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ABSTRACT

It is only out of a sound theoretical rationale of readiness that practical educational application can derive. The child gradually gains voluntary control of movement throughout the states of locomotive, speech and cognitive development. Thinking is a more subtle form of movement. Voluntary control of movement is an integral part of learning. An orderly sequence of motor and developmental maturation is such that the capabilities for certain kinds of learning and performance fall along an age-readiness scale, such as language development. It is from this orderly sequence that neural development and the capacity for certain kinds of learning and performance unfold. Organismic growth patterns can be slowed down or supported by the quality of the environment, but they can neither be forced or coerced. Recent research and ancient Asian theory point to the existence of invisible bioplasmic energy forces that sustain the development and replacement of cells. At the transition between preoperational and concrete operational levels, the energy forces have completed to a certain degree their task in physical development of the head and are then released for the forces of thinking. Premature intellectual learning or the attempt to speed up the stages of cognitive development interferes with physical development, causing possibly a reduction in full development of the brain. Environmental deprivation interferes similarly with the work of the bioplasmic forces. (KM)

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UNDERSTANDING READINESS: A RATIONALE
(A REJOINDER TO JENSEN)

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UNDERSTANDING READINESS: A RATIONALE
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The Problems of Readiness:

As Jensen points out in his Occasional Paper, Understanding Readiness, (1) "...certain kinds of learning take place much more readily at one age than at another," is an indisputable fact. However, the crux of the problem is the explication of readiness. For it is only out of a sound theoretical rationale of readiness that practical and genuine educational application can derive. Educational practices today are eclectic. In most cases teachers teach children using the same methods by which they were taught -- i.e., "teach as taught". The American education scene is currently witnessing a controversial trend -- a drive for earlier and earlier schooling for all children. On the other hand, researchers and educators have discovered that the early education, with its stress on the assimilation of academic content, is the reason many youngsters quickly lose their appetite for learning; they are "turned off" early in their schooling careers. Research in child development reveals that children are not ready for cognitive learning until they have reached a certain level of maturation.* (2,3,4) The mean age of readiness seems to be between the ages seven and eight years. Yet this push for early schooling still prevails. As Jensen states, these "...disagreements (in readiness) arise only when we try to explain readiness". (5) We lack a sound theory, because we do not really understand the processes of

*(The author refers the reader to the article by Moore, Moon and Moore, "The California Report: Early Schooling for All?", Phi Delta Kappan, June 1972 for the summarization of research on child development and the compelling arguments against early schooling.) (6)

human development and, hence, readiness. There are two divergent theories of readiness -- growth-readiness and the cummulative-learning model. The combination of these two theories gives us an idea that the child's readiness is determined by physical and mental maturation and his experiences or interaction with the environment. To a certain degree they tell us where the child is in his development and what the child can do or accomplish at certain age levels. But the theories do not give an indication as to how and why the different stages, e.g. cognitive development, unfold. Until we have the answers to the dynamic nature of human development and its relation to readiness, we will be "groping in the dark", for relevant educational processes. Scientists and educators alike have fallen into a rather static mode of thinking in that they attempt to apply natural scientific theories which explain inorganic life very well to organic life -- the world of the living. It seems quite clear that the forces which operate in the inanimate world cannot explain the phenomena of life. Then perhaps we need a more dynamic, organismistic oriented approach. For example, we have volumes of information on the characteristics (definitions, facts) on the growing child at the various age and developmental levels. However we are little aware of the process of, e.g., how he acquires speech, how thinking develops, what is thinking, etc. To grasp an understanding of readiness, one must be able to view the complexities of human growth as wholistic processes, of physical and mental development in a cause and effect relationship. The author will attempt to examine this relationship, in terms of controlled-movement in motor, language and cognitive development.

Voluntary Controlled Movement:

Motor Control: The first premise we begin with is that human development is a process by which the human being gains greater and greater voluntary control over himself -- i.e., over his motor, speech and cognitive development. For example, the new born baby has no voluntary controlled movements; his movements are chaotic. Soon after birth, control of movement develops from the head downward.

The growing child begins with movement control of the eyes, the entire face, descending over the neck, which gradually allows the child to turn and lift its head. The voluntary control of movement gradually descends further to the arms and hands; here the child develops the ability to coordinate eye-and-hand-movement and by the third month to grasp objects. By the fifth month the child sits-up. Gradually by the first year of life voluntary movement control has descended yet further enabling the child to stand and walk. The child in a period of a year has developed a minimal level of voluntary control over his motor system.

