



Evolution's Latest - The Prefrontal Lobes

Immediately behind the ridge of our brow lies the prefrontal cortex (the prefrontal lobes), the largest and apparently most recent of brain additions. Behind the prefrontals lies the rest of our neo-cortex. While our reptilian brain has modules or parts that are hundreds of millions of years old, indications are that only about 40,000 years have passed since our prefrontal lobes appeared in their present size and with their current significance.

Neuroscientists have a variety of viewpoints on this comparatively new portion of our neural system, which was once called “the silent area” of the brain because its function was largely unknown and no activity was indicated there. Paul MacLean considered the prefrontals a fourth evolutionary system, however, and called them the “angel lobes,” attributing to them our “higher human virtues” of love, compassion, empathy, and understanding, as well as our advanced intellectual skills. Antonio Damasio considers prefrontal function the source of all higher intellectual capacities such as our abilities to compute and reason, analyze, think creatively, and so on.

The Stages of Prefrontal Development

Significantly, the prefrontals unfold for development in two stages I refer to as primary (meaning early) and secondary (meaning late). Primary prefrontal growth and usage develops rapidly after birth, in parallel with the rest of our brain. At about age fifteen the majority of the threefold brain completes its development and stabilizes. Only then does the secondary stage of prefrontal growth begin, opening with a major growth spurt, or outpouring of new neural material. Because it was discovered only recently—in the late 1980s—this aspect of development has not yet been acknowledged on a broad academic level.

It is this secondary stage of prefrontal growth, about which we are only beginning to learn, that relates to the two roads we as humans may take—both the path of violence and the path of transcendence hinge on the outcome of this mid-adolescent event.

Primary Prefrontal Development and the Orbito-Frontal Loop

In their early primary stage, then, the prefrontals unfold not so much from their own inherent capacity for development, as the older brain systems do, but more through their influence on the unfolding of these earlier evolutionary systems. The prefrontal lobes parallel the growth of the other systems because they have an important task at hand: Their main objective at this time is to govern each module or lobe of the threefold brain in its sequential unfolding in such a way that each older system forms according to the needs of the prefrontals in their secondary stage of development during the child's mid-adolescence. The task of the prefrontals is to turn the unruly reptilian brain, old mammalian brain, and neo-cortex into one civilized mind that it may access later. It is only when this has occurred that the secondary prefrontal stage can unfold as designed.

All primary and secondary prefrontal functions having to do with our relationships and our control of the R-system instincts (survival, protection, sexual drives, appetites, and so on) center on the orbito-frontal link with the emotional-cognitive brain. And further, the “affective tone” or emotional state experienced by the toddler during the exploratory period after age one determines the nature of the

orbito-frontal loop and its ability to function. Allan Schore explains why it is that a toddler's emotional state during this time of world exploration determines whether or not the orbito-frontal connection is established and used or largely lost: He describes how the orbito-frontal linkage is entwined with the care a toddler receives and how this, in turn, determines the lifelong shape and character of that child's worldview, mind-set, sense of self, impulse, control, and ability to relate to others. With this explanation in mind, it's impossible to overestimate the importance of the orbito-frontal function.

Other Stages of Brain Growth Development During Primary Prefrontal Development

Beyond the growth that leads to the development of the orbito-frontal loop, a number of other neural growth spurts occur in other parts of our brain at birth, age one, age four, and age seven, with additional shifts of function taking place age ages nine and eleven. These shifts coincide with the developmental stages of childhood called "windows of opportunity," during which particular blueprints for intelligences and abilities unfold relative to the neural modules or parts of the brain ready for development at those times.

In "building" a child's brain and corresponding capacities, each window of opportunity closes as the next one opens in its appropriate evolutionary sequence—though perhaps it's more accurate to say that a developmental stage doesn't close so much as the energy and attention of growth simply shift to the next module or portion of the blueprint waiting to be read and made real. According to this pattern, our neural structures are printed and ready for stimulus and response in their sequential evolutionary order. At each shift from one developmental period to the next, the child's energy and attention also shift, looking for that next window of opportunity.

The Role of Experience in Prefrontal Development

All of this sequential development takes place in our first fifteen years of life as preparation for the mid-adolescent prefrontal growth spurt that allows us to rise and go beyond the limitations, constraints, and shortcomings of the earlier neural system.

Miss one sequence and the entire structure is at risk. Try putting a roof on a house with no walls, or framing walls with no foundation! To do her part in making certain no step is missed or shortchanged, nature provides us with genetic blueprints, but only as bare outlines for possibility and action. It might be assumed that these generic blueprints within a child will suffice as the stimuli for neural development. Those genes, however, must be stimulated by the child's interaction with the actual expression of the capacities they imply at the time when those capacities within the child are ready for development. This is why one infant or child can't model for another. Someone who is fully able to do something or behave in a certain way must perform the role of model if a similar ability is to be awakened in that child.

