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ABSTRACT

This paper examines the philosophical approaches to knowledge that have governed education and concludes that a new paradigm is needed for the new millennium. Education is subdivided into a three-level hierarchy, including: (1) the accumulation of factoids as knowledge; (2) the development of knowledge into theories and models for the purpose of selecting out and organizing data into order sets; and (3) the pursuit of wisdom. The study argues that students of the future will need to reach the highest level of the hierarchy in order to process information and use it in their lives. Often the lowest level of the hierarchy is what is accepted in education. The paper likens students to pilgrims in a changing world where students travel at the edge of their perceptions while shifting paradigms wobble and threaten to antiquate established views. The document also discusses the theory of critical mass causing social change as in the collapse of the Berlin Wall and the Soviet Union where political philosophy did not keep up with the perceptions of the changing societies. (Contains 33 references.) (EH)

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A Guide for Education in the Third Millennium

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A Guide for Education in the Third Millennium

In the Preface to *Quantum Reality*, Herbert (1985) wrote "For better or for worse, humans have tended to pattern their domestic, social, and political arrangements according to the dominant vision of physical reality. Inevitably the cosmic view trickles down to the most mundane details of everyday life" (p xi). If Herbert's assessment is valid, the physical principles that explain reality become the foundation of human thinking that defines the dogmas of society.

For the past two hundred years, Newtonian principles have governed our perceptions of reality. With this viewpoint, reality is the meeting of various fundamental properties that are promulgated into immutable principles which are predictable and finite. The underlying assumption in this period of Reductionism is that society operates as a clock with measurable units and predictable outcomes. The epitome of this belief was expressed in 1776 by Laplace.

> The present state of the system of nature is evidently a consequence of what it was in the preceding moment, and if we conceive of an intelligence which at a given instant comprehends all the relations of the entities of this universe, it could state the respective positions, motions, and general affects of all these entities at any time in the past or future. (As cited in Crutchfield, Farmer, Packard, & Shaw, 1986, p.48)

Many people scoff at Laplaces' assumption that society operates in such an orderly fashion and the answers to the future lie in identifying the correct variables. Yet, society is replete with examples of researchers, educators, and politicians who have left visible marks on society as they attempted to use Newtonian assumptions to quantify phenomenons into predictable units. Psychologists divided intelligence into finite units, such as intelligent quotients, IQ and have attempted to predict success in educational endeavors (Benjamin, Hopkins, & Nation, 1987). Behaviorists compressed education into teaching machines where students record the "right" answers and receive positive reinforcement when they answer the questions correctly (Skinner, 1966). Educators group children by grades and assign quantifiable units for achievements, which determine whether a student passes a grade or not. Politicians promote the use of national tests as a cure-all for the nation's school systems (Greene, 1997). Social scientists extract contemporary data and predicting that a certain trend will dominate society during the next decade (Ray, 1996). Even the Declaration of Independence reflected Newtonian predictability with the statement: "We hold these truths to be self-evident"

The belief that reality is based upon a finite society has at various times nudged some scientist to promulgate that they will unveil the shroud which cloaks the vital secrets. Crease and Mann (1986) noted that Max Planck, a pioneer in quantum physics, was told by his thesis advisor toward the end of the Nineteenth Century to abandon physics and go into another field because physics was almost finished. Nearly a hundred years later, in a 1980 lecture, cosmologist Stephen Hawking foresaw the possibility that theoretical physics would have a complete, consistent and unified theory of the physical interactions to describe all possible observations by the end of the century (p.1). A decade later, Lederman (1993) reported that physicists will discover the missing Higgs boson, labeled the "God's Particle," when the supercollider, later blown out of the budgetary waters, is built.

With the coming of the Third Millennium, scientists continue to fill the possibility crucible with clues that will enable them to delineate reality. However, the picture often gets confusing as matter can be either photons or wave; the atom, once believed to be the basic unit of matter, is composed of quarks and leptons; time has become relative; artificial intelligence begins to think; nonlocal influences require superluminal response time and raises question about the speed of light being the ceilings of motion; fuzzy logic ascertains that everything is a matter of degree; and the observer determines the state of quantum matter.