Language: Accompanying this descent in movement-control of motor development is the development of language. Lennenberg states:

Since motor development is one of the most important indices of maturation, it is not unreasonable to assume that language development too, is related to physical growth and development. It is also interesting that language development correlates better with motor development than it does with chronological age. (7)

Just as there is a descent of voluntary control of movement during the first year of life from the head through the trunk to the limbs, there is

also a descent of language development or grammatical sequence from the cognitive through the affective (emotion) to the active limbs or psychomotor realm. That is, the noun corresponds to the head (cognitive), the adjective to the feeling realm - the heart etc., (affective) and the verb to the active limbs (psychomotor). Table II depicts this sequence of language or grammatical sequential development. (8)

Table II

	<u>Age</u>	<u>Nouns</u>	<u>Adjectives</u>	<u>Verbs</u>
Cognitive	1.3	100%		
Affective	1.8	78%	22%	
Psychomotor	2.0	63%	14%	23%

At each level of motor development the child reaches a certain level of motor-movement control or maturation before language develops. It is a kind of controlled-motor readiness. It is also known that when the child is struggling for motor-movement control, there is a temporary retardation in language development. Once the child masters a certain phase of motor development, the rate of language development accelerates. There is a transformation of voluntary motor control, i.e. from the movement control of locomotion to an extension and perfection of these movements into the more refined and differentiated movements of speaking. The child gains gradual mastery over the finer muscles of mouth, lips, tongue and larynx. He increasingly gains control over his speech organization through the stages of cooing, babbling, saying (imitation of words), naming and talking. (9)

Cognition: In summary, locomotion and speech are control motor movements, but speaking is a more subtle and finer control of the muscles of the

speak organization than is walking, running, etc. Could not thinking or cognition be thought of as a kind of control over one's mind. This transitional development takes place in the young child about the third year. His ability to think unfolds. He begins to differentiate percepts or objects in his environment. Piaget calls this period the transition between the sensory-motor at 2 1/2 - 3 years (the child is almost totally dependent upon the immediate environment for stimulation to which he reacts), and the pre-operational, 3-7 years (the child's thinking is instinctive, he relies on his memory more; he senses differences between an individual item and a class, e.g. mother and women etc.). Perhaps this transition is the result of the child mastering his locomotion and speech organization to a certain level of maturity, i.e., just as the child gained voluntary movement control over locomotion and speech, so he gains control over his cognitive processes. Therefore, could not thinking be considered a more refined and subtle form of movement? Unlike locomotion and speech there are no muscles involved...but movement purely from percept, mental image and fantasy, to concept and idea. Modern psychological and neurological theories consider the brain to be a kind of muscle; it must be exercised to develop. For example there are certain maturational indices (65% physical maturity of the brain), of the development brain when learning of a language is optimal. After the brain has reached physical maturation language acquisition becomes more difficult. (10) Here also the brain is developing through maturation. (This may not be a casual correlation, but it does indicate the dynamic nature and optimal developmental characteristics of the brain).

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Another indication of the dynamic aspects of movement within the brain is the functional basis of the electroencephalograph, which is used to measure noise levels and electro-wave patterns of the brain. The electrodes placed on the scalp of the subject measure 1/1,000,000 of a volt. The recorded noise level of the brain is about 100 times that potential. (11)

To explicate this point further, let us examine the act or process of cognition. For example, when we are attempting to find a solution to a problem, we are searching for the correct concept or idea out of the rather vast storehouse of concepts, ideas and experiences we already process. We labor cognitively to find the proper connection or link between our knowledge and the solution. We sort, select, reshuffle our old concepts. We seek new ideas from other sources - people, literature, experimentations, etc. to reinforce and refine our knowledge. And the conditions we want for thinking or sorting out process are quiet and solitude. This type of concentrative thinking does not take place automatically or effortlessly. But it requires contemplative effort and work. Effort requires energy. Mental fatigue is just as real as physical fatigue. In both cases energy is expended. In physical labor energy is expended through overt movement, whereas in thinking energy is expended through covert movement. This hypothesis that thinking is movement will be elucidated further when we examine Piaget's stages of cognition.

Piaget has shown that children manifest different mental abilities as they mature. Their minds evolve through a series of intellectual stages as they progress from early childhood through adolescence. Piaget has classified these into four main stages:

- I. Sensory--Motor Stage (0-2 years)
- II. Preoperational Stage (2-7 years)
- III. Concrete Operational (7-11 years)
- IV. Formal Operational Stage (11-15 & over years)

The three major stages preoperational, concrete and formal operational can be summarized as follows:

Table IV

Piaget Stages of Development

Pre-operational (3-7 years)

1. Cannot conserve or hold mental images
2. Thinking is non-reversible
3. Thinking is perceptual bound (bound to physical body - the senses)
4. Cannot deal with variables or changes
5. Little voluntary control over thinking (non-operational)

Concrete-operational (7 or 14 years)

1. Can conserve or hold mental images
2. Thinking is reversible
3. Thinking bound to inner-life, emotionally affectively oriented
4. Thinking is imagery and pictorial, not symbolic
5. Needs concrete props to support thinking, such as problem solving
6. Can solve problems with transformations, variables or changes
7. Has greater voluntary control thinking - (thinking is semi-operational)

Formal operational (14 -years)

1. Solve problems using symbols and pure concepts, without outer concrete props
2. He ran hypothesis solutions using propositional logic
3. Thinking is more objective, free of emotional life
4. Thinking is abstract flexible and mobile-grouping classifications, etc.
5. He can think about his thinking for the first time
6. He has greater voluntary control over his thinking processes. (Thinking is fully operational)

The theme of increased voluntary control over cognitive processes seems to be the thread of transmutation through the three stages. Each succeeding stage depicts an increased independent and higher level of cognition, a greater and greater manipulative power and control over thinking. The terms - pre-operational and operational signify this. The terms are cogent and relevant; they accurately describe the cognitive abilities at the different levels. Preoperational means the inability to operate one's thinking. It is non-operational, noncontrollable. His physical and experiential maturity are not developed sufficiently at the preoperational level to give him the power to control his own thinking processes. As shown, at this stage the child cannot conserve, reverse his thinking or deal with variables. Whereas at the concrete operational level, his thinking is operational, i.e., he can control it to a certain degree in terms of conservation and reversibility and the ability to handle variables. The same pattern of voluntary control is exhibited at the formal operational level when the youngster's thinking is more abstract, symbolic, logical, and most importantly more mobile, flexible and freer. He can hypothesize.

Piaget also alludes to thinking as movement, when he speaks of operations. He states: (12)

Learning is possible only when there is active assimilation...To understand the development of knowledge, we must start with an idea which is central . . . the idea is operations . . . to know an object is to act on it. To know is to modify, to transform the object, and to understand the process of this transformation . . . An operation is thus the essence of knowledge; it is an interiorized action which modifies

the object of knowledge . . . In other words, it is a set of actions (mental movements) modifying the object and enabling the knower to get at the structures of the transformation.

Summary of Controlled Movement

The author has advanced the theory of voluntary control of movement through the stages of locomotive, speech and cognitive development. Thinking is a more subtle form of movement. One could say that the child's mental maturity and acquisition of experiences are dependent on his ability to gain voluntary control over his movements (in all realms of development) and hence his environment. Voluntary-control of movement is an integral part of learning. In essence, it is the definition of readiness.

As indicated an orderly sequence of motor and developmental maturation is such that the capabilities for certain kinds of learning and performance fall along an age-readiness scale, such as language development. Similarly there is a hierarchy or developmental sequence of abilities to draw and copy geometric forms in relation to a kind of mythological-historical evolution of the human race and human development, the recapitulation theory. Ilg and Ames in School Readiness outline this developmental pattern of geometric forms drawn by children at different age levels. (13) This development depends upon maturation, not experience. (14) For example, some children who can easily draw a copy of a circle or square cannot draw a diamond, but the reverse is not true. Also a child cannot be trained or forced to copy a particular geometric figure prior to the stage of readiness to do so. The intensive training of a five year old in the specific act of drawing a

diamond will not only be difficult but ineffective. But at age seven, no training is necessary. (15) This developmental sequence of performance capacities, which are transitional stages of distinct steps, emerge as a form of instinctive motoric development--reflected in evolutionary geometric patterns or forms. Piaget's study of the geometric operations in young children found that they draw topological structures before the projective and the projective before the metric. He says, (16) the geometric sequence corresponds "...to something in the natural thought of children." In light of the voluntary movement-control theory - the child needs less control to draw topological forms (circular) than projective forms. The metric forms require the greatest amount of movement-control. The phenomenon of controlled-movement, which can be extended into other performance spheres, is dependent on the maturation of the whole organism.

Maturation: Maturation-readiness is based on the phenomenon of organismic growth (a coined phrase for all available growth ages at a given point in the child's development); the growth patterns such as height, age, mental age, dental age, etc., of a child tend to cluster around a mean. (17)

...i.e., that the various attributes in an individual tend to cluster about a center of gravity of growth of that individual and that the freedom to vary is restricted. The detailed support has been worked out, but the manuscript has not been printed.

Therefore, maturation is a complex organismic pattern which reaches levels or plateaus of development. It is from this orderly sequence of maturation that neural development and the capacity for certain kinds of learning and performance unfold and fall along an age or performance scale. On the

other hand, organismic growth patterns exist in degrees of faster or slower. The growth pattern can be slowed down or supported by the quality of the environment; growth can neither be forced or coerced. Growth is a positive, constructive process, and for its optimal development it needs a propitious environment. (18) As Piaget states, (19) the unfoldment of learning capacities are

...tied to the whole process of embryogenesis...(which) ends in adulthood...In other words, development is a process...in which...development is the essential process and each element of learning occurs as a function of total development.

Studies and research in child development have long known of the simultaneous relationship between physical maturation and intellectual development. Few researchers have ventured to ascribe a cause-effect relationship between these two phenomena. The characteristics of the stages of physical development and the stages of cognitive development such as those developed by Piaget have been fully described. But we do not know how physical maturation, cognitive development, and readiness are related and unfold.

Let us examine the physical-mental development correlation as it occurs at the pre-operational - concrete operational transitional period at age seven years. Ilg and Ames conducted a study on the rate of teething in relation to school readiness with first grade children. They found that those children who were ahead of schedule in teething were definitely ready for and could profit from academic school experiences. Those children who were behind schedule in teething (94%) should have repeated (22% did repeat) the first grade. Of those whose teething was both ahead and behind schedule

64% would have benefited by repeating the grade (14% did repeat). Ilg and Ames reported that subsequent to teething the children seemed to have reached a higher level of mental development. However they ascribe no cause and effect relationship.

What does this mean in terms of the transition between the preoperational and concrete operational cognitive stages? Teething signifies that the brain has reached about 95% of its development, the head about two-thirds of adult proportion, and now the child is ready for academic learning. He has had a change in mental development; he has crossed the bridge from the pre-operational to the concrete levels of thinking. He now has greater control over his thinking, it is freer; it is less sense bound.

At the transitional period between the concrete and formal operational, ages 13 - 15 years, Nesbit found that the attainment of puberty correlated with increased achievement on intellectual and academic achievement tests. (20) That is, adolescents who had attained puberty performed better on intellectual tests, than adolescents who were still at the pre-puberty level, although the subjects were the same ages.

Is there a causal-effect relationship between physical maturation and mental development? If so, how does it function?

Nature of Growth Forces

Let us look at a phenomenon that we see and experience, but of which we are not fully cognizant. That phenomenon is the process of growth. Organisms grow and develop. We know the child grows from the head downwards;

plants grow upward. Each germinate from a sperm and a seed, respectively. We see the child grow and we see the plant grow. We perceive the stages, and through accelerated photographic process we can actually see a plant growing. However we cannot perceive the process, that which is causing it to grow. Perhaps we could look at it from another point of view.

Growth and movement require energy. Just as a ball propelled through the air requires the expansion of energy by the thrower. Just as an automobile racing down the highway is propelled by the combustion of the engine under its hood, so human growth is powered by an energy force. We could call this energy growth forces. Is this not a valid approach? After all, no one has ever seen magnetism or electricity, only its effects and end products. The same is true of the atomic theory. No one has ever seen an atom, an electron, etc. Nevertheless, we borrowed from the macrocosmic world, our planetary system and galaxy, to explain the chemical and material world through the use of the atomic theory which is a microcosmic picture of our universe. The scientific theories which explain the physical world, become laws because they consistently explain physical phenomena. Why cannot one use the same approach to describe the phenomenon of human growth and development? What are these growth or energy forces, which facilitate human growth?

In recent years the Russians have done extensive research in the area of parapsychology, which included studies on the energy body. Their research is based upon scores of experiments done on living plants, animals and human beings using the most sophisticated computerized electronic equipment and microscopes. Ostrander and Schroeder visited Russian research centers

and report in their book, Psychic Discoveries Behind the Iron Curtain that the energy body, (21)

...is a brand-new idea in Soviet biology...But throughout the ages it's been called the 'subtle body', the 'ethric body', 'fluidic body', 'beta body', 'counter body, pre-physical body' to name a few.

The energy, etheric or biological plasma body consists of, (22)

Some sort of elementary plasma-like constellation made of ionized, excited electrons, protons and possibly other particles, but at the same time, this energy body is not just particles. It is not a chaotic system. It is a whole unified organism in itself. It acts as a unit...and as a unit gives off its own electromagnetic fields and is the basis of biological fields.

The scientists report the dynamic energy body to have a specific spatial organization. "The biological plasma of the energy body is specific for every organism, tissue and possibly bio-molecule. The specificity determines the form of the organism." (23)

The bioplasmic body contains energy levels that sustain the development and replacement of cells. The concept of energy or current flow stems from the ancient Asiatic theory or knowledge that the physical organs are temporary deposit of a number of currents which move continuously at various speeds throughout the body. It is known that the substance of the liver is changed in the course of ten days, whereas the substance of the brain takes much longer, while it is almost six months before you find new molecules in the bones. Everytime the organ is the effect, the current prime moves the condition. The Russian scientist photographed the energy or bioplasmic body. They concluded, (24)

...the energy body didn't seem to be merely a radiation of the physical body. The physical appeared somehow to mirror what was happening in the energy.

They also photographed the moment of death in plants and animals. They report,

...Russians saw sparks and flares of the bioplasmic body shooting out into space swimming away and disappearing from sight. Gradually there was no luminescence at all coming from the dead plant or animal. (25)

They hypothesized that the energy coming from the dying physical body is the dispersing bioplasmic body. This could be what Anderson refers to as physical entropy--the degradation of physical energy. (26)

The ancient Chinese method of healing by acupuncture (the placement of fine needles in one of the 800 nerve centers on the skin), is based on the flow of etheric or bioplasmic currents throughout the body. (27) The blockage of one or more of these channels brings on illness--an imbalance in the organism. These bioplasmic forces, which flow along meridians or channels, effect the flow of blood to effected tissues. The objective of acupuncture is to balance the bioplasmic flow in that (28)

...good health (is defined as)...a free and unimpeded circulation of energy--the life forces--flowing from organ to organ along an invisible network of intercommunicating channels.

Another piece of evidence that seems to confirm the existence of an etheric or bioplasmic body is the phenomenon of the phantom limb. Persons who have a missing limb often continue to sense the missing arm or leg as if it were still there. Research by Weinstein and others have shown that among 101 born with missing limbs, 18 had clear perceptions of phantom-limbs. (29)

In the development of body schemes in children, it was found that there was no difference between blind and normal children in the development of the body scheme with respect to hand-perception. This indicates the child's visual perception of all limbs. (30) Since the development body-scheme is not dependent upon the physical limbs, therefore, the phantom limb or the bioplasmic limb must be the basis for the development of the body-scheme. That is, the phantom or bioplasmic limbs contain the dynamic processes or energy forces of growth, which facilitate the development of the physical limbs, when present. The phantom limbs grow and develop just like the physical limb, except it is non-material, invisible. Steiner referred to this as the functional gestalt, the ether-body or the body of the formative creative forces of growth. (31) He asserted that human development and the accompanying development of a body-scheme in childhood is the birth or the freeing of the child's formative or etheric forces of growth.

Transmutation of Bioplasmic Forces

Now that we have established the existence of the invisible bioplasmic forces, let us examine their function in human development.

As indicated the change of teeth occurs at age seven as does the transition between the preoperation and concrete operational levels of cognition. One could say that since the brain has reached 95% of its physical development, the change of teeth at this period signify that most of the forces of physical growth have completed, to a certain degree, their task in the development of the brain and head. These growth forces are then

released for the forces for thinking, (as indicated thinking does take energy and power to become operative -- concrete operational). Now the child has greater control over his thinking as a result of the greater amount of energy now available for cognition. (Review the Piaget Table). The child has reached a higher level of cognitive processes. Just as the growth forces are partially released from the physical body, because of the attainment of a level of physical maturation, therefore so is the thinking released and freed from the physical body (being sense bound at the pre-operational level). Jensen indirectly elucidates this viewpoint when he points out that the whole in learning is more important than the subskills. He states, (32)

It is the child's progressing ability to integrate the component subskills that the phenomenon called readiness is most apparent. It is the integrative process, the development of a higher order 'master plan' that depends most upon the maturation of brain structures.

Jensen demonstrated this point when he attempted to teach his five-year-old daughter to play chess. She readily learned the names of the six chess pieces, the placement of pieces on the board and the rules for moving each piece. She was highly motivated, and her learning proceeded smoothly through th's cummulative-associative approach. However when it came to playing a game, putting together all that she had learned "...a game did not emerge." (33) A year later, age six, she had no trouble in playing chess. She had reached a level of maturation and cognitive development where the subskills were integrated into an organized whole. Based on the bioplasmic theory one could state that the child had thus reached a level of physical maturation releasing the growth forces for thinking.

The child now had more power or energy for greater cognitive control, for manipulation and integration of subskills and learnings. The child now possessed the cognitive energies, which are transmuted forces of growth to control her own thinking. It is as if the shepherd appeared amongst the herd to establish peace and order.

Viewing physical and cognitive development from this standpoint, a number of other problems related to human development and education seem to fall into place. As pointed out at the outset of this paper research indicates school readiness is a major concern. Most of the research shows the pre-school academic-readiness programs such as headstart have been "ineffective in producing any (lasting) gains in cognitive development. (34, 35)

Moore, Moon and Moore's article cite a number of studies in which children who began reading a year or so later than their peers, surpassed the earlier reading children in reading ability later on in their school career. (36) Cases were cited in which pre-school age children who were exposed to academic learning exhibited a greater number of incidents of maladjustment than children who began their school career at a later age. Also the skill and knowledge retention level of pre-schoolers was much less as compared to later school entrants. It is known that children who are forced into intellectual learning beyond their present capacity or maturation level become "turned off". (37) Early learning is not only inefficient, but there are indications that it results in a lower plateau of learning proficiency. (38)

Premature learning creates a mental blockage, resulting perhaps in a permanent handicap or, at least, a lower ceiling for the subsequent development

of a particular skill, e.g. reading. It may even result in permanent cognitive and academic retardation. The socially disadvantaged is a good example of this phenomenon. Elkind and others have found negative correlations between early schooling and school success and attitudes toward school. (39,40)

"The longer we delay formal instruction, up to certain limits, the greater the period of plasticity and the higher the ultimate level of achievement." (41)

Let us examine these problems in light of the theory of transmuted growth forces for thinking. Cognitive readiness is a matter of the organism reaching a certain level of physical maturation at which time the growth forces can be released to become the energy for thinking processes. Therefore, the pre-school child (preoperational) does not have enough cognitive energy available to really cognitively act on the learning so as to fully experience intellectual learning, making it a part of his own being. Almy refers to these learnings as pseudo-concepts. (42) His learnings are non-transferable to new or different situations. This also explains why later school entrants become more efficient readers than early school entrants. Since the pre-school age learner has been burdened with these pseudo-concepts, (which are somewhat non-transferable), he is unable to use them as a foundation upon which to build upon or integrate with subsequent skills and learnings. He doesn't have enough cognitive energy to manipulate the concepts, to rehearse the learning. Hence he cannot experience it. In fact it may condition his style of learning, and cognitive plasticity is reduced in this area of learning.

Looking at the effects of premature or forced learnings, one could state that something never comes out of nothing. To gain one thing, something

else must be sacrificed, the law of conservation of energy and matter. So it is with accelerated learning or the attempt to speed up the stages of cognitive development; there is an accompanying loss in quality of development. Portman reports, "Whenever acceleration has occurred there has been a noticeably increased susceptibility to certain diseases especially those of psychological origin." (43) Shortened processes of maturing cause later immaturity. This would, perhaps, account for the increased maladjustment in early school entrants. Since learning is hardly ever a purely cognitive process but contains emotions (e.g. interest, motivation, preferences, etc.); it could be that the stress on early intellectual development entropizes emotional development. As the immature learner becomes frustrated and anxiety-ridden, he loses his motivation for intellectual success later on. He becomes "intellectually burned" out. In becoming frustrated and psychologically disorganized, his psychological (cognitive) and physiological energy are entropized.