If, however, a child's environment does not furnish the appropriate stimuli needed to activate prefrontal neurons—the model imperative has not been fulfilled—the prefrontals can't develop as designed. Their cellular growth itself becomes compromised and faulty.

Overall, nature's blueprint unfolds regardless of the success or failure of any individual stage of development. If the window of opportunity offered by a particular stage is missed, she blithely opens the next one on schedule as though all were well. Despite the fact that each stage of development depends on the success of the previous one for its own success, the stages keep coming. Nature's schedule, not our response, is at the controls. She doesn't call a time-out if a child's nurturing environment fails to respond to his needs.

Elkhonon Goldberg refers to the prefrontal cortex as giving us our civilized mind. At least, we are given the chance to develop civility through the prefrontals, and it is this civility that is a prerequisite for the development of our capacity to transcend, to fill our role in evolution as well as curb our suicidal violence, and to survive.

Secondary Prefrontal Development

Each major stage of development offers a window of opportunity distinctly different from anything that has come before. When a higher neural form in our brain completes its growth and begins its full function, a new form of reality and a larger world unfold to us and distinctly new behaviors and abilities fill our repertoire. As we grow from birth to age twenty-one, the strength and complexity of these stages increases exponentially. The fifteen-year-old brain is as different from that of a five-year-old as are the body sizes and behaviors of the two. Logically we could expect that on the completion and maturation of nature's latest, largest, and highest brain at age twenty-one, we would possess capacities more dramatically different from and more powerful than anything previously experienced.... But, in fact, nothing much happens at all.

The Missing Stage

In 1988 Oxford University Press published an intriguing work edited by physicists C. N. Alexander and E. J. Langer titled *Higher Stages of Human Development: Adult Growth Beyond Formal Operations*. Even though this work was compiled before discovery of the late-prefrontal growth spurt, two items stand out in relation to what we now understand about this developmental stage. First, the editors showed how the increase of intelligence at each stage of development is disproportionately greater than the increase exhibited in the previous stage, similar to the order of increase found in the Richter scale for measuring earthquakes. Thus the intelligence increases in the stage designed to open at late adolescence is an order of magnitude vastly beyond that of the previous stage, suggesting an intelligence in no way related to anything coming before. Adding up all experience and knowledge gained to that point gives no hint of the possibilities ready to unfold somewhere around age twenty-one. A similarly massive gain in intelligence can be found when the six- to seven-year-old shifts into operational thought.

Second, Alexander Langer showed that as each developmental stage offers a more advanced intelligence, a significantly smaller percentage of our populace achieves that stage. The more advanced the intelligence that unfolds through evolutionary process, the fewer the people who develop it.

For most twenty-one-year olds, when the infrastructure of evolution's newest brain is complete and the neural form is ready for full functioning, nothing seems to happen that is in any way commensurate with the newness, size, and long, drawn-out formation of the complete prefrontal cortex.

On the contrary, evolution's latest neural addition seems to lie largely dormant within us despite the fact that it seems it should offer a discontinuously new potential, a new reality—a whole new mind. The primary prefrontal function, formed in the earliest years, continues but there is little to indicate an evolutionary shift of function and behavior, or revolutionary change in life, as can be rightfully expected.

A Trinity of Great Expectations

Consider three characteristics of adolescence: A poignant and passionate idealism arises in early puberty, followed by an equally passionate expectation in the mid-teens that "something tremendous is supposed to happen" and finally by the teenager's boundless, exuberant belief in "the hidden greatness within me." A teenager often gestures toward his or her heart when speaking of these three sensibilities, for the heart is involved in what should take place. Recall what Eckhart said: There is no being except in a mode of being. The teenager's gesture toward the heart when expressing these great expectations shows that the heart is involved in these feelings and thoughts.

The brain is the heart's modus operandi, or means, for transcendent experience, and nature intends this highest stage to be ready to unfold fully at twenty-one. Development of this new stage would be lifelong if that stage were to unfold. Rudolf Steiner clearly describes these higher stages, pointing to age thirty, for instance, as the time of another step toward transcendence.

Operating to this mature developmental sequence is the adolescent's great expectation. We might think the intelligence of the heart is present all the time and permeates all being, but the heart's latent capacity for deep universal intelligence must, like the brain, be provided with models for its full growth and development. If no nurturing or modeling is given, the powers of the heart can't unfold—they will be dormant for life.

