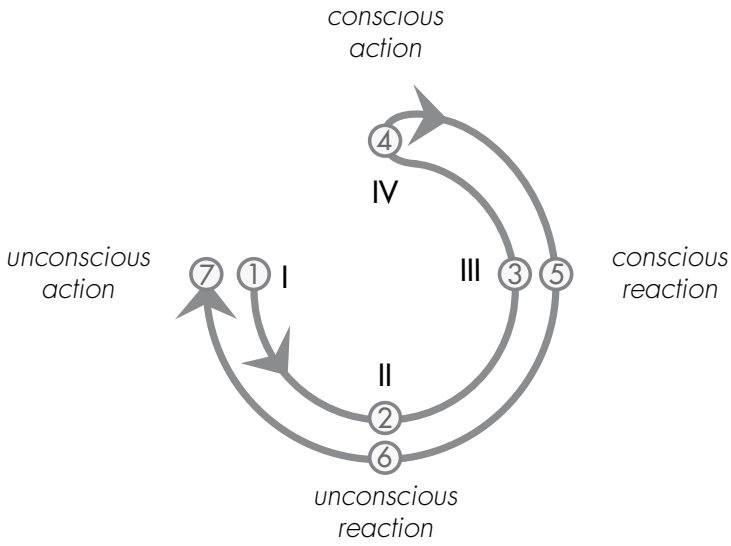


Figure 1. The Learning Cycle

Young describes how the child learns. He reaches out in a spontaneous act or in curiosity to feel some strange object. This is the instinctual starting place of learning, (I) thoughtless or unconscious action. If he touches a hot stove, he withdraws his hand instinctively in pain, (II) unconscious reaction. Next he observes the situation, reflecting on what has caused him pain. Eventually he makes the mental connection that signals an awareness of the situation, (III) conscious reaction. Finally he incorporates and applies that awareness to future encounters with stoves, exercising deliberate action or control, (IV) conscious action. Thus, there are four aspects in this learning cycle: (I) impulse, (II) feeling, (III) reason, and (IV) control or manipulation of physical reality. Through this cycle, the child acquires a conscious grasp of the world.

The proposal that these particular four distinctions are the correct and only way to categorically divide the flow of the cycle is given support by ancient philosophy. Young feels that the ancients had a far more profound, albeit intuitive, understanding of the universe than does modern man. Many of the ancient symbol systems, esoteric traditions, and mythologies incorporate a fourfold distinction and offer valuable clues to any attempt to verbalize the four aspects. The "four causes" of Aristotle are a good example. Aristotle analyzes an object such as a table in terms of four causes or aspects: (I) a final cause, its purpose; (II) a material cause, the substance from which it is made; (III) a formal cause, the blueprint or concept that guides its construction; and (IV) an efficient cause, the actual work of the carpenter in making the table. In the theory of process Young defines these four aspects of reality as: (I) First Level—purpose or potential, (II) Second Level—substance or value, (III) Third Level—form or concept, and (IV) Fourth Level—combination or formed substance.

Young represents the fourfold alternately as a set of coordinate axes and as four layers or levels (see Figure 2). These diagrams show a categorical distinction between objective (quantifiable, measurable, verifiable) reality and aspects of reality that do not lend themselves to objective study and com-

munication. We have little difficulty in acknowledging the objective physical reality of our sense perceptions or the objective mental reality of concepts, language, mathematics, and logic. Both are subject to confirmation and communication independent of the observer. Note that we are recognizing two types of objective reality—one is physical and the other is mental and nonphysical. It is less easy for us to understand nonobjective reality because of the focus the modern Western mind has on objective reality.

Returning to our earlier example of the fourfold, Aristotle's four causes, we can show that the ancient recognition of nonobjective reality was lost to modern science. Aristotle's final and formal causes were assigned by Bacon to "metaphysics" since they were less discernible in nature (being noumenal rather than phenomenal). "Physics" appropriately studied the material and efficient causes: the substance undergoing change and that by which change was produced. Gradually these two branches of "natural philosophy" were separated and by the time of David Hume the term "cause" meant only "efficiency," the energy expended to produce an effect. Natural science had become limited primarily to description rather than broad explanation. Efficient cause was regarded as the only cause. The fourfold causal order of Aristotle was reduced to the simplistic relation of cause and effect and to the modern dogma of determinism.

Young's treatment of fourfold reality is above all an attempt to reinstate these forgotten causal aspects, to give nonobjective realities the formal status they deserve in a holistic understanding of universal process. He begins by renaming the nonobjective, or what we commonly call "subjective," as "projective." Subjective suggests that these lost realities are merely creations of our individual minds, having no reality outside of our inner subjective experience. Young makes the important point that the concept of nonobjective or projective applies to the universe as a whole, not just to us. The solar system, for example, can be viewed as a purposeful organism that generates meaning and that "experiences" powerful forces and feelings. The ancients had the insight that man was a microcosm that mirrored the macrocosm of the cosmos. The theory of process comes to the parallel conclusion that all systems that are "in process" share the same basic fourfold anatomy.

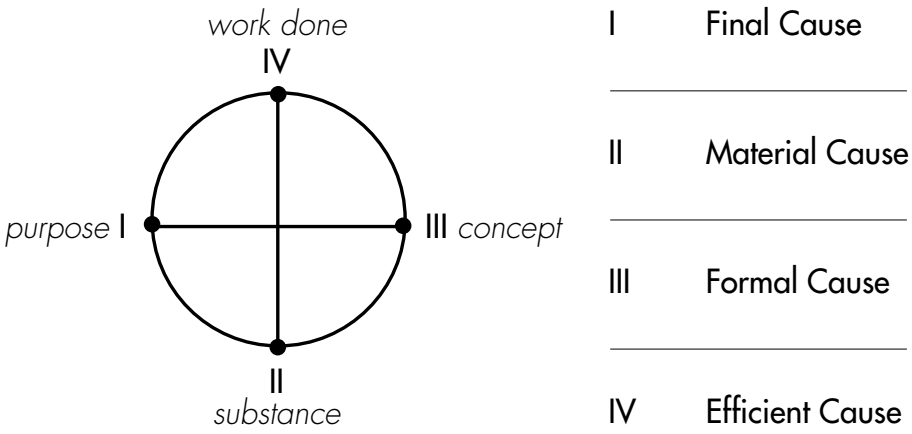


Figure 2. Fourfold Analysis

Just as objective reality actually comprehends two distinct aspects, one that is objective and physical and a second that is objective and nonphysical or mental, projective reality may be resolved into two separate aspects. Young describes these as (I) purpose and (II) substance or value. To the individual these are respectively our decisions or actions, and our emotions or "charged" motivations. At the cosmic level the two projective realms correspond to "first cause," the nonphysical, completely immaterial (i.e., "spiritual") active principle that initiates process, and to the underlying projective "substance" from which the universe is built, a substance that is both physical (although unformed in atomic structure) and psychic (emotionally charged). We will return later to the distinction between these two projective realms using physics as an illustration. An example that may be more familiar to the reader is provided in the depth psychology of Carl G. Jung. Jung's exploration of the unconscious was essentially an exploration of projective reality. Jung's realm of archetypes per se (archetypal contents) is coextensive with the second of Young's projective realms, that of "substance." The first projective realm is totally ineffable.

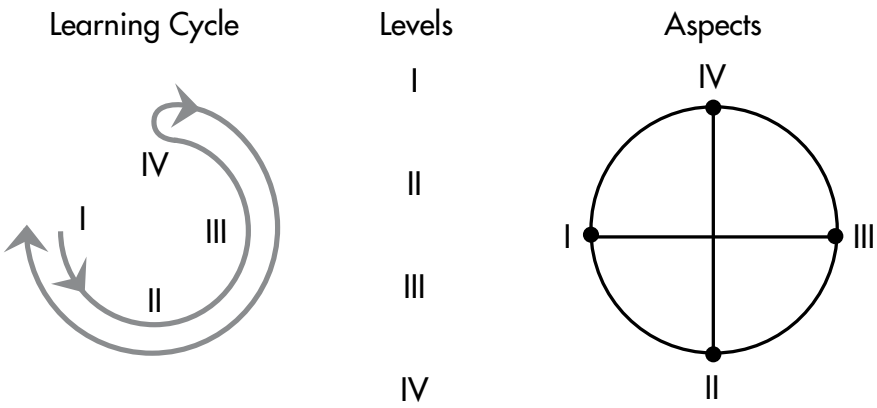
With the introduction of the diagrams of four levels and four aspects we gain something and we lose something. The reader may object, "How can you reduce reality to a two-dimensional mapping on a sheet of paper?" The answer is that you can't. Here we encounter the first of the simplifications and approximations in Young's theory, used in the service of advancing our understanding. Young, in his years of working on the helicopter, became a master of physical reality, developing his analytical skills through the use of simple models. In the theory of process, he uses this skill to extract profound meaning from deceptively simple formalisms like the fourfold. It is important to start with "first principles," Young argues, and to establish firm foundations before one wrestles with potentially confusing multidimensional geometries and advanced mathematics. The theory of process is primarily a conceptual or Third Level "mapping" activity, as is any effort to develop a paradigm. The map is not the reality, Young readily admits. But we must begin somewhere, as cognizant as possible of total reality and the interrelationship of its various aspects.

Young incorporates another categorical distinction between the four levels that is more subtle than the distinctions of objective-projective, and physical-nonphysical. He represents this distinction as the contrast between discreteness, (individuality, the quantum) and continuousness (generality, continuum) in physics and mathematics. He alternately uses the terms particular and general. The First Level (purpose) has a discrete or particular quality. First cause can be viewed as unitary. Decisions or actions are taken in wholes. We shall also see presently that the photon (the representation of First Level in physics) or light is packaged in discrete units (quanta of action) of invariant size. Fourth Level (formed substance) is also particular in the sense that, in objective physical reality (the three-dimensional space of our sense-perceived reality), no two objects can occupy the same space at the same time. The molecules of physical matter are in effect discrete units (we might say quanta of matter to contrast them with nonphysical light quanta which have no rest mass). The remaining aspects or levels are continuous or general. Second Level (substance) is like a "psychic sea"

where archetypes, constantly changing, flow or shade into one another. Third Level (form or concept) is general in the sense that a concept like "table" describes a whole class or group of particular objects.

We can now summarize these basic characteristics of fourfold reality and gain new insights into process (see Figure 3). The four levels suggest a hierarchy or sequence that is "open" at the top. The four aspects, on the other hand, suggest a simultaneity and underlying unity in the sense that one direction of the compass implies all the others.

Diagrams of Fourfold Reality



Characteristics of Fourfold Reality

I	II	III	IV
purpose	substance	form	material object
unconscious action	unconscious reaction	conscious reaction	conscious action
impulse	feeling	reason	control
final cause	material cause	formal cause	efficient cause
potential	value	concept	combination
projective	projective	objective	objective
nonphysical	physical	nonphysical	physical
particular	general	general	particular
not in time	temporal	not in time	temporal
intuition	emotion	intellect	sensation

Figure 3.

The diagram of the four levels suggests that the projective levels of reality precede and are hierarchically superior to objective reality; that process requires two mediating, general levels of reality or "media" in moving from a projective, particular origin or source ("pure spirit" or the "ground of being") to the objective physical universe; and that process alternately uses or requires nonphysical and physical realities. The diagram of the four aspects affords an equally revealing perspective. The basic distinctions of objective-projective and particular-general appear as paired opposites. Fourfold analysis, Young holds, is useful in revealing this "double oppositeness" underlying reality. In a fundamental sense, First and Third Levels and Second and Fourth Levels are opposites of one another. Process requires and uses these distinctions in creating the time-structure of the universe.

The diagram of the four aspects reveals another essential feature of the universe. First and Third Levels are aligned along a nonphysical axis (they share this feature), while Second and Fourth Levels are aligned along a physical axis. (Note that the nonphysical and physical realities stand at 90 degrees to each other, suggesting that they mediate the fundamental oppositions which process constructs.) A cluster of characteristics appear to be associated here. First and Third Levels are nonphysical and also nontemporal (not "in time") and noumenal. Second and Fourth Levels are physical, temporal, and phenomenal.

Young uses this distinction to restate and clarify the classic "mind-body" problem. The mind-body dichotomy, he remarks, is not a valid dichotomy but actually represents these "mental" (nonphysical) and physical axes (see Figure 4). Fourfold analysis reveals that two heretofore unrecognized dichotomies or dualities underlie the problem. "Mind" is in fact the dichotomy between curiosity (the need for concept) and knowledge (the concept). Intuition or projective mind is opposite to intellect or objective mind. "Body" is the dichotomy between emotion and sensation (a physical need and its supply). What we might describe as projective body stands opposite to objective body (see Young's essay, "The Mind-Body Problem," *Essays*, pages 127–141).

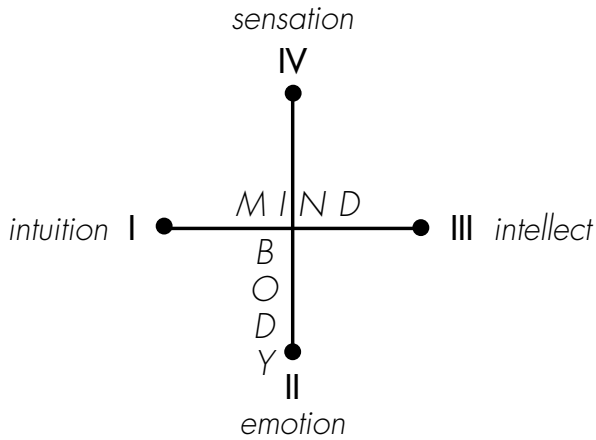


Figure 4. The Mind-Body Problem

Cosmology

Having laid out the structure of fourfold reality, it is now possible to set the picture in motion, and describe the cosmology expressed in the theory of process. Young uses both the language of physics and the imagery of mythology to effectively portray the seven-stage process by which the universe manifests.

Young begins his cosmological statement with an "undefined term." This is not a dodge, he contends, but a matter of getting first things first. "We must expect undefined terms, and it is proper that they should be the originating term in an ontological declension." This first indefinable term or the origin of generation may be called "zero-dimensionality." Alternatively, we can represent this First Level by "rotation" around an axis (through 360 degrees), a point without extension, primordial unity, or complete freedom or potential. In terms of the philosophical grammar and system he develops in

"A Formalism for Philosophy" it is the fact of consciousness itself, the formal unity of consciousness that underlies all experience. This unitary level is the primary or First Level.

The division of the primary unity of consciousness into a linear sequence of events, the breaking of the cosmological egg, generates the Second Level of reality. "Time flow" or "extension," next in priority to consciousness itself, may be represented as the movement of a point along a one-dimensional line. At this Second Level we are committed to an irreversible flow of time that is directly apprehended or known as the sequence of events that impinge on any given consciousness as its experience. While we might expect this first division of unity to be in two parts (such as the separation of past and future or of positive and negative particles in physics), in fact, Young emphasizes, it has a threefold character. A moving present connects past and future; charge attracts positive and negative entities. The threefold division is characterized by the incorporation of experience, by an asymmetrical dynamic, by a bias of action (or value), by a longing for completion. (Note; The threefold division, one of the more esoteric concepts in Young's cosmology, is further developed in *The Geometry of Meaning*, especially pages 25–31, 56–65. While we have stressed the rational fourfold division in this paradigmatic mapping, the reader should be aware that Young considers the threefold division to be even more fundamental.)

The Third Level emerges when the moving present or focus of awareness seeks to know again one of its experiences, tries to examine some part of its past. The conscious agent cannot double back and took at past experience, since it is on a line constantly moving into the future. To compare two events, the knower (on the line of experience) must recreate two simulacrums (images or representations) in a simultaneous space. Two dimensions are necessary for such a comparison: one to measure the specific variable being compared (say, the temperature of two objects), and a second to bring the two events together (while keeping them separate) for comparison. This analysis suggests that there is a distinction between two kinds of "knowing"; one that is experiential and subjective (projective in our terminology); the other, scientific and objective.

Young takes the position that the three dimensions of the physical world (3-space) are in some fundamental sense a combination of the one dimension of experience and the two dimensions of intellect (mind space), i.e., a "I + 2 dimensional world." We can visualize this in two ways. First, consider three-dimensional space as compounded of two-dimensional mental spaces strung on a thread of one-dimensional experience or "motion space" (see Figure 5). Like the frames of a motion picture film, they imperceptibly blur into one another as we move fast enough, forming an apparent continuum (solid space).

Alternatively consider how one constructs a cube or any three-dimensional figure. We use a series of views, each of which is two-dimensional (the plan view, end view, and side view as in a series of blueprints). We can perceive only one view at a time and must observe some convention, some sequence of operations in forming a three-dimensional sense of the object. Both objective description and the experience /participation of the observer

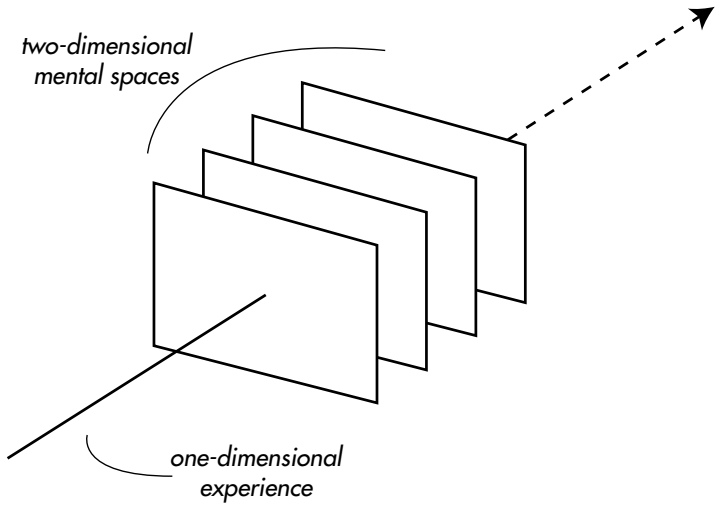


Figure 5. The 1+2 Dimensional World

are necessary. As Young notes, "we must use both the threefold (observer-oriented) and the fourfold (objective) 'way of knowing' to account for objects in three-dimensional space." This is another way of describing time-structure, the essential feature of process.

With the three dimensions of physical objects, the Fourth Level brings us to an end to dimension. Applying both the threefold and fourfold divisions we reach a new unity, unlike the initial unity of consciousness—the unique physical universe of our senses. Young suggests that this level, like the First, is also in a profound sense ineffable:

> Here "consciousness" is divided indefinitely. For even if there are a finite number of objects (i.e., 10^{71} particles in the Eddington universe), their combinations are more numerous still. This, then, is the floor; consciousness has been spilled upon it, infinitely dispersed. But we must recognize this floor, like Everest, because it is "there"—and there is a unity of its own, the unity of thereness ... Three-dimensional space constitutes a sort of terminus to the fragmentation of the unity of consciousness. Due to its own unity, it presents a barrier to the proliferation of further spaces and enforces a reality to otherness. It is only here that the tangible object prevails ... It is here that determinism applies. (From "A Formalism for Philosophy" in original essay version.)

Reviewing the order of generation we can now see what Young means when he concludes that "our learning of the world involves the superposition of several worlds." These worlds are actually steps in the disappearance or dismemberment of an initial wholeness. Mass, length, and time—the basic measures of physics—are not the fundamental features of the universe but only aspects of some prior unity. Behind the "real" physical world of our senses lies the world of form, and the world of experience in time, and the point of initial and final reference—the self or the ultimate knower. These abstract realities support three-dimensional reality, Young observes, "like the pins of a great steel door to a bank vault, so that if one but had the key, all would be open to him."

Dimensions and the Entities of Physics

We are now at a point where it would be useful to consider Young's definition of the term "dimension." Young rejects the mathematical sense of dimension and shows that it is inappropriate to an understanding of cosmology. The universe is three-dimensional, not n-dimensional. These three dimensions are associated with the successive divisions of unity or zero-dimensionality. The complete freedom of the First Level is lost: 1) in the commitment to an irreversible timeflow at the Second Level (the one-dimensionality of extension or "motion-space"—note that this dimension of experience involves both time and space but precedes the conceptual comprehension or measure of either. Young refers to it as "time-like" because of its asymmetric dynamic); 2) in the cessation of time-flow (in the conscious agent) and creation of a "mental space" (or Third Level) perpendicular to the one-dimensionality of experience (the two-dimensionality of comparison and measure that makes concept, form, and definition possible—note that the two dimensions of this level are static and "out of time" or "space-like" in Young's terminology); and 3) in the combination of substance (the extension of Second Level) and form (the conceptual space Third Level) to yield the uniquely determined three-dimensional physical universe, the Fourth Level.

Young's "dimensions" are actually constraints or loss of freedoms. In generation we move from complete freedom to complete constraint (from pure "spirit" to pure "matter"). Furthermore, Young shows the direct correspondence between dimensionalities and the basic entities of physics: photons, nuclear particles, atoms, and molecules or molar matter. Science has been dealing with representations of fourfold reality without recognizing their deeper significance. Young applies the ontological distinctions made by the theory of process to achieve a new understanding of physics, as diagramed in Figure 6.

Level I

The photon or pulse of light represents the zero-dimensionality of the First Level. Photons have several features that give them a unique status in physics, Young argues. A photon of appropriately high energy can create (condense into) a pair of charged particles (such as the proton and antiproton or the positron and electron). Photons are also the end point of "gravitational collapse"—the "singularity" of the black hole. The energy of a photon increases as its size or wavelength decreases. Thus one can visualize the universe as originating in a single photon of infinitesimal wavelength and almost infinite energy (or ending in a black hole that packs matter into an ever smaller area).

Young regards the photon as the primordial entity of nature. The beginning of all things is light. In *The Reflexive Universe* he concludes that "light is the unitary purposive principle which engenders the universe, and that is the nature of first cause" (see *RU*, pages 10–31). In terms of dimensional analysis, the photon is point-like, is associated with frequency (rotation), and has three degrees of freedom (complete freedom or "uncertainty"). Within a second a photon can be 186,000 miles away from its origin in any direction.

LEVELS	DIMENSIONALITY	UNCERTAINTY	ENTITIES OF PHYSICS	MOLECULAR BONDS
I	**Point** *(zero dimensions)* 	**3° Freedom** *(complete uncertainty)*	**Photon**	**Metallic** *(free electrons)*
II	**Line** *(one dimensional)* 	**2° Freedom** *(uncertainty of position and momentum)*	**Nuclear "Particle" Force**	**Ionic** *(charge, communal attraction)*
III	**Plane** *(two dimensional)* 	**1° Freedom** *(uncertainty in the timing of an atom radiating or absorbing energy)*	**Atom**	**Covalent** *(formed, contractual)*
IV	**Solid** *(three dimensional)* 	**0° Freedom** *(uncertainty in phase timing)*	**Molecule**	**Ionic plus Covalent** *(functional)*

Figure 6. Dimensions and the Entities of Physics

It is the most unqualified, indeterminate unit in the manifest physical universe. It has no rest mass and no time. The observed velocity of light is a boundary condition of our universe, Young notes, rather than a limitation of the photon. In relativity theory, clocks stop at the speed of light.

The photon may also be defined as a unit of action equal to Planck's constant. The photon in its representation as the quantum (discrete unit) of action plays a fundamental role throughout the theory of process. It is essential that the reader grasp the significance of the quantum of action as a term in physics before he can understand Young's use of it.

Light has the truly remarkable property that it can only appear in nature "packaged" in units of exact, constant, and invariant size. Photons come in all energies (and corresponding frequencies) from highly energetic cosmic rays, to less energetic x-rays, to ultraviolet through infrared light (the upper and lower limits of the visible spectrum of light are only a small range of the allowable frequencies or wavelengths of the photon), to microwaves, radio waves, and extremely low low-frequency waves. No matter what the energy level of a photon, however, it must be packaged in such a way that its combined energy and wavelength are exactly equal to the universal constant *h* or Planck's constant.

While the photon is completely free at the First Level, in order for it to interact with particles, atoms, and molecules, i.e., to participate in the manifest realities of the Second, Third, and Fourth Levels, it must take on the constraints of these dimensionalities. The unit of action, as we shall see presently, provides an exact description of the constraints the photon must assume at these levels. It is the photon's "price of admission," the ticket it must buy for entry into the physical universe.

This condition assumes enormous significance when we realize that the photon is the fundamental unit of the electromagnetic field and that all physical and chemical interactions in nature involve the exchange of photons. The quantum nature of photons governs all atomic and molecular change. Nothing can "happen" in the physical universe as we know it without the participation of light. We can and should thus consider the quantum of action the fundamental unit of reality.

Level II

The proton and the electron—the charged nuclear particles from which the physical universe is built—are, Young suggests, one-dimensional entities of the Second Level of generation. Unlike the photon, these fundamental particles have a permanent rest mass that makes the physicality of the universe possible. Nuclear particles have the essential, asymmetric threeness of the Second Level expressed as persistence, charge, and interrelation. Charge, Young points out, is asymmetrically associated with mass. The positive proton has a mass 1800 times that of the negative electron. "The 'desirability factor' in value," he concludes, "has its ontological basis in the asymmetry of nuclear particles: the electron revolves around the proton, not the contrary."

Nuclear particles also impressively illustrate the one dimension of constraint and the two dimensions or degrees of freedom that identify the Second Level. The constraint is persistence in time as "mass." A portion of the original energy of the photon is precipitated into an exact and known rest mass; the remainder continues as the product of two uncertainties, for example the position and momentum of the particle. The reader may recognize this as a statement of the Heisenberg uncertainty principle (which applies to a number of paired or conjugate variables used to describe a particle). A complete or exact description or definition of a nuclear particle is thus barred. Recall that definition and measure can only be achieved at the Third Level where two dimensions of constraint are available.

The uncertainty principle shows that as we learn more about the position of the particle, the less we know about its momentum. Our combined uncertainty can never be less than a quantity *h* or Planck's constant—the same Planck's constant that circumscribes the quantum of action! The quantum of action, Young reminds us, is also the quantum of uncertainty. A free decision or act by a conscious agent will appear unpredictable or uncertain to the outside observer.

The uncertainty principle thus provides a minute window (the size of Planck's constant), a "legal loophole" through which the quantum of action or consciousness can enter the physical universe unobserved and interact with the subatomic particles of Second Level reality. Its freedom of action, however, is now limited to two dimensions-the paired variables that describe the particle. Two of these conjugate variables, besides our illustration of position and momentum, are energy and time, i.e., the state of energy a particle may have over a period of time. (The uncertainty principle in this case is stated $\Delta E \times \Delta t \geq h$.) Young takes this point to emphasize again that action (*h*) is primary and energy secondary. Planck's constant is a cosmological goose egg which hatches out into the one-dimensionality, of the Second Level

producing time and with it energy. (Note: Action has the measure formula ML^2/T, where M is mass, L is length, and T is time. Young asserts that such divisions of action or the photon are essentially analytical. They are aspects of the totality, ways of dividing it into parts to which sense experience has access. Thus action as ML^2/T engenders time (T) and energy (ML^2/T^2), position (L), and momentum (ML/T), etc., i.e., the equivalent paired variables of the uncertainty principle.)

Science has tended to minimize the importance of this inherent uncertainty in subatomic (Second Level) physics on the grounds that it is too small to influence events in the real world of molar objects (Fourth Level). The uncertainties associated with individual particles tend to be distributed randomly and to "wash out" of the picture in the aggregate. Young instead emphasizes that the minute energy contained within Planck's constant can serve as a "trigger energy" in hierarchically organized systems, generating a cascade effect. A few physicists, such as Evan Harris Walker, have also suggested that human consciousness may be able to order uncertainty at the subatomic level producing a coherence effect that may help to explain psychokinetic or "mind over matter" phenomena.

Level III

Atoms, constructed out of protons and electrons in equal pairs (with additional neutrons as necessary for binding in the nucleus), are the two-dimensional entities of the Third Level of generation. The substance of the Second Level (nuclear particles with fixed mass but uncertain identity) now gains form in the precise orbital configurations, the shell structure of electrons, of each atomic element. Each kind of atom, with an atomic number equal to its number of proton-electron pairs, forms a separate letter in the alphabet of the periodic table (see *RU*, pages 56–66).

Unlike nuclear particles, the position of atoms can be exactly fixed. But atoms retain one-dimensional freedom. An atom is always free to emit or absorb energy in the form of photons. Its electrons can jump to different quantized energy levels unpredictably. In order for an electron to change orbits, however, Young observes, the shape of the orbit has to change. Since shape is determined by angular momentum and not energy, it is the angular momentum of the emitted or absorbed photons, i.e., action, and not energy that is critical to such changes. This point is subtle but important. Action in the form of angular momentum is primary, energy secondary.

The two-dimensional nature of the atom can be best illustrated by the plane of symmetry its orbital electrons establish. Within this two-dimensional matrix the form principle operates to create the precisely determined electron configurations of rings or shells (according to the Pauli exclusion principle).

Level IV

Atoms organize proton-electron pairs; molecules combine atoms. Through bonding, molecules, (the Fourth Level of generation) become stable or fixed. While molecules have a random motion at room temperature, it is not an inherent motion but is imparted by impact with other molecules agitated by temperature. At the molecular level the initial freedom of action is lost in

complete constraint. The last piece of uncertainty has been invested in the molecular bond. The determinism of physical law now holds. But even in constraint four levels are revealed!

The essence of the molecule, Young emphasizes, is not the constituent atoms, but the bond that holds the atoms together. Different molecules require different kinds of bonding. In the simplest molecules, the metals, which are monatomic, we find the metallic bond where free electrons drift freely through the metal (giving metal its conductivity). In simple compounds like the salts (NaCl, table salt, is a good example) we encounter a positive atom (sodium) and a negative atom (chlorine) held together by their opposite charges. Since charged atoms are known as ions, we refer to this as an ionic bond. Young calls it the sexy bond since it depends on mutual attraction. In more complex molecules, like the organic molecules of the methane series, we find a different kind of bond that does not depend on ionic attraction. Instead the combining atoms share two electrons, creating a relatively permanent unit. Young likens this covalent bond with its interlocked electrons to a marriage contract. (Salts, for example, dissolve in water. Oils, with a covalent bond, do not; nor do they readily combine with other molecules.) More complex molecules, functional compounds like alcohols, utilize both ionic and covalent bonding. Alcohol, which reintroduces the weak ionic bond in the form of the hydrogen bond, is soluble in water. Communal attraction results. "The married couples meet at a cocktail party and are attracted to one another; all sorts of combinations result." (see *RU*, pages 67–82)

The generation of the four levels and the imprisonment in matter of the quantum of action (which was completely free at the First Level as light) is only half of the story. We have merely set the physical stage on which the quantum of action will act out its creative role in a great cosmic drama. The creation of the physical universe, all of our discussion to this point, anticipates life.

The Seven-Stage Arc of Process

Process as a purposive thrust toward actualization creates determinate or fixed means as a basis for learning. This is the essential reason for the physical universe in Young's view. It serves as an anvil or forge where the hard lessons of experience are hammered out and eventually mastered by the quantum of action or monad. Mythology provides numerous images of a fall or descent into physical matter and an escape and return to higher realms. One of the most beautiful and suggestive of these is the gnostic myth of an original being, recounted by Marie-Louise von Franz in her book *C. G. Jung: His Myth in Our Time* (Boston; Little, Brown and Company; Chapter 6):

> Highly dramatic accounts are given by various Gnostics of the journey taken by the Light-Man or by the personified principle of light, the Anthropos, who is identical with the supreme godhead. At first he travels in a spiritual beyond but then, persuaded by evil star-powers, he falls or flows down into matter and is finally broken up into thousands of sparks of light or is scattered throughout matter as a "crucified world-soul," there to await redemption. His liberation is effected through the efforts

> of a Redeemer sent by God, or it may be the task of the single individual to free the pneumatic original being within himself and to return with him to the kingdom of light. The gnostic Anthropos myth lived on, underground, in the alchemical tradition and in Hermetic philosophy, down to the beginning of the contemporary period.

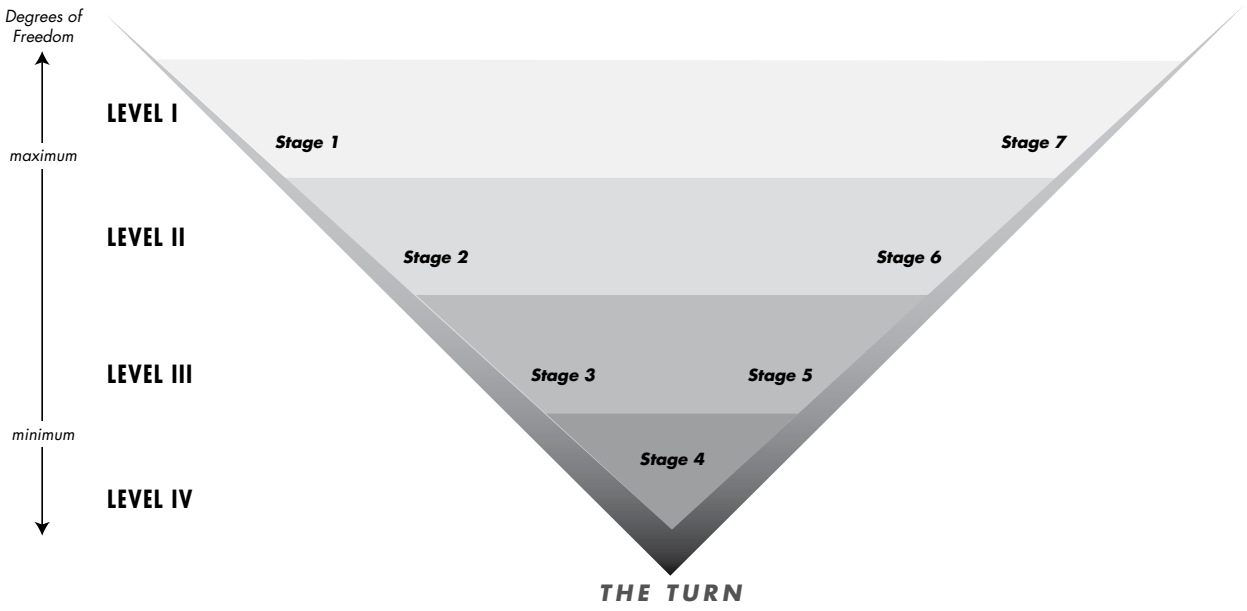
The next step in the development of process theory is to account for and formally describe this reflexive or bending-back-on-itself feature of the universe. Purposive action, Young observes, "calls for a universe that, though it evolves outwardly into manifestation, reverses entropy (through time inversion in imagination) to eventually become reabsorbed into a reservoir of potentiality." Process then requires a "turn" that initiates life (negentropy); that introduces voluntary control in place of involuntary, compulsive, random action; that begins to reclaim the freedom lost in the "fall" into physical matter. When this concept is added to the map of fourfold reality, a seven-stage arc-like diagram results (see Figure 7).

The "turn" is a central concept in the theory of process which connects fourfold reality and seven-stage process. Young attempts to explain it through two related ideas: 1) an inherent capability of the quantum of action to control timing and 2) a learning cycle that makes it possible for the quantum of action to learn correct timing. Young begins with the assumption that the quantum of action provides the spark of life. We have already seen how it initiates process as a photon and falls progressively into the complete three-dimensional constraint of matter. How, then, does it free itself and initiate the return to the First Level? What is the secret of life?

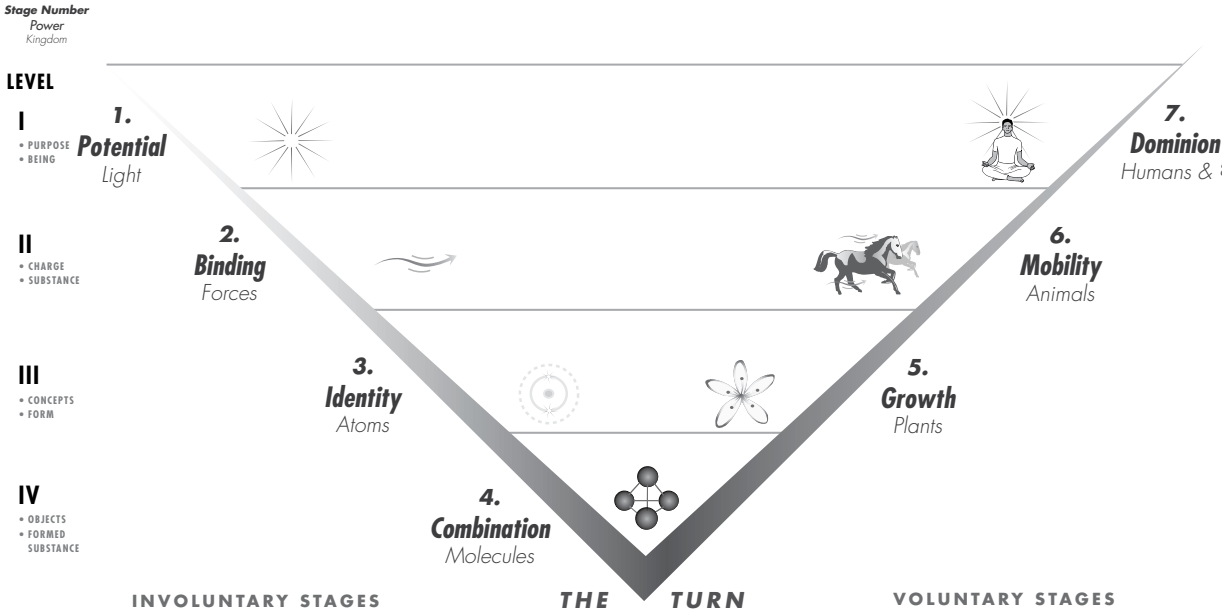
Young argues that the zero-dimensionality of the First Level contains an extra or hidden dimension—rotation—which the quantum of action carries through process as a kind of birthright. The sole requirement for the quantum of action to initiate life at the molecular level (i.e., begin storing order) is that it be able to discriminate time intervals within a period of rotation. Eddington found a similar extra dimension in relativity theory that he named the phase dimension and that was equivalent to a free choice of timing. This extra dimension could be represented as a cycle or circle of 2π radians. The phase dimension or rotation, in Young's view, provides the necessary condition for the reversal of entropy. This hidden freedom is still available at the molecular or Fourth Level where the quantum of action uses it to draw energy from its environment by judicious sorting.

The free phase dimension is also a learning cycle that allows consciousness, both in the sense of awareness and conscious control by an act of will, to enter the universe. Timing, not energy, is the critical ingredient in the advent of life, and the correctly timed control of energy must be learned.

We have now arrived at what Young describes in *The Reflexive Universe* as "the most important point of the whole arc (of process)"—the turn and its associated "twofold operator." Another simple example, the burning barn that roasts the pigs, illustrates the point. The naive observer of this natural disaster can make a conceptual statement of the law, i.e., "Burning barns cause roast pigs." Assume that he then discovers that roast pig is a delicacy and wants to enjoy it again. If he is imaginative he will see that he does



This simplified version of the Arc shows how the seven stages are portrayed as a descent and ascent through the four levels. The levels are shaded from light to dark in order to emphasize the gradual change from maximum freedom in the stages on Level I to complete constraint on Level IV.



On this rendition of the Arc, excerpted from the Theory of Prcoess Poster, the kingdoms of nature are mapped on the seven stages of process and the key word characterizing each stage is given in italics.

Figure 7. The Arc of Process

not need to wait for another barn to burn, but can make his own fire to cook pigs, inverting and using the law, i.e., "Cooking (imagined) causes fire causes cooking (actual)." By learning the law and then reversing the direction of time in his imagination, the operator is able to invert cause and effect. He masters and uses the law to escape from cause and effect to greater freedom.

This escape from the wheel of karma (the law of cause and effect or determinism) is illustrated by Figure 8. By following the cycle of learning the operator learns the physical laws at the Fourth Level. An act of self-limitation is required if he is not to repeat the cycle endlessly. At the 3/4 point in the cycle (the control point) he decides to act on the available information and not to get further involved. The only true escape from the wheel is for him to reverse his direction upon it. (Note: Young associates this "control" factor of 3/4 with Eddington's "stabilization of scale." Together with the 2π of