However something else is sacrificed. What is sacrificed is the physiological development of the organism. It has been stated that energy forces for thinking are metamorphized from the same forces that facilitate physical growth. If the child is forced into intellectual learning prior to readiness, as determined by physical maturation, the child is prematurely using these forces, (to do intellectual thinking) which should be used to develop the physical organism. Hence physical development must be sacrificed, to some degree. What may be sacrificed is the full development of the vehicle for thinking, the brain. Research has shown that gross brain changes take place

from birth through adolescence, which entails the shifting of cognitive control from the emotional centers to the reasoning centers. (44) If these bioplasmic forces are wasted on attempts at accelerated, premature cognition in young children, not only is there an entropism of the brain but an inefficient use of these forces as well. The reason for the inefficiency is that the bioplasmic forces at this age level (pre-seven year old), are not totally free from the formative processes of physical development. Forced intellectual thinking at this period in the child's development prematurely drains off a certain portion of these bioplasmic forces, which should be utilized for physiological and, perhaps, emotional growth.

The consequence is that there is not enough transformed bioplasmic energy forces to effect the efficiency of thinking (e.g. pre-operational to concrete operational). On the other hand, the physical body (brain) is being robbed of its full growth potential. One could also state that the overall effects of forced premature intellectual learning is a form of retardation in that it effects the young child's total growth pattern, physiologically, emotionally and cognitively. The wasting of these bioplasmic forces leads to physiological and psychological entropy. Therefore, it is important that these etheric or growth forces be sustained and developed in the growing child rather than being prematurely misused for intellectual learning.

The effects of the environment on human development can be detrimental. Cultural deprivation is a prime example. It is well documented that culturally disadvantaged children proceed through the developmental stages at a slower and less complete rate than their middle class peers. The

transition from the concrete to the formal operational levels of cognition are slower and incomplete. (45)

The deprived child has cumulative deficits in growth incurred from past deprivation. Ausubel states, (46)

The child who has an existing deficit in growth incurred from past deprivation is less able to profit developmentally from new and more advanced levels of environmental stimulation...his deficit tend to increase cummulative and to lead to permanent retardation.

Anderson describes this phenomenon as environmental press, domination and disorganization which results in psychological entropy, and hence the degradation of psychological and biological energy. The end result is physical entropy. (47) Research shows that the plasticity of intelligence tends to decrease with age, limiting the organism's degree of plasticity or freedom to respond developmentally in a certain direction which is compatible to the environmental stimulation. This decrease in plasticity in intelligence is accelerated in proportion to the decreased rate of transition from the concrete to the formal operational levels of cognition, and in direct proportion to the strength or amount of bioplasmic forces available to the child.

The retardation is the result of the inadequate development and sustenance of the child's bioplasmic forces during the early formative years. As a result of the restrictive and chaotic stimulated environment, there is a degradation of the child's psychological and biological energy - resulting in psychological and physical atrophy. The environment dominates the child's growth processes, rather than sustaining them. His energy forces are scattered.

There is a loss of bioplasmic energy. This degradation or dispirsement of energy in the human body has been confirmed by Kirlian by his high frequency photography of the bioplasmic body or forces. Schroeder and Ostrander write, (48)

Illness, emotion, states of mind, thoughts, fatigue, all make their distinctive imprint on the pattern of energy which seemed to circulate continuously through the human body. (In the pictures, you can see the fingertip of a normal, healthy person, photographed by Kirlian process. The second picture shows the same fingertip of the same person, this time he is fatigued and overstrained. More energy appears to pour out of the body when tired.)

One could infer from this that a deleterious environment causes the degradation of bioplasmic energy levels. It has been well documented that an adverse environment acting during the early critical years of childhood can be responsible for the growth retardation, causing in some cases simulated idiopathic hypopituitarism. (49) The depletion of bioplasmic forces during these formative years leaves little energy forces left to be transmuted for cognitive processes later on.

Conclusion:

The theory of bioplasmic or growth forces has been rationalized to explicate some of the complexities and integrative relationships in human development. The theory, in the opinion of the author, seems to unify and explain the relationship of physical development to mental development. It lays a theoretical foundation for readiness and cognitive development. The bioplasmic theory becomes the key to human development. The question is how one nurture and sustain these bioplasmic forces?

The answers would be to construct a curriculum and educational climate that is compatible to the stages of human development. Hence the task of education would be to sustain and preserve the bioplasmic forces in a healthy state. Education would not only be the assimilation of content, but a therapy. The concept of bioplasmic forces could very well revolutionize education.

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Postscript

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