In the Newtonian classical system, matter is considered to have a single path resulting from the past influences. When matter is shrunk to the quantum world, a particle does not have a single path in a space-time but travels by all the conceivable paths. If the observer uses measurement to define the probability, reality is transfixed to become the path of least action (Englert, Scully, and Walther, 1994). Thus, reality ceases to be a fixed quantity with rigid boundaries, as viewed by Newtonian physics, but a variable system made tangible through the observer's view. Wolf (1981) extended this viewpoint of reality to a product of consciousness when he wrote: "Perhaps much of what is taken to be real is mainly determined by thought. Perhaps the appearance of the physical world is magical because the orderly processes of science fail to take the observer into account. The order of the universe may be the order of our minds" (p. 6).

In these three approaches to reality, "I" plays different roles (Toben and Wolf, 1982). The "I" in the Classical Newtonian View observes reality as a specific moment in a space-time as it unfolds. What is presented is a product of the forces which acted upon it. By learning the variables, "I" can predict the future. In the Quantum View, "I" is a participant in the indefinite number of possibilities. How "I" defines the parameters for matter to coexist determines the path of least action or matter's probability. The distinguishing characteristic of the third view, the Action View, is that "I," the creator of consciousness, uses thought to change reality by stopping the path of least action and opening other paths of least action thus influencing the manifestation of reality.

Views of reality are beginning to surface that suggest quantum principles are woven within society. Kosko (1993) argued that all the possibilities exist at any moment. In defining the parameters, the selector narrows the choice down so that the probability occurs. When the event happens, it is not absolute, but shades of gray or fuzzy. Reed (1989) in discussing channeling wrote "Ideas don't belong to us but exist within the universal mind . . . We can't assume responsibility for the ideas themselves, or their consequences. Instead, our role is to choose which ideas or patterns we will hold within our mind. It's more accurate to say that our choices determine which ideas will create our reality" (p. 74). The author has encapsulated a quantum viewpoint of reality into the discussion of channeling.

If Herbert is correct and reality principles are planted in humans' minds to mold humans' thought, he is presenting an argument that cognition creates reality. Although the view that the observer creates reality is bizarre in a Newtonian world, an example exists in the quantum world dubbed nonlocal influence where an occurrence at a distance, with seemingly no connections, changes another event. Chiao, Kwiat, and Steinberg (1993) in an article entitled "Faster than Light?" described a study of twin photons in which the outcome of the measurement of one photon depends non locally on the result of a measurement of the happening of a photon at a distance. Bohm and Hiley (1993) explained this phenomenon with a pilot wave, which altered its form based upon the measurement, that served as the messenger to communicate with the other particle.

Evidence that particles communicate between each other is emerging in the macro world. Gary Kasparov (1996), after defeating Deep Blue in a chess match, wrote "At 4:45 p.m. EST, when in the first game of my match with Deep Blue, the computer nudged a pawn forward to a square where it could easily be captured. It was a wonderful and extremely human move . . . So I was stunned by this pawn sacrifice. . . . I could feel--I could smell--a new kind of intelligence" (p 55). In other words, Deep Blue was processing Kasparov's moves and choosing responses to establish a strategy with long term consequence. When I saw this in *Time*, my initial reaction was that it was his imagination. True, Hal in *2001: A space odyssey* schemed to alter humans' decisions, but that was in Clark's mind not in the "real world" (Clarke, 1991).

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Since that competition between the machine and Kasparov, I read a book entitled *Complexity: The emerging science at the edge of order and chaos* that described principles which have resulted from the evolution of simulated computer experiments (Waldrop, 1992). Computers programed with "If-Then" rules of feedback and competition, such as "If this is the case, then do that," have automatons emerge to a new state as they amalgamate their current state with that borrowed from the current state of their neighbors. These transitory "gliders" store data and emit new signals like a primitive computer. Thus, programmed computers set up complex loops that emerge as entities that make survival decisions.

Keyes (1985) in the book *The Hundredth Monkey of* used the metaphor of the Japanese Macaca fuscata monkeys' behavior of washing their food to illustrate the impact of critical mass that likely occurs within a culture as a phenomenon is assimilated. In this example, sweet potatoes were dropped in the sand and a 18-month-old female monkey began washing the potatoes in a stream. She taught it to her mother and some playmates. Within a six-year period, supposedly, all the young monkeys and a few mature monkeys started washing the sandy sweet potatoes in the stream. At some point, the hundredth monkey washed the potatoes in the stream and the conscious process engulfed virtually the rest of the monkeys.

While scientists have posted many stories on the Web debunking this story, the phenomenon of a critical mass tipping the teeter-toter and causing other to tumble over to the acquisition side can be seen in other examples (Possel and Amundson, 1996). Bly (1996) reported that young people from another country such as Germany are more kin in thought and behaviors to their counterparts in the United States than they are to their parents. He attributed the rapid, horizontal movement toward homogeneity of siblings of divergent cultures as to dress and customs to the influence of MTV. If computer-program models apply, humans are entities in transition that emerge to form hierarchy systems. In this case the media was the massage, but was there a nonlocal influence that swayed the thinking of other entities toward the homogeneity patterns?

Another example where a single consciousness became an avalanche that tumbled over established viewpoints to change consciousness occurred with the MADD movement (*Time*, 1985). Candy Lightner's daughter was killed by a drunk driver. She was appalled and angry that the court slapped the drunk drivers' hands and then sent them back on the street. She began lobbying her state legislators with very little satisfaction. Carol Lightner formed MADD (Mothers Against Drunk Driving) to lobby for the change in drunk driver laws. MADD groups sprouted up across the nation. At first one state passed stricter laws against drunk drivers, then another, followed by several and eventually every state in the nation wrote stricter laws in their respective statues against drunk drivers. Today, one mother's outcry that cascaded into a thunderous roar influences all individuals who drive.

While at one time these paradigm shifts in consciousness traveled at a glacial pace until they reached the critical stage and then they rippled through the media to affect society, today they can occur overnight creating waves of thought that will topple institutions that are incompatible with the emerging hierarchy. Citadels of the past such as the Soviet Union and the Berlin Wall are now annotations in history books because they failed to adjust to the tidal wave of change.

What emerges out of this media quagmire is not always what is most efficient or most economical, as the principle of increasing returns fuels the system (Arthur, 1990). For example, the QWERTY keyboard was introduced in 1873 to slow typists so that the machines could handle them (Waldrop, 1992). Nevertheless, Remington Sewing Machine Company mass-produced a typewriter using the QWERTY keyboard. Other typewriter companies offered it and more typists trained on it. Eventually, it became the standard for all typewriters and computers. That system has governed typing rules for more than one hundred years; however, within the next couple of decades, typing may be a historic remnant of the twentieth century as voice processors and scanners become the standard mode to enter data on a computer.

Computer-simulated programs have provided insights into why a system grows to become a thriving entity that produces emergent hierarchies, dies, or goes into chaos. Wolfram (1984) classified all cellular automata outcomes into four universal classes. In Class I, the living cells would die out within one or two time steps, like marbles in a fish bowl (Langton, 1992). In Class II, living cells and dead cells are scattered over the screen at random as attractors are formed, but the lack of sustained energy results in frozen stagnation and death. A Class III system created cells which were too lively resulting in activity that percolated to a boil, resulting in an unstable and unpredictable structures that broke up almost as though they were in a dynamical system with unsettled strange attractors. In Class IV rules, structures emerged that propagated, grew, split apart, and recombined in a wonderfully complex way.

The state that the system fell into depended upon the lambda value, the probability that it will still be alive in the next generation. When a lambda value is 0.0, the cell will be dead and at 0.5 chaos swirls out of control. Complexity, where complex computation and quite possible life itself were encountered, occurred at the edge of chaos.

When systems were pushed beyond an orderly process, chaos emerged. Chaos consisted of any number of orderly behaviors, none of which dominated under ordinary circumstances, until the system was perturbated (Ditto and Pecora, 1993). When that occurred, an attractor in phase state was formed that created a deterministic system, although it was sometimes unstable and switched rapidly among different behaviors. What evolved from the chaos reflected their sensitivity to initial conditions? In other words two chaotic systems in different states evolved toward very different states.

The power of thought can readily be seen by creating a Web page where thousands of people access it or post a thought on the Internet bulletin board for discussion by individuals from every country of the world. Those individuals who are intellectually flexible and able to transfer their anachronistic principles into avant-garde changes will be the survivors. It is too early to predict what will evolve out of this chaos. However, it may be something like *1984* where the divisions cease to be axiomatic but exponential (Orwell, 1949).

Education is at a crossroads as it teeters between a Newtonian world that is definable and the uncertainty of a complex world that is created from swirling thoughts. Schools' curricula are developed with the assumption that the students need to acquire skills that will enable a smooth transition from the classroom to the job. Furthermore, schools seem ill-equipped to prepare students to make the giant jump from books to high-tech equipment. Louis Gerstner, an IBM CEO, was quoted in *USA Today*, "We can teach them what they need to run a machine or develop a marketing plan. What is killing us is having to teach them to read, compute . . . and to think" (Jones, 1996, 1B). Without the ability to think, students trained for positions that eventually will be done faster and more efficient by computers or robots will ultimately be replaced by cyberworkers. However, the educators and politicians that advocate flooding the classroom with computer education may be exacerbate the inability of children to think (Oppenheimer, 1997). Several researchers fear that excessive computer use may produce hypertext thinking (disconnecting processing) and acceptance of things at interface value. Computers not only pose a threat to a child's ability to adapt to a changing world, but they will annihilate established jobs and, more than likely, make many professions jobs obsolete.

The notion that intelligence is memorizing a pool of knowledge so that it can be spouted out like an open encyclopedia fails to recognize a dynamic society. This belief is a remnant of the Newtonian assumption of finiteness. When the speed of change was much slower and society was stable, schools could train students with skills that complimented the job market. Now, expecting schools to prepare students for the future when they acquire factoid knowledge, which is what is imbedded in the curricula, is like navigating the seas by the stars when you lack knowledge of star patterns in relationship to the seasons. Furthermore, the pace of change will accelerate as individuals increase the use of digital communications to influence the direction a society travels.

How should students be educated? Wirth, Pool, and Whiddon (1995) subdivided education into a three-level hierarchy. The lowest level is *the accumulation of "factoids" as knowledge*. Students trained at this level becomes information handlers. They are disabled people in a dynamic society where the questions are updated to coincide with the changing propensities of society. The second level is *the development of knowledge into theories and models for the purpose of selecting out and organizing data into order sets.* Those educated at this level become specialists who view the order sets as reality and attempt to convince the populace that the world as they see it is the world that all should see. The third and highest stage is *the pursuit of wisdom.* Wisdom is the understanding of the streams of consciousness and the realization of strategies to amplify those conscious wave patterns that improve judgment.

Educators must not view the acquiring of factoids as the goal of education. Nor will education in the Third Millennium succeed if educators train students to become planners in systems destined to become obsolete. Rather, education must awaken students to the power of thought--not canned thoughts about anachronistic processes nor saddlery times--but, thoughts that are forces created for the realization of a fulfilling life and more just humanity. Einstein (1950) was opposed to the idea that schools should teach specialized knowledge. He wrote:

> The development of general ability for independent thinking and judgment should always be placed foremost, not the acquisition of special knowledge. If a person masters the fundamentals of his subject and has learned to think and work independently, he will surely find his way and besides will better be able to adapt himself to progress and changes than the person whose training principally consists in the acquiring of detailed knowledge. (p. 36)

Students' education can no longer be limited to the study of their own culture; nor should their education be limited to receiving rudimentary skills. Such an educational approach is self-limiting and can quickly become anachronistic during paradigm shifts. For example, moving keyboarding down to lower grades may enable the students to input data sooner, but it fails to recognize the likely change from key processing to voice-activated modulators. Furthermore, most of the children's interactive programs require a mouse to trigger responses.

To describe a photomontage in which a business person wades through the ocean heading toward a bevy of escalators, Mutter (1992) cited the following lyric:

> I'm a pilgrim on the edge,
> On the edge of my perception.
> We are travelers at the edge,
> We are always at the edge of our perception. (Within "The Images" explaining photomontage #11)

As pilgrims in a changing world, students will continue to travel at the edge of their perceptions while shifting paradigms wobble and threaten to antiquate established views. Those who escape the eddy of data entry and data retrieval and use wisdom gained from education to enrich their own lives and the lives of others will become pathfinders to more enriching lives.

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