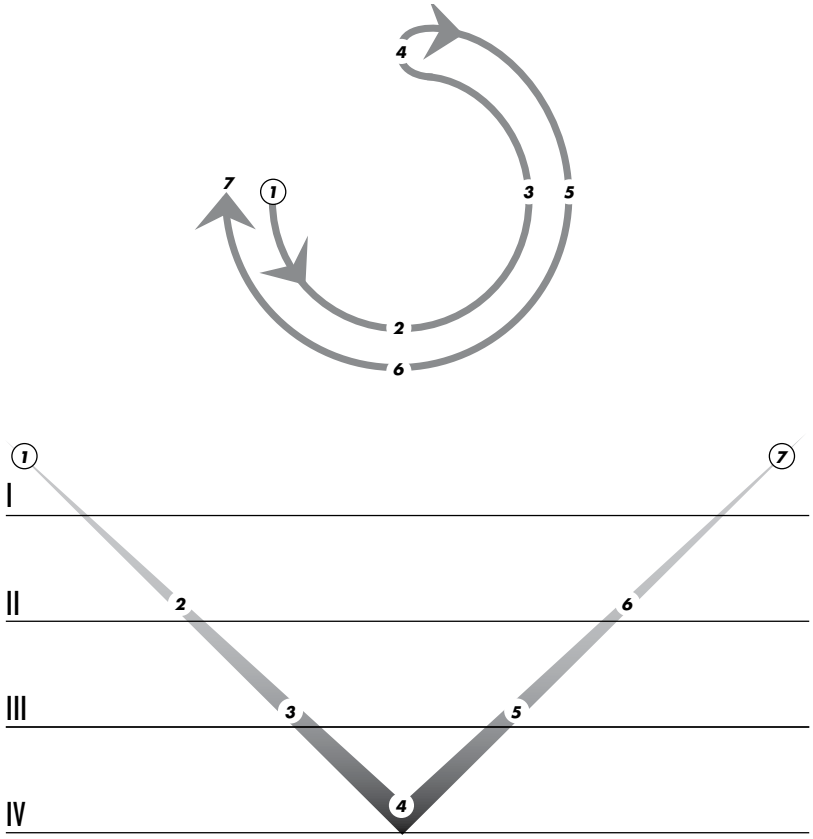


Figure 8. The Turn

"timing" it is the formal representation for the contribution of consciousness to the universe.)

This reversal of direction is the twofold operator. It is beautifully illustrated by a conscious agent with a lock and key. The key that locks the door also unlocks it, providing it is turned the other way around. The agent has to learn from experience which way to turn the key.

The twofold operator seems so simple as to be trivial. Yet it is a representation of the most important event in process and has a truly mystical quality. Young associates the turn with the idea of the virgin birth in various religious traditions and mythologies. It also has a parallel with spiritual reawakening or second birth. To the outside observer the event occurs spontaneously, miraculously. There is no physical father, no identifiable external cause. Rather it is an instance of the interaction of the divine with the physical, a

gift of grace that transcends the law. In terms of process theory, the monad must initiate the turn by its own efforts and unaided by natural law. It must draw on the spiritual prerogative (zero-dimensionality or rotation) that is its heritage from the First Level; it must become first cause.

Thus begins life, a second order of generation. The monad becomes a spark of creativity, starting with nothing but its birthright—the power to make things happen. Young represents the turn as a distinct point, the pivot of a 90-degree angle which symbolizes the newly discovered (remembered) freedom and change of direction in process. (Note: Young views process as moving orthogonally or at right angles between levels, i.e., nonphysical realities "mediate" or stand at 90 degrees to physical realities. At the turn the monad uses a hidden degree of freedom, rotation, to move orthogonally within the fourth level of reality. This turning back on itself is also represented by 90 degrees at the 3/4 point of the learning cycle.)

We can gain another perspective on the mystical nature of the turn through the "aha" experience of human consciousness. Young uses the key word "recognition" implying that one knows the answer all along. One "sees the light... in a flash" (instantaneously a connection is established between the First and Fourth Levels in the present, out of time and space). Generally some kind of work or preparation precedes the experience, but like "grace" in Christian theology it is unmerited. Young refers to "divine light"—"a positive creation of light" that illuminates our situation. It is that instant when creation at last comes to recognize itself. With this spontaneous act of recognition, man rediscovers his purpose and direction. His further evolution now requires a turn of consciousness back to its divine or projective origins.

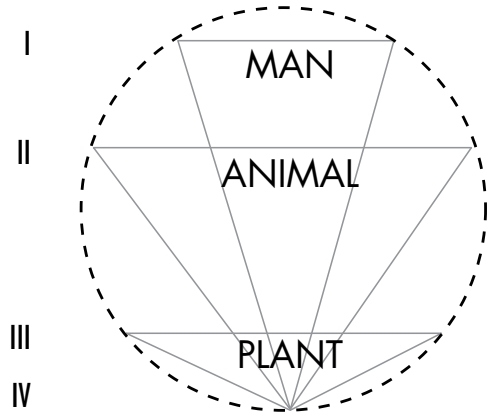
Three Evolutions

The two orders of generation we have noted (the generation of the four levels of reality and the second generation that begins at the turn, the increasing competence of conscious action) suggest the seven stages of process (seven rather than eight since one of the four aspects serves as the pivot). Young extends his analysis to show that evolution will involve three categorically distinct levels of life: plant, animal, and human. (The present state of man's evolution, in Young's view, does not represent the highest evolution.)

Assuming that the monad must regain the freedoms lost in the descent and that it traverses the levels in reverse order (from Fourth to First) Young formulates a novel characterization of these three distinct kinds of entity. The first type of entity regains one degree of freedom at the Third Level. This freedom enables it to move toward an infinitely distant goal but with no choice in direction. Thus, the first step of evolution is equivalent to conquering time, the first constraint that process takes on. The evolution of plant life or more specifically of cells fits this definition. Growth (the reproduction of cells) and self-propagation (through the seed principle) allow the plant to build negentropy (store order) and transcend time in the sense of its own life cycle. The seed is thus a three-dimensional object that has evolved a higher and hidden dimensionality. It contains an internal organization which can store or expend energy. This capacity of the plant

for unlimited growth and self-multiplication may be interpreted, Young suggests, as an "inversion" of the first constraint, extension in time. It inverts the initial constraint and makes it a power. The key words associated with this development are growth and organization.

A second type of entity evolves at the next highest (Second) level of reality—one that regains two degrees of freedom. Such entities have a choice of direction, movement in two dimensions of space, toward finite goals. This second step in evolution is thus equivalent to conquering space, the two constraints that process assumes with form or conceptual space. The volun-



LEVEL	III	II	I
Entity evolving	PLANT	ANIMAL	MAN
Regains	1° Freedom— *conquers time*	2° Freedom— *conquers space*	3° Freedom— *conquers time and space*
Power	growth self-propagation negentropy organization	mobility choice of position and velocity animation	dominion individual creativity consciousness

(Note: The diagram of the three evolutions is made within a circle. For the reasons underlying this formality, see Appendix II, "Seven-ness" in *RU,* pages 259–282.)

Figure 9. The Three Evolutions

tary motion or mobility of animals fits this definition. With two degrees of freedom, form now becomes subject to manipulation by motive. The key words associated with this power are mobility, animation, and transformation. (See *RU*, pages 110–116 for Young's definition of "animal power," an important concept in the theory.) An interesting and significant parallel between particles and atoms on the one hand and animals and plants on the other now becomes apparent. The uncertainty of position and velocity (the uncertainty principle) that characterized particles also describes animal entities. Similarly the uncertainty of contained energy (one degree of freedom) is a property of both atoms and plants on the Third Level. (The animal is free to move but unable to create its own energy, while the plant is fixed in position but able to synthesize energy from sunlight.) In moving between these two levels, process in effect "exchanges" freedoms and constraints. The freedom(s) of one level becomes the constraint(s) of the other and vice versa, suggesting a basic complementarity (see *RU*, pages 41–42, 111).

A third type of entity evolving at the First Level, Young suggests, has the power to move toward a non-finite goal together with the choice of direction. It combines the one-dimensional freedom of plants and the two-dimensional freedom of animals. Man's greater control of his environment, his greater freedom through the manufacture and use of tools, his creation of language and culture, all suggest a higher principle than that which motivates animals in pursuit of food. Young defines this power as "dominion," suggesting the completion of process and the mastery of all that has preceded it. The three evolutions are outlined in Figure 9.

The concept of the turn together with Young's ontological analysis of dimensions thus anticipates the completion of seven-stage process through three categorically distinct evolutions. As Young observes, "process involves seven stages-three and one-half to invest in means and three and one-half to divest itself of means."

A View of Process from the Arc

We can now summarize several features of process in terms of the arc:

- Process is initiated by a purpose, by the projection of a goal, and is not completed until the goal is attained. Because process incorporates experience and learning, it does not return to its origin unchanged. The advance from Stage 1 to Stage 7, while returning to the First Level, suggests a new level of development. Alternatively one can visualize a spiral to a higher level rather than a closed cycle. Process can return to the First Level only by going ahead. We can never go back to Stage 1, to some remembered "golden age." Nor can we anticipate the outcome at Stage 7. The universe is truly open and creative, and process is an adventure in the fullest sense of the word.

- Process develops and advances in distinct stages, seven in number. These distinctions in process are categorical and cumulative and are defined by the fundamental requirements of creating determinate means and of reflexivity. The characteristics of the levels already defined (projective-objective, physical-nonphysical, particular-general, and dimensionality) both delineate the levels unambiguously and provide the

context within which process must develop at each stage. Process, for example, must develop form (atomic structure) at a level (Third) that is objective, nonphysical, general, and that has two degrees of constraint and one degree of freedom.

- At each stage, process develops a new "power" or thrust. In our previous analysis of fourfold reality and its generation, we progressively defined the first four powers. With the turn three additional powers were suggested. These powers are identified by the key words for each stage of the arc (potential, substance, form, combination, organization, mobility, and dominion) and are described sequentially below.
- The stages and powers of process are cumulative; each new stage/power retains all of the powers developed in the previous stages. This cumulative feature of process was suggested in the generation of the four levels. An example is man who incorporates the nervous system and mobility of the higher animals of Stage 6 (chordates); the cellular organization of Stage 5; DNA, advanced proteins, and molecular combinations of Stage 4; etc. One can visualize process beginning as a wire at Stage 1 and adding a new sheath or covering at each stage, a crude analogy that makes the point.
- The powers of process are evolved sequentially in what Young describes as "kingdoms." These are separate realms in nature defined by the categorical distinctions noted above. They provide the reader an alternative set of key words for identifying the stages of process and serve as the organizational format for *The Reflexive Universe* and Young's grid of process.

STAGE	POWER	KINGDOM	
1	Potential	Light	(*RU* Chaps. 2, 3)
2	Substance	Nuclear Particles	(*RU* Chap. 4, *GM* Chap. 8)
3	Form (identity)	Atoms	(*RU* Chap. 6)
4	Combination	Molecules	(*RU* Chaps. 5, 7)
5	Organization	Plants	(*RU* Chap. 8)
6	Mobility	Animals	(*RU* Chaps. 9, 10, 11)
7	Dominion	(Man)	(*RU* Chaps. 12, 13, 14)

- Process, it must be stressed, incorporates a reflexive turn. This feature is overlooked or not developed in most other evolutionary theories which instead emphasize linear (usually upward) progression or development. "Process must go down before it can go up," Young observes. (Young refers to the descending or left side of the arc as "involution," the ascending right side as "evolution" proper.) The turn as a second birth or rediscovery of potential (zero-dimensionality) introduces the spark of life necessary for evolution. It transforms process. The turn

also suggests a fundamental economy of action in process. By turning back on itself process uses that which it has already created to evolve to higher levels. The stages on the right or controlled side of the arc invert or mirror the stages on the left side of the arc. For example, Stage 3 (atoms) takes on centers (the atomic nuclei) while Stage 5 (plants) throws off centers (seeds). Similarly Stage 2 (nuclear particles) moves compulsively by charge (between proton and electron) while Stage 6 (animals) uses charge (instinct, stimulus-response learned behaviors) to move.

- Process is "visible" to our objective sense perception only at the molecular or Fourth Level. (Psychics or sensitives claim to be able to perceive other levels although such perception remains to be verified or explained by objective science.) This is an important point to grasp especially concerning Stages 5, 6, and 7. We detect the power of organization at Stage 5 only through the pattern of organization we perceive in the molecular structure of cells. Similarly the mobility or animation of Stage 6 is visible to us only as the movement of tissue structures composed of cells and molecules. The theory of process indicates higher stages that include molecular organization as part of their cumulative development.

- Process moves alternately through nonphysical and physical levels (as suggested in Figure 2), an important feature that will be further developed when we reach the grid. The odd-numbered stages of process are essentially nonphysical (light, atomic structure, cellular organization, and human consciousness) although plants at Stage 5 and man at Stage 7 incorporate and build upon Stage 4 molecular combinations. This is a subtle point. The nonphysical organizational power of the plant is its essential defining characteristic, not the molecular formed substance we see. The even-numbered stages in turn are physical (nuclear particles, molecules, and animals), although here again only Stage 4 molecular combination is visible. Note that Eddington talked about two desks, an invisible physical desk at the microscopic level of electrons and protons and an objective molar desk perceived at the macroscopic level by our senses, which correspond to Young's Stages 2 and 4. At Stage 6, Young hypothesizes an "animal body" which like Stage 2 is also not objective. Animation suggests a dynamic syndrome of urges, pulls, and forces. The demonstration of such a "plasmic directable agency" is especially difficult because of its nonobjective or projective existence (see *RU* pages 131–146).

To conclude this summary of the arc of process it might be helpful to describe the seven powers of process in their sequential development. Process begins as *potential*—undefined purpose, unrestricted choice, complete freedom, and dynamic potency. The goal for the arc of process that is to follow is projected. Process, as it falls into increasing constraint, creates means. The first means, *substance* or extension in time, introduces charge (binding), the motivating force that sustains process in its forward thrust. Process moves by charge, the experience of incompleteness that drives it on compulsively. With added constraint, process takes on *form* or its own center that stabilizes the experience of charged substance but creates an illusory

reality of objective identity or separation. The two means of form and substance combine to yield formed substance or *combination* and provide the uniquely determined universe, the fixed setting, where process can learn to control or use means (through the turn). Process, to achieve its goal, must recall that goal and reverse its direction. First it gains the competence of *organization*. Through growth and reproduction it gives off centers or seeds, conquers time, and eventually transcends the limitation of separate identity. With *mobility* process learns to control the compulsive nature of desire energy that has sustained it. At the seventh stage, having the means it created, having achieved dominion, process attains its goal and completion.

The Grid and the Kingdoms of Nature

We now move from a fairly abstract discussion of the arc of process to a concrete application of Young's ideas and methodology to the evidence of the physical universe. Such an elaborate formal system, if mistaken in its assumptions, should easily collapse when tested against reality. On the other hand, if its initial premises are sound, it should find important support and extension. It is clear that the formal requirements of the arc, which Young has painstakingly deduced from first principles (ontological analysis), are supported by the facts of nature.

The first and guiding discovery of what Young calls "grid theory" is that the arc of process is recapitulated within the stages of process. When we examine an individual stage of process we find the same arc-like powers operating within the stage (see Figure 10.). Young calls this feature of process "self-mapping." "Each stage of process (or kingdom) is itself a process in which the power of the stage develops. The development of this power occurs in stages called substages, whose description correlates with that of the main stages." This is a scientific discovery of the first magnitude, and mirrors a tenet of ancient alchemy: "As above, so below; as below, so above." Just as there are stages ("substages") within stages, Young's further study into chordata (Substage 7 of the animal stage or kingdom) revealed further stages (sub-substages) within substages. Arcs within arcs within arcs... ! The overall arc is first broken into its seven component stages each one of which contains an arc. These seven stages (arcs) are then arranged in descending order. Each stage can in turn be broken into its seven component stages in a linear fashion (the V-shaped arc is effectively flattened) producing a description of process in a 7 X 7 grid.

Another important discovery of grid analysis is a regular "a-a-b" pattern of development that is repeated throughout process. Each stage (and substage) repeats itself before a new development occurs. The shell structure of electrons follows this pattern in the periodic table of elements. (First we have a 2 shell followed by a 2 shell, then a 6 plus 2 shell followed by another 6 plus 2 shell, then a 10 plus a 6 and a 2 shell followed by a second 10 plus a 6 and a 2 shell, etc. See *RU* pages 62–63.) The same a-a-b pattern appears in the development of cells and organs. The plant and animal kingdoms both begin from a single cell (see *RU* pages 116–124). Young concludes that the odd Stages (1, 3, 5, and 7) innovate and the even Stages (2, 4, and 6) repeat. Such repetition is required so that process may incorporate developments as it advances. Process progresses, Young observes, "by an alteration of in-

novation and recapitulation." This discovery that process requires memory imposes yet another theoretical constraint on the properties of the stages. Earlier we noted that process advances orthogonally through successive nonphysical and physical levels of reality. The a-a-b pattern confirms this, with the added observation that innovations occur at nonphysical levels and are incorporated at physical levels.

Examining the grid of *The Reflexive Universe* (see Figure 10), we can get a sense of its usefulness to Young in developing process theory. The four completed rows (Stages 3, 4, 5, and 6) permit both a finer-level examination of process and an elementary comparative analysis across stages. From these Young gained further important insights into seven-stage process. For example, in the atomic kingdom the pattern of electron shells developed in a definite cumulative sequence. When atoms were arranged in terms of binding energy of their nuclei, an arc-like distribution resulted. The enormous variety of molecules confirmed several properties of the arc. Certain features appeared across kingdoms including patterns of "chains" and "side chains" in higher-level molecules, plants, and animals. Young grew more encouraged with each new "bull's-eye for process theory." The Embryophyta (the mosses and liverworts) of the plant kingdom displayed an unmistakable Stage 3 development: identity expressed in terms of reproduction (the embryo is given an identity). The coelenterates of the animal kingdom similarly gained identity by forming a hollow chamber or stomach with a mouth ("coel" = hollow, "enterate" = stomach). Soon a pattern emerged and with it both overwhelming confirmation and penetration to a new and deeper level of mystery in process.

The evolution of molecules after the turn gives added support to Young's interpretation of process. Beginning with the polymers (chain-like molecules at Substage 5), higher-order molecules exhibit a lifelike capacity to grow, i.e., negentropic properties. Proteins (chain-like molecules with side chains at Substage 6) like actin and myosin, which constitute muscle tissue, are actually mobile chemicals or animated substance. The master molecule of life, DNA, stands alone at Substage 7 and reveals a seemingly incredible feature of process. DNA requires cells for the completion of its function; yet cells belong in the next higher stage of process. After inspecting the grid, Young concluded that all seventh substages require the next higher kingdom to function. Flowering plants, for example, depend on insects for their pollination. The dependence of seventh substages on the next higher stage suggested to Young that process, at the seventh substage at least, anticipates its own future. The fact that the photon always takes a path that gets it to its destination in the shortest possible time (the principle of least action) had implied a teleological feature of process (see *RU*, pages 16–18). Now, the entire grid implied teleological design.

Science and Spirit

Many parts of Young's message are directed primarily to science and to scientists, the high priests of our modern secular age. The theory of process constitutes a coherent attack on the limited and limiting assumptions of objective science and a call for a new, higher, integrative science. In this higher sense, science, no matter how resistant it may be to a transcendent

perspective, is inevitably, if unwittingly, our principal ally in the breakthrough to a comprehensive metaparadigm.

Although not developed in this essay, the theory of process has much to say to students of religion and mysticism as well. While conceptual mapping is a partial and limited mode for knowing reality, the proper use of intellect is nonetheless essential. As the Buddhists describe it, mind (or intellect) is the slayer of reality, but only mind can slay the slayer. Young would say static mental forms at the Third Level represent "non-Being," the polar opposite of Being at the First Level. We have to master the "yoga of thinking" before we can escape the trap of the Third Level. The reader who is familiar with the writings of Carlos Castaneda will recall don Juan's injunction to "clear the tonal" (master the realm of rational concepts) before venturing into the mysterious "nagual" (the realm of the irrational). That is our only sure grounding on the upward path. Realization requires the mastery of both intellect and emotions, and, as the theory of process indicates, in that sequence.

If we really believe the teaching "as above, so below; as below, so above" we must accept instruction in both directions. Granted the hierarchical superiority of spirit in the reflexive universe, it is unconscious spirit that seeks conscious realization through process. A spiritual interpretation of the universe that is isolated from our evolutionary understanding of science is necessarily incomplete and far less persuasive than an integrated interpretation of spirit as process. (The former attempts to describe the world from the First Level, the latter through an understanding of the unity of fourfold reality.) Process theory has revolutionary implications for religion. It offers a metalanguage and the possibility of bridging translations that can give religion a new legitimacy and contemporary restatement in a modern scientific era. Fourth Level reality is not the source but it is our base for testing reality. Through the concept of the three evolutions we can see that it is our basis for testing all higher realities. To deny that, no matter how pure our spiritual intent, is to cut ourselves off from the means toward further evolution.

In light of this fact, the value of Arthur Young's achievement in developing the theory of process cannot be overstated. The theory provides the map showing the communality of the worlds of science and spirit. With this unification, Young has given us the truly comprehensive cosmology that we need to solve our current problems and to successfully navigate the challenges of the next centuries.

The Grid

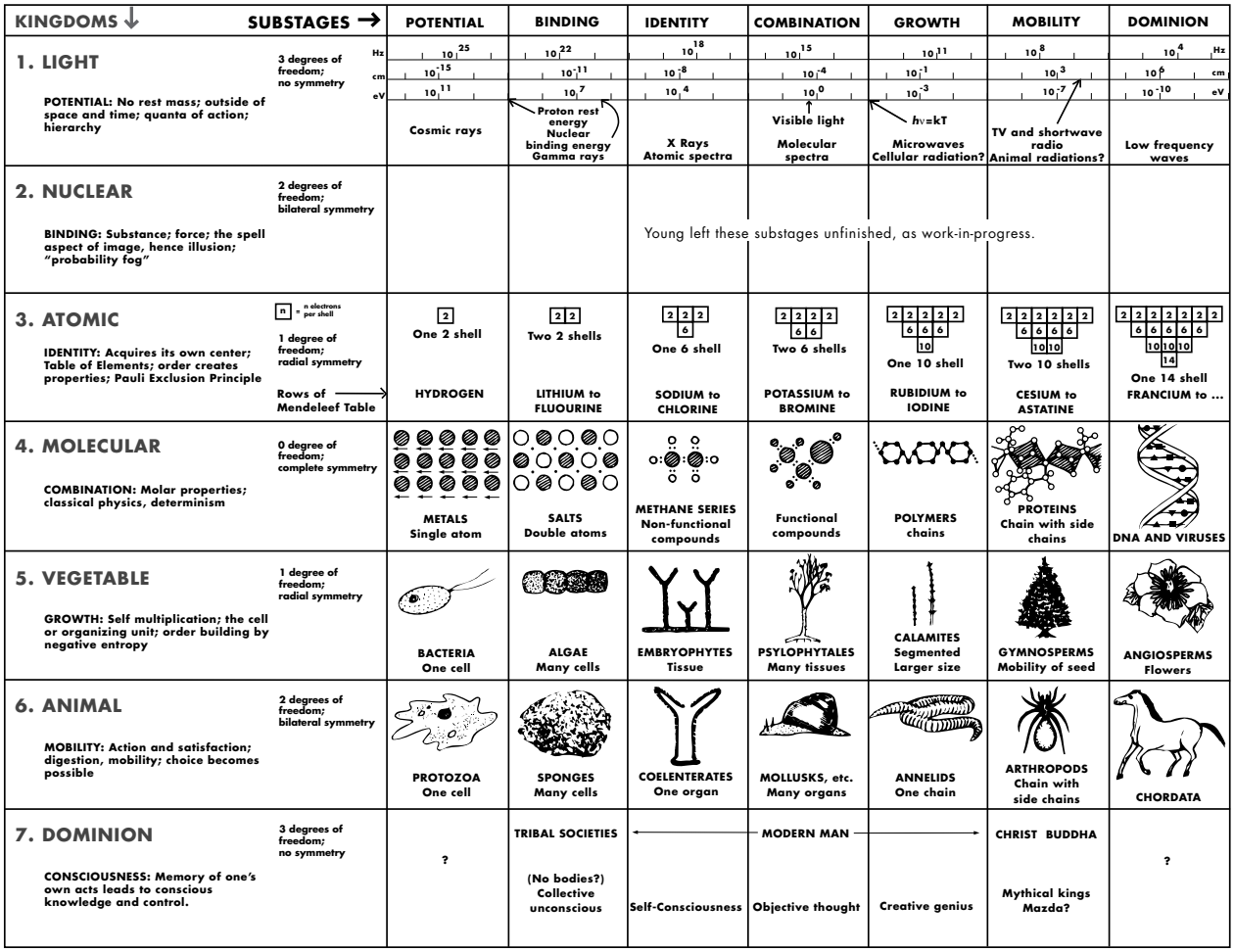


Figure 10. The Grid

For a full-size version of The Grid, the Arc of Process and other visual aspects of the Theory of Processs, see the Theory of Process Poster.

Resources

Videos

Projective General Productions

Visit www.arthuryoung.com/pgp.html for ordering information.

- *The Reflexive Universe* (1-hour documentary)
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The books of Arthur M. Young expound and argue for epochal changes in our perspective on life. To many readers, his "yoga of thinking" is a difficult practice. Others recognize fundamental truths in his ideas but are perplexed about how to apply them. These essays propose to serve the needs of students, educators, and researchers as they begin to put the theory of process to work.

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