A Dialogue Between Brain And Heart

Over many years of research under grants from the National Institutes of Health, John and Beatrice Lacey traced the neurological connections between the brain and the heart. Their discovery of these connections and the ongoing heart-brain dialogue was largely ignored by academic science. Today the new field of neurocardiology has verified and validated the Lacey's work, which means that in time acceptance will follow.

The heart certainly has an intelligence, though this calls for a new definition of the word to differentiate it from cerebral intellect. The heart's intelligence is not verbal or linear or digital, as is the intellect in our head, but rather is a holistic capability that responds in the interest of wellbeing and continuity, sending to the brain's emotional system an intuitive prompt for appropriate behavior. Intellect, however, can function independently from the heart—that is, without intelligence—and can take over the circuitry and block our heart's more subtle signals.

The following, then, is a sketchy summary of the hypotheses regarding the heart-brain-body dynamic:

1. The heart's electromagnetic field is holographic and draws selectively on the frequencies of the world, our solar system, and whatever is beyond.
2. Through glial action, our neural system selectively draws the materials needed for world-structuring from electromagnetic fields as coordinated by and through the heart.
3. Our emotional-cognitive brain makes moment-by-moment qualitative evaluations of our experience of the resulting world structure, some of which we initiate in our high cortical areas and others of which form automatically and instinctually in the old mammalian brain.
4. Our emotional-cognitive brain has direct, unmediated neural connections with the heart. Through these neural connections the positive and negative signals of our response to our present moment are sent to the heart moment by moment.
5. The heart's neural system has no structures for perceiving or analyzing the context, nature, details, or logic of our emotional reports. Thus, the heart can't judge the validity of or reason for these reports and responds to them as basic facts. The heart responds on all levels: electromagnetically, through the unmediated neural connections to the limbic brain, and through neural connections to a myriad of body functions. Additional responses include hormonal shifts between the heart and the body and the heart and the brain, and perhaps shifts on sound and thermal levels as suggested by Schwartz and Russek.

In response to a negative signal, the frequency realm of the heart drops from coherent to incoherent. This is a survival maneuver that opens the heart spectrum to an indefinite or variable state. In this fluid situation our body, brain, and heart can respond in new ways to an emergency, if the old survival responses initiated by our lower brain systems are insufficient.

6. When the heart makes such an adaptive shift, suspending its stable norm, our perception changes accordingly. The world we see and experience in a state of fear, rage, dire emergency, competition, or struggles is quite different from that which we experience in a state of harmony and love.
7. During an initially negative response, our brain shifts from the slower reflective intellect of the frontal lobes and neo-cortex to the quickly reflective reptilian brain and its links with the emotional-cognitive brain's survival memories and maneuvers. This shift from forebrain to hindbrain is not voluntary or within our awareness—it just happens and always appears as logical, practical, common sense.
8. The dialogue between our heart and brain is an interactive dynamic where each pole of our experience, heart and brain, gives rise to and shapes the other to an indeterminable extent. No cause-effect relationship can be implied in such an organic, stochastic, and infinitely contingent process. This mirroring is another vital example of the creator-created dynamic.

Evolution and Devolution Again

Our potential can't be utilized and our dilemma can't be resolved by either intellect or moral and ethical effort alone (if at all). But we have within us this other link, the three-way connection among our emotional-cognitive brain, our prefrontal lobes, and our heart. Here in this connection lies our hope and transcendence—if we can break from the madding crowd. Through understanding and using our heart's intelligence along with our brain's intellect we can resolve our dilemma. Whatever language or rationale it might take, our task is to discover—or rediscover—these two potentials, align them, and come into transcendent dominion over our life.

Fields Within Fields: Of Frequencies and Neurons

Our heart participates in electromagnetic fields within fields nested in hierarchies that are holographic, the whole existing within any part, and all functioning as an integrated dynamic. Mae Wan Ho, Ph.D., a reader in biology at the Open University in England, studies the coherence inherent in each living creature. "... [B]ased on empirical findings from our own laboratory, as well as from established laboratories around the world," she writes, "the most suggestive evidence for the coherence of the organism is our discovery, in 1993, that all living organisms are liquid crystalline."

Coherence, in this context, refers to the fact that the trillions of cells and the myriad parts comprising them function together as a unit to produce the mysterious, unified, and magnificent whole called *me*. I must remind myself, as a layperson, and my reader as well, that by this word *organism* biologist Mae Wan Ho means me, this person sitting here at this keyboard, and you, there reading, and that we are not just specimens of research material on the microscope's slide but are, in fact, what all this research is about.

Mae Wan Ho continues:

In the breathtaking color images we generated, one can see that the activities of the organisms are fully coordinated in a continