Energy and Information: A Study in Paradigm Shifts

This article was written approximately twenty years ago and forms the core of some notes which might be developed into a more full-fledged document. Actually, to my surprise several months ago I discovered it tucked away in a folder of old notes dating from that time period. I offer it for what it is worth, revised it two or three times. Several quotations from books are cited in this document. Originally their sources were in footnotes, but I was unable to recover them. Nevertheless, I leave the citations as they are without reference.

Two influences have come to exercise a profound impact upon our modern society, energy and information. By themselves these terms remain simply concepts and abstractions until we flesh them out within a specific context. One important means of accomplishing this task is to focus our attention not so much upon the ideas of energy and information in themselves but upon some of the more important presuppositions and thought patterns which underlie these realities which have given them birth. If we remain faithful to this task, we will find ourselves in a better position to comprehend the various ways by which the concepts of energy and information have come to affect our conscious perceptions of reality. The physicist and historian of science, Thomas S. Kuhn (**The Structure of Scientific Revolutions**), had explored this problem, namely, the close relationship which exists between (scientific) theories and the more comprehensive background from which they have emerged. These background sources are valuable because they reveal the fundamental world view and beliefs held by a particular scientific community as well as those possessed by the larger context of society and culture in which scientists and lay persons function alike. Not only do they define the framework in which scientific theories have developed but reveal entire world views which have given them shape. For example, the technology of ancient cultures was founded upon manual labor derived from human and animal muscle power as opposed to mechanical devices. This immediate, very concrete and physical manner of conducting daily business had a direct impact upon philosophical speculation which tended to view the universe as a vast living organism. It stood in sharp distinction to the well-documented mechanistic view of a much later time which perceived the working of the cosmos as a vast, inanimate clock. That image has faded away yet still exerts some hold over our imagination.

Kuhn prefers to define the more comprehensive sources which both lie behind and inspire scientific theories in terms of paradigms. In his words, paradigms are “entire constellations of beliefs, values and techniques shared by the members or a given community.” This definition is more inclusive than any particular theory or concept and therefore provides a "tacit infrastructure of ideas" which can be passed on to succeeding generations of scientists. It suggests an accepted norm or proven method of behavior which has been developed over a relatively long period of time and has come to acquire a certain dominance over the way a particular group of persons perceive reality. For example, within the field of scientific research a paradigm serves both to guide and to structure a scientist's thoughts according to a well-established path. According to Thomas Kuhn, paradigms should not be

confused with individual scientific theories; rather, paradigms are more comprehensive by nature because they embrace a whole constellation of beliefs and cultural values which are expressed within various disciplines of (scientific) thinking. This insight into the comprehensive structure of a paradigm finds expression through the concepts of energy and information because each in its own way represents a wide variety of theories and ideas which have given rise to complex technologies. Furthermore, the all-inclusive nature of a paradigm transcends particular theories, a fact which can mislead us into identifying it with a universal principle we often perceive as remaining external to creation and human affairs. A philosopher of science, Stephen Toulmin, has remarked that Kuhn's writings are important in this regard because they point out the proclivity modern science has for fixed, immutable concepts and for associating this proclivity with other fields of human endeavor. By recognizing the fact that paradigms are not to be confused with transcendent principles external to the ones they inform, we are in a better position to avoid the temptation to confer them with immutability. The inability to achieve such an all-embracing comprehension of reality therefore is a healthy admission of human finitude, for despite the more permanent nature of paradigms, they, as Kuhn has demonstrated, are subject to change and evolution.

Kuhn has argued that in the course of history science contents itself with "normal science." During this time few, if any, significant advancements are accomplished. Scientists content themselves with the routine processes of their experiments and do not seriously challenge the presuppositions from which they are working. But once this "normal science" yields to a scientific revolution through the process of asking deeper questions about accepted norms and anomalies concerning older hypotheses, theories change and give birth to whole new systems and concepts which eventually evolve into new paradigms. It is precisely this relationship between an older paradigm and a newer one which we wish to explore. The focus of this essay is on just such a paradigm shift, and it will be argued that the presuppositions upon which our culture rests has shifted from the world of energy to the world of information.

Before I attempt to delineate this shift, it is necessary to examine some chief presuppositions belonging to the world of energy. The direct application of non-human energy sources to the service of mankind achieved its classical expression approximately two hundred years ago when time saving machines such as the steam engine were invented. These devices liberated whole societies from their traditional dependence upon the brute muscle power of human beings and animals. Once the practical applications of new energy sources were extended to the field of transportation, they facilitated the rapid dispersion of mass produced goods which themselves were the direct consequence of abundant, cheap sources of power. It was only natural that this widespread dissemination of material products has come to have a profound effect upon society. Although these products were largely the consequence of the practical application of new energy sources, they relied upon a complexity of factors which transcended yet included any particular theory or application of a theory as it pertained to energy. This comprehensive web of interrelating factors was

composed of such diverse elements as more efficient modes of transportation, economic theories, improved standards of living, and above all, a tendency to look upon human beings as parts in a machine that required efficient operation. Despite the fact that so many different elements were involved, they all contributed to the evolution of a paradigm of energy (in the sense defined by Kuhn), primarily due to the availability and mobilization of inexpensive energy sources. The paradigm is not energy itself but the rich mass of assumptions, beliefs and expectations that new sources of energy had given birth. Thus for the purpose of our essay I am considering the paradigm of energy, not its phenomenon.

Although the paradigm of energy escapes easy definition, nevertheless it can be appreciated by closely considering the various factors which have contributed to its birth. Chief among these is the profound influence of the Industrial Revolution which originated in late eighteenth century England. This turning point in history from a previously agrarian based society to one of mass produced goods has both galvanized and transformed the manner by which Western societies have come to organize themselves. Until then societies had honored the natural world as a mother or source of our nourishment, but now the new sources of inexpensive energy bestowed new powers to harness nature in a way which had never before been conceived. Nature became a thing to be conquered, not courted. It is impossible to adequately estimate the power and influence this shift in attitudes had over the workings of the human mind. For example, the Industrial Revolution had given rise to a wide variety of philosophies which are basically empirical and utilitarian in nature. The teachings propounded by this major transformation in human society thereby have served to both explain and to justify humankind's violent use of natural resources for its own economic ends. Furthermore, they provided a basis on which to organize society for the exploitation of such natural resources. As a result, mankind's relationship with the environment has lost its emotional and reverential quality. The environment has now become another "object" or a "good" to be measured, quantified, controlled and used for economic purposes. I prefer to omit judgments on the value of this influence because it may distract from the fact itself, but the example clearly serves to describe the phenomenon of a paradigm as applied to energy. It serves to form an impersonal world view into which every machine is born.

It is interesting to note that British empiricism developed at approximately the same time and on the same soil as the Industrial Revolution. That is to say, the advent of mechanically powered engines to take the place of human labor and the philosophical infrastructure which evolved from the application of this new technology had their origin in the same country. British empiricism thus provided an important foundation for those particular economic theories which, in turn, allowed for the exploitation of inexpensive energy sources in order to power the newly invented machines. Both these machines and the energy required for their operation now formed an inextricable unity. Although the benefits stemming from this marriage were tremendous indeed, only in recent decades have we become aware of its negative ramifications. Not only are the natural resources necessary for running mechanically powered devices rapidly becoming depleted; just as important, we

have become dissatisfied with a depersonalized perception of ourselves which is the direct result of a machine-oriented culture. The philosopher Thomas Hobbes is one notable example of this view whom, as Stanley L. Jaki, a noted historian of science observed, has anticipated a striking way "some latter-day cyberneticians by ascribing to automata ('engines that move themselves by springs and wheels as doth a watch') an artificial life."

Although the Industrial Revolution was the crucible in which many current economic presuppositions essential to Western Civilization were formed, for the most part we remain unaware of their pervasive yet subtle influence over our affluent life style and perceptions of reality. Perhaps our ignorance lies in the fact that we have come to take for granted the continued, uninterrupted production of material goods in abundance. Not being conscious of the fragility of these benefits can make us self-satisfied and oblivious to the dangers which such abundance offers. As we have pointed out, this affluence largely rests upon the systematic exploitation of nature for energy sources. This self-inflicted hypnosis to long term dangers can, in turn, prevent us from being sensitive to alternative views arising from new advancements in scientific research or other fields of human endeavor. Admittedly it is difficult to see a comfortable life style threatened which is based upon the availability of inexpensive and rapid transportation and the wide diffusion of products.

One of the more important recent scientific developments which offers an alternative to the dilemma we have just described is computer technology. This relatively new science has enjoyed a rapid ascendancy from its origins in research stimulated by the Second World War. It promises to have an effect as profound as that of the direct application of energy upon how society both organizes itself and interprets the world at large. The principle feature of this revolutionary technology is the transmission and storage of data or information within an electronic medium. Such information cannot be readily subjected to familiar techniques of measuring objects. In contrast to the dynamic nature of energy, the manipulation of such data relies upon a specialized form of language and logic which makes it difficult for us to "physically" comprehend the electronic form of information. Such awkwardness partly stems from the fact that information displayed on a computer screen literally escapes our grasp, that is, the electronic representation of data appears to be several steps removed from what we are accustomed to call reality. To complicate matters, computer technology exchanges information almost at the speed of light and is well beyond the grasp of any human mind to conceive. Here lies the essential tension between the world of energy and that of information or the machine and the computer.

Although the development of computer technology has certain radical differences when compared with the older, more familiar concept of energy, I prefer to view these differences in a positive light, that is, as pointing the way to a transition from the paradigm of energy to that of information. One important reason for contemplating this shift favorably is that many theories and practical applications founded upon the paradigm of energy create more problems than they solve. For example, a growing number of people are now re-evaluating those economic theories which presume the virtually unlimited availability of natural

resources in light of a newly discovered awareness that these resources are indeed limited. This uneasiness, in turn, compels people to seek alternate expressions of reality such as the concept of information which lacks both the mechanical and dynamic expression of energy and finds practical application in computer programs. Although the act of processing information or data is endowed with an abstract character, ultimately it relies upon the dynamic movement of electrons, an activity which is not characterized by conspicuous moving parts as we can observe in mechanical technology. But more significantly, the very concept of information implies a rational, intellectual manipulation of data which to some degree is analogous to how our minds function. One of the most notable features of rational life is language, the ability to communicate. When language is coupled with logic, the other important attribute which falls under the paradigm of information, it bestows the ability to communicate in both human beings and in computers with an eloquent consistency although in obviously different ways.

Despite the recent development of computer technology and the promise it holds for creating a new paradigm based upon the concept of information, it bears a certain affinity with the paradigm of energy which has been in existence for a much longer period of time. Although computers differ from mechanical devices in that they process data within the abstract medium of electronics, they measure this information according to certain pre-defined rules which adhere strictly to the linear pattern of logic. That is to say, the processing of information operates according to a logical progression which resembles the general direction of energetic movement: a computer's data which exists in the present has been conditioned by past input which tends towards a pre-determined goal. Thus information can be represented as the accumulation of past knowledge projected into the future. But data does not move "physically" through what we commonly perceive as time and space; instead, it is processed through the medium of (computer) language and logic, elements bearing a certain affinity with the human intellect which are not so readily subject to measurement and quantification. This operation stands in contrast to energy whose "past" we commonly equate with a material entity which can be quantified and objectified with relative unambiguity. Despite the profound differences between both paradigms--one material and the other non-material--the pervasive influence exerted by the former paradigm often constrains us to perceive information as subject to the same temporal dimension, the past, which is then projected into a pre-determined future.

Now that the nature of a paradigm and its relationship to the concepts of energy and information has been outlined, let's consider a point of view intended to fulfill Kuhn's observations with regard to the incommensurability of paradigms. Two physicists, David Bohm and F. David Peat, maintain that Kuhn draws too sharp a distinction between "normal science" and "scientific revolutions." By adhering to such a dualistic view, fragmentation can result which stifles creativity. Now instead of focusing upon potential contributions to science, a researcher can be overcome, as it were, by stage fright. In this instance a scientist becomes unduly self-conscious of the relationship between his or her research and the paradigm in which he or she is operating. Such heightened awareness of the self as an

entity perceived as distinct and in frequent opposition to everyone else can thwart one's work and destroy creativity which requires a certain freedom and spontaneous expression. It also has the unfortunate ability to dominate a scientist's work by putting his or her research in often fruitless competition with other co-workers. While self-awareness may not always hinder manifestations of creativity, it runs the risk of shifting attention away from important task at hand to an undue concern over how it compares with research carried out by other persons. This unfruitful waste of energy gradually takes precedence both over the desire to gain knowledge and to see its practical applications. The subtle identity between one's research and a heightened awareness of the self is further strengthened when it involves that entire constellation of beliefs or a paradigm in which a person is currently functioning. That is to say, we can make an identity between our egoistic tendencies and a long established paradigm, a particular aspect of which appeals to our self-centered awareness. This dilemma is difficult to avoid because not only does it involve disagreement over the interpretation of a particular theory, but it embraces the multi-faceted features of a paradigm which have now become subservient to our own ego awareness.

To avoid what Kuhn has called those occasions of incommensurability between conflicting paradigms which so often give rise to a heightened awareness of the self, Bohm and Peat ask, "Is it possible to allow creativity to function at all times, not just during periods of scientific revolution?" By posing this important question, both men are challenging the widely accepted fact that human creativity must be constrained within the framework of a paradigm which has become a fixed and established norm for persons engaged in scientific research. In their words, the desire to enhance human creativity is indicative of "a natural tendency within scientific thinking for ideas to converge," not necessarily to diverge or to stand in opposition or even in conflict with each other. To achieve convergence or harmony between differing points of view first of all requires insight into the nature of a paradigm--any paradigm–as a cumulative store of tried and true perceptions which has become normative for a given (scientific) discipline. This newly gained perspective suggests liberation from the accumulation of memories which are essential to a paradigm and the way it governs our thought patterns and behavior. Once we have obtained the liberating insight that we are not irrevocably bound to the recollective and mutable nature of a paradigm, regardless of its qualities, we can then appreciate those factors contributing to a paradigm's existence such as culture and tradition which by no means loose their value. However, the pervasive influence hitherto exerted by paradigms has now become secondary because we have tapped a source of greater creativity characterized by freedom from accumulative memories of the past which is not constrained by the "largely unconscious, consensus [paradigm] of the scientific community."

The preference of Bohm and Peat to substitute the notion of convergence for scientific paradigms is a novel approach characterized by their emphasis upon the value of play. When children engage in play, they are in the process of being creative without those constraints imposed by the adult world. Their spontaneous actions combine familiar though sometimes disparate elements from the adult realm which become part of their

particular game or world of make-believe. This process is not marked by deliberate or systematic reflection; instead, children observe those things at hand which may be useful to support the structure of their game and immediately direct them towards this end. For example, children may string together a group of chairs to form a "train" and assign themselves such functions as engineer and conductor. These roles contain a minimum of props to support their fantasy and do not necessarily require an elaborate apparatus. Children proceed to freely express themselves within this newly established world of make-believe. Because it is chiefly founded upon imaginative insight, they hardly bother to reflect upon how such a transference of meaning from the adult world to the realm of play has come about.

When adults engage in creative activity, their endeavors are characterized by a spontaneity which is indeed present but noticeably more reserved than children. Part of the reason for such restraint is that in adult years self-awareness is more dominant and by reason of their age and experience, adults are bound to assign greater significance to the consequence of their actions. This is especially true within a context where a purposeful, utilitarian world view so typical of Western Civilization has come to influence our perceptions of reality. Such a world view is often hostile with regard to any spontaneous manifestation of playful creativity considered as strictly belonging to the lower order of children. But as Johan Huizinga has pointed out, play's accent upon the faculty of our imagination is essential to any creative activity. It is precisely the imagination's role as a serious contributor to our perception of reality which had suffered neglect within the Western cultural tradition. In its place we have seen the role of rationality emerge. But close observation reveals that the imagination is crucial for interpreting the world at large, for it re-presents or makes-it-present-again in a more or less structured manner as we observe in the less developed playful activity of children. This ludic operation of our imagination thereby constitutes that unique activity we call play which establishes a "symbolic correspondence" between two things belonging to different orders. Already we have noted this in the tendency of children to chose elements from the adult world and to assign them with meaning, thereby transferring them to the realm of play. Adults engage in the same process, but they go about it in a different manner. Because adults are endowed with a more developed intelligence, they are able to focus attention or discern a given pattern which emerges from within their activity. It, in turn, serves to bestow this same activity with a sense of greater purpose and direction.

Forgetfulness of the play element which is so well manifested by children while they are in the thick of it makes life tedious as adults because all too often it ensnares us within serious, purposeful activity. Instead of engaging in mature creativity, the adult form of play, we can stifle creativity by habituation to such things as memories (whether they be good or unfortunate) of our past and the constraints imposed upon us by society. These elements are by no means bad in themselves, but we become habituated to them because they satisfy our immediate needs, emotional or otherwise. Now habituation contributes to the emergence of norms which become generally accepted. They are then projected into the

future as a map to determine it as much as possible in terms of a past which is already known. In a very real sense, both past and future have now assumed a dreary monotony. The constant danger to control or to interpret the unknown future in light of the known past contributes to this monotony and also saps life of its spontaneity. One important means to recapture spontaneity is to examine more closely adult creativity through a mature appreciation of play which functions on a somewhat analogous though different level from that belonging to children. As mentioned above, this less mature form of play is marked by an unreflective attitude towards specific elements taken from the adult world which are made subservient to the particular expression of play or game at hand. But when an adult opts for creative self-expression, he or she has the opportunity to bring mature reflection upon those elements which are arranged in a fashion unknown to the child. That is to say, in the process of growing up, an adult has obtained naturally a certain understanding of the world. He or she then *recombines* knowledge about various elements within this world which already are familiar but now are known in a novel fashion. In this instance, the recombination of familiar pieces of information does not concede to a slavish imitation of knowledge. Instead we have a gesture which differs significantly from a child's simple, unreflective tendency to associate or combine objects from the adult world without having a thorough or mature knowledge of them. One notable example is the creation of a totally new means of transportation, the automobile. The inventor first required an insight into a new means of transportation independent from the long accepted one of animal power. This intuition also included those elements taken from various technologies which were already known and developed at the time such as the steam engine. After closely examining the way in which each of these various technologies functioned in their own respective ways, the inventor was then able to recombine them all in a novel fashion instead of assembling them without a coherent order. The result was a self-propelled vehicle.

Adult creativity is remarkable in its own right, but the creativity of concern here is essential for making a shift from one paradigm to another, not for functioning imaginatively within a particular paradigm. The former requires a rarer form of genius and has three facets. First, it has the ability to discern the most salient features belonging to a given paradigm. This intuition contains no exceptional knowledge, yet it leads to two further insights. The second insight is more complex in that it presupposes that the new paradigm is at least seminally present within one's mind according to which either old or fresh data may be deleted, appended or totally reorganized. Just as important yet perhaps even more subtle is the third insight which is two-fold: on one hand it has the capacity to perceive an alternate to those salient features which constitute an established paradigm while on the other hand, it makes the actual shift from this established paradigm to the one which has been newly conceived. Thus we have a notion of the new paradigm, at least seminally present in our minds. It recognizes the salient features of the older paradigm but in their place, makes the salient features in the new paradigm opposite to those which had existed within the older one. When creativity is perceived in terms of play, it escapes a rigid manner of perceiving reality and has the freedom required to effect a shift in paradigms, for example, from energy to information as described in this essay. Furthermore, adult playful activity cannot be

neatly pigeonholed within any pre-determined category and subjected to rational analysis. Such an abstract, immaterial quality parallels the concept of information which, although remaining subject to a clearly and rigorously defined pattern of cause and effect, nevertheless resembles the spontaneous and free operation of the creative human intellect.

This reflection on the profound impact of play upon our behavior is significant in that it offers a means by which of disengaging ourselves from the accumulations of memories which contribute to the formation of a paradigm under whose influence we happen to be subjected. While the role performed by paradigms are crucial...indeed necessary...nevertheless quietly though persistently they make us conform to a particular way of perceiving reality while we often remain unconscious of them. The pervasive influence of paradigms often prevents us from seriously questioning how or why we have come to behave according to the constellation of values they represent. For example, scientists have had tremendous success working within the framework of Newtonian physics for several centuries. However, the well documented revolution of quantum physics and the principle of indeterminacy radically has altered the way scientists have come to perceive reality. This classic conflict between two paradigms based upon profound insights into the nature of physical reality led to serious problems in attempts at reconciling one with the other. Already I have suggested one means of resolving such a conflict between two competing paradigms, that is, by viewing creativity in terms of play as a recombination of elements which are already known. Creativity thus embodies a desire to break free from the inclination to undue seriousness and to categorize everything unfamiliar to our experience. In this light creativity spontaneously effects a convergence (as defined by Bohm) or a bringing-together of resources from among diverse backgrounds, disciplines and theories.

I have delineated more clearly those elements which actually constitute a paradigm shift, but the desire to engender such a profound transformation has as its ultimate goal the establishment within our seminal notion of the paradigm-to-be those elements which are *opposite* to the salient features of the particular paradigm in which we are currently operating. This first step as outlined above establishes the direction in which we are to proceed and is significant because it separates subsidiary elements from those essential to the paradigm. Such an insight enables us to make a shift away from the accepted norms and rules governing a long accepted paradigm. For example, to shift from a paradigm of energy to one of information implies that we have recognized energy's most salient feature, passivity with respect to those agents or instruments which had brought it into existence. Furthermore, the new paradigm, information, acknowledges the inherent limited nature of energy's passivity and seeks an expression of reality in terms of its opposite, movement. The importance of this insight cannot be overestimated, for we have taken a major step in our evolution from a former perception of reality to one which is radically different, even though some elements from the older paradigm may be incorporated within the new one.

Already we have seen that adult creativity perceived in terms of play is characterized by immediacy and freedom from constraints. This ability to create spontaneously though

decisively finds a correlation in that movement determined as representative of information: both have the ability to present themselves to our attention all at once and without interference from a mediating principle. On one hand, playful creativity cannot be explained in terms of something else but only experienced as anyone who has engaged in its activity can testify. Its reality is sufficient in and by itself and requires neither justification nor reference point. On the other hand, the information displayed on a computer screen is immediately present to us; this nebulous form of data manifested through an electronic medium escapes our ability to get a handle upon it physically even though we can manipulate such data through a computer's keyboard. Because both playful creativity and information share this abstract and immediate quality, they point the way for making a paradigm shift from energy to information. Such an significant change in world views naturally requires an equally important shift in terms and concepts which have been traditionally associated with place-to-place movement.

At first glance information or the processing of data appears passive with respect to those rules or logic which govern it. But because information is characterized by a noticeable lack of moving parts, a significant difference from the manifestation of energy, it cannot be delineated clearly according to the traditional norms of cause and effect. And so the concept of information offers a more comprehensive description of the human mind's spontaneous activity as manifested through play. Independence from a governing force external to both creative play and the concept of information does not imply that the data displayed, for example, on a computer screen operates independently from a source which governs it; rather, on the purely physical level the data is related intimately both to the program which directs it and the physical machine which enables the program to operate. They stand in sharp contrast to an old fashioned mechanical clock, a symbol of an era when virtually every activity was interpreted in mechanistic terms.

Further consideration of play as carried out both by children and adults reveals that thought patterns which have conformed to a more or less rigidly determined standard of behavior loose their grip upon participants once they are engaged in carefree activity, thereby revealing their essentially provisional character. This liberation from psychological constraints is a natural outcome of play's spontaneity which abrogates our inclination to impose preconceived ideas as to how we comprehend the world about us. When we apply our observations of playful creativity to science, it is easy to see that play prevents us from making an artificial dichotomy, for example, between so-called periods of "normal science" and "scientific revolutions." Instead of conforming to artificial distinctions between normal versus revolutionary science, our creativity now assumes a broader range of expression as imaged in the activity of children. Both this mature form of creativity and the play belonging to children reveal the provisional nature of our knowledge. This process allows us to engage in a continuous interchange with the world and to avoid a rigid codification of the knowledge we have gained. Fundamental to this view is the realization that knowledge is not an abstract, absolute reality; instead, knowledge is an ongoing process which begins when we recognize its provisional character and employ this incomplete body of

information as a means to advance our understanding of reality.

Recall that attention to energy's most salient features, spacial and temporal extension, is the first step for making a genuine paradigm shift. It allows us to single out the very source of tension which gives rise to a dualistic perception of reality. We must not simply remain content with this important discovery but consider it as the herald of a transformation which does not operate within the context of energy's long accepted paradigm, a fact reminiscent of Thomas Kuhn's observations on the nature of scientific revolutions. Persons may not initially be aware of the dualistic nature of the conflict in which they are presently engaged. However, if they pay close attention to their struggles and the desire to resolve them, they demonstrate a significant fact, namely, that the essence of their dilemma and the solutions they propose belong to a lower order. Despite this realization, people are often unable to break out of the mold in which they find themselves; they persist in searching for answers on a plane which never produces a satisfactory answer. To stop here reveals a lack of creativity and willingness to accept the status quo. But as already outlined, the search to find a resolution implies that we have a pre-conceived notion of the paradigm-to-be (information). This paradigm which has come to birth in our minds attempts to resolve the tensions of the old paradigm by offering a new perspective on reality. Now that two poles have been erected, so to speak, between our initial dissatisfaction and the proposed solution, we can make a true shift from one paradigm to another. The shift occurs by transforming the salient feature of a paradigm founded upon the concept of energy–passivity with regard to the source which had set it in motion–into its opposite, movement without reference to a source external to it.

We have seen that the paradigm of information, so closely associated with computer technology, has a distinct advantage over the paradigm of energy by being founded upon grammar and logic. Therefore information has a certain affinity with human intelligence and is better described in concepts related to this intelligence instead of those belonging to the place-to-place movement commonly associated with energy. Although this latter form of movement is directed intelligently according to a plan, it remains subject to the law of entropy: regardless of energy's quantity, eventually it will become exhausted. Furthermore, the very notion of a plan implies a distinction between intelligent direction and the forces it governs. As the biologist Rupert Sheldrake has pointed out, the concept of a plan suggests the operation of universal laws which form our perceptions according to a dualistic mode of expression; that "lower" reality which is governed by laws must always measure up to the "higher" reality of these laws. This mis-perception conveniently perceives these principles as belonging to a sphere beyond human experience since they have been relegated to a false transcendent realm which informs our present sphere of activity. Once such a sharp dissimilarity takes hold in our minds, it can be mistakenly applied to the concept of information: the "software" of (intelligent) information is now seen as informing the (relatively unintelligent) "hardware" or our everyday life. This inclination to conceive concepts we have of our experience in terms of transcendent principles found its classical expression in the Platonic world view where eternal Ideas are separate from the matter they

inform or in the Aristotelian view which perceives these Ideas as immanent within matter. Even though this latter position stresses the immanence of Plato's Ideas, it nevertheless implies a distinction between the concept of a principle and that (physical matter) which it informs.

A Platonic world view allows for the perception of information in terms of an "invisible" reality (software) which governs the "physical" computer system (hardware). In this instance a person would insert the appropriate invisible program into a visible piece of machinery which proceeds to process data according to a pre-determined program. Although this model offers a number of beneficial insights, the notion of an "invisible" program should not be considered as existing in a realm transcending the "physical" reality of the computer. Instead, an integration exists here because each is intimately responsible for the other's operation. Anyone who has had interaction with data displayed upon a computer screen in an electronic medium has confronted this situation. The rapidity at which information moves about can be disconcerting because still we are accustomed to the clear (Platonic) distinction between information in our minds and its written, concrete manifestation. Although the text we see on a computer screen has the same content as the written form, it lacks familiar reference points commonly associated with the written word. Even more significantly, the computer forms an integral unity not only between itself and a particular program but between the electronically expressed information and ourselves. Therefore we are placed in immediate contact with the computer's data and program which operates almost instantaneously. Despite the difficulties many persons experience with this electronic display of information, it has the distinct advantage of offering a new analogy for describing the operation of our minds. That is to say, it images the close identity which exists between our thought content and the means by which we express it while not positing any artificial distinction between both. On the other hand, the written word is more compatible with the Platonic perception of reality because it is a concrete representation of our immaterial thoughts and incarnates that which is invisible. Clearly this more traditional model is in line with the Platonic distinction made between our intellectual activity and how it relates to the physical world.

The abstract nature of information manifested on a computer screen also may be employed as an analogy, however imperfect, of not only pointing to the operation of our mental faculties but of suggesting a mode of awareness within us which is more comprehensive and profound in comparison to these faculties. Similar to the concept of information described earlier, this particular form of awareness lacks subject-object manifestation. It becomes revealed, however, if we pay close attention to the normal operation of our intellectual faculties without becoming absorbed in them. That is to say, our faculties give birth to an endless succession of thoughts and accompanying emotions. Should we remain detached from this circular activity, we can see right through our mental activity to a source from which thought itself emerges. Being at the source of thought implies that we have attained our true selves and our true identity instead of focusing upon the content of our intellectual faculties. Only at this point do we realize that attentiveness eludes normal subject-object

regard and can be manifested by a person who has come to the realization that his or her thoughts are relative to existence. This insight is important because thoughts are re-presentations and always remain secondary. They are mental images of reality which remains primary to all conceptions of it. Therefore attentiveness transcends the subject-object nature of thought and has another distinct advantage, liberation from the tendency to posit abstract governing principles which exist "out there" and are perceived as independent to the reality they inform. Pure awareness by its very nature is difficult to articulate because it does not participate immediately in intellectual activity. Like the concept of information expressed in an electronic medium, it does not refer to external governing principles. Rather, it is a presence to ourselves at the deepest level of our being; awareness without an object thus *precedes* even the articulation of any subject-object relationship, the domain of our intellectual faculties.

Since awareness without an object lacks familiar reference points in space and time, it cannot be described adequately as either "external" or "internal" to the sphere of human activity. Keeping this important point in mind, soon we realize that familiarity with such a unique form of presence to ourselves cannot be gained by actively seeking factual knowledge about its constitution. Awareness without an object thus requires immediate *participation*. It, in turn, requires that we abandon our customary habits of thought, regardless of its content, and refrain from actively inquiring into these thoughts. At first glance this radical step appears difficult to accomplish, but is not so if compared to the third and most important insight required for the shift from an old to a new paradigm: recognition of an older paradigm's salient features and making the salient features in the new paradigm opposite to them. Within the context of this essay, the older paradigm belongs to energy whose chief characteristic is place-to-place movement. This activity finds a certain parallel in the learning process where a person proceeds by gradual steps and therefore adds to his or her personal knowledge through memory, a key faculty for the acquisition of knowledge. But if we wish to shift from this mode of learning to something quite different, we must first perceive the most important instrument for gaining knowledge, memory, and make the salient feature within the new mode of perceiving reality opposite to it. Therefore we may posit the more salient feature of the latter as a process of unlearning and withdrawal from familiar concepts, not the acquisition of new knowledge subject to rational analysis. That is to say, the shift to this new paradigm (information) precludes *learning about* pure awareness because it transcends subject-object relationships. In this instance the normal process of learning or the step-by-step accumulation of knowledge is temporarily suspended, not destroyed, for something of greater value.

Awareness without an object is not subject to division and resembles the concept of information by being present to us all at once. For this reason it cannot be readily described. Therefore we have recourse to negative or apophatic terms which emphasize both our ignorance of a realm transcending our mental faculties and our need to engage in a process of unlearning which does not rely upon the conventional methods of acquiring knowledge. Words accentuating this negative aspect of experience are intended not to

nullify its content but to make us more conscious of the limited nature of the dualistic or relational manner of how we normally perceive reality. Apophatic terms do not devaluate the inherent worth of our experiences; they are more like signs pointing to a reality which differs radically from the one we know through our senses and intellect. Precisely because our organs of apprehension are the means by which we mediate the world to our understanding, their dualistic constitution cannot represent awareness except through subject-object relationships. In order to overcome the apparently insurmountable barrier between awareness without an object and the means of expressing it, we must have access, as mentioned above, to a mode of perceiving reality other than the traditional one associated with education. This alternative may be called *initiation* which will be considered shortly.

Since awareness without an object lacks familiar reference points and stands outside our normal range of experience, it merits being called a true occasion or *kairos*. The advantage of this familiar Greek term, difficult to translate, lies in the fact that it has a religious association which refers to instances when a reality beyond the familiar one has informed a person and has changed him or her for the better. Such an encounter cannot be articulated in terms of everyday experience nor be transmitted by the normal channel of education. We can never induce a *kairos*; instead, our task is to engage in as a process of unlearning or becoming unfamiliar with our normal modes of perception. I don't imply that the operation of our faculties should be abandoned; rather, they must undergo a temporary suspension to allow awareness without an object make itself present to us. Because our faculties are unaccustomed to perceive such a transcendent reality, perhaps one of the most accurate statement we can make about these interventions is that they effect a total unification of our senses and minds while at the same time they impart a profound sentiment of gratitude.

The sentiment of profound gratitude which often characterizes an occasion or *kairos* reveals that such thankfulness is a response directed outward towards another person, object or event. In other words, gratitude tends to *inform* or impart a form similar to that which belongs to awareness but only without a subject-object regard. Experience reveals that thankfulness places minimal attention upon our personal self, even though we never loose total consciousness of this self which depends upon subject-object relationships. Such gratitude effects a special type of unity between the person expressing thankfulness and the object of his or her attention. Because this sentiment cannot be adequately described in causal or mechanistic terms, it lacks utilitarian perception of reality and does not subject the object of our attention to manipulation. In this sense gratitude, like pure awareness, essentially is non-referential; not only does it enhance the value of one's personhood and object of regard, but it transforms both into something infinitely better. For example, consider those profound occasions of gratitude familiar to us all. They are not characterized by an analytical reflection upon our activity; we are simply too immersed in being thankful instead of trying to evaluate our actions. Such immersion within the very act of gratitude is an end in itself, cutting as it does across our inclinations to neatly

compartmentalize our experiences into dualistic concepts.

These observations on the meaning of an occasion (*kairos*) interpreted in light of a subject-object regard and the presence of gratitude should enhance our understanding of the concept of information. Both are characterized by simultaneity or freedom from the past and future, dimensions which both constrain and define our activity. They represent instances which transcend our usual experience while at the same time they impart new meaning to it. Although the immediacy of a *kairos* during which we experience a profound sentiment of gratitude escapes description, nevertheless is marked by freedom whose sphere of influence lies within the present moment. In order to become sensitive to the present, we require initiation or a shift in awareness. Already this gesture has been outlined in terms of shifting from an older paradigm to a new one. It differs from the more familiar method of education, a process suggesting accumulative growth or a gradual passage from ignorance to knowledge in which the faculty of memory plays important role. We are using initiation not as an introduction into some esoteric membership or cult but as a transformation which occurs at once since it is devoid of past-to-future movement. The literal meaning of this word indicates a beginning or commencement (*initio*) into a new mode of awareness which had been previously unknown. Initiation thus has a certain quality of immediacy about it; one either begins...is initiated into a new mode of awareness...at once or not at all.

At this point I return to the notion of creative play as presented by Bohm since it resembles the initiation process. Its activity is characterized by a liberation from ideas and preconceptions which had kept a person in bondage to rigidly defined categories. Indeed, creative play and gratitude are true occasions...*kairoi*...which break through our familiar and accepted ways of perceiving reality. Distinguished by their freedom from purposefulness, both point to that more comprehensive reality of pure awareness described in terms of information. Like pure awareness, creative play and thankfulness are undeniable realities. As Jeremy Campbell observes, "Play is the normal activity of persons who feel secure; it is a symptom of versatility that tends to lead to more versatility." That is to say, when a person engages in creative play (and for that matter, gratitude), he or she spontaneously perceives a freedom from those limitations associated with the paradigm of energy. Playful activity which is creative pre-supposes a penetrating insight into one's surroundings and relationships: one now beholds himself or herself as no longer constrained to act in a pre-determined manner. In this sense play may be described as a *kairos* or freedom from memory and thought processes which normally inform a us. Once these faculties are superseded by pure awareness, we are able to perceive a unity with the object of our attention without becoming fused with it.

I have presented the influence of two concepts, energy and information, upon the course of Western culture and have considered them in terms of paradigms. From approximately the time of the Industrial Revolution two centuries ago our culture has tended to perceive reality in a dynamic or energetic light, a view which has contributed to the remarkable

growth and development of Western Civilization. But this false perception of unlimited progress has its dark side, namely, the inability to consider adequately the inherent nature of the created realm. Also it is remarkable that when awareness of the finite resources available to us has reached general public acceptance, we have witnessed the growth of computer technology. Ironically, this new science has emerged, as already observed, at a crucial time when the older world view characterized by an "energetic" outlook dominant since the Industrial Revolution has reached its apogee. Almost we could say that the new technology arose at the right time in order to allow human creativity to expand horizontally, not vertically. That is to say, the concomitant development of information theory points away from the traditional values associated with the created realm towards the abstract realm of the human intellect. Because this implies a radical break with the manner by which human beings have related to the world about them, we require a new structure by which we may express ourselves. That is to say, we require a paradigm shift from energy to information. This essay attempted to outline the principles by which such a paradigm shift comes about. Not only is this new paradigm (information) representative of our intellectual capacities--itself a major shift away from the brute muscle power so typical of energy--but it points to that deepest part of our human constitution designated as pure awareness. Since this interior realm is not subject to bounds, we may call it the world of the spirit. The normal process of education with its emphasis upon memory fails to represent this type of awareness, for we can only be initiated to participate in its reality. Finally, gratitude is an important, indeed, essential ingredient because it is a faithful image of pure awareness by reason of its unique ability to unite both the person expressing thanks and the object of his or her regard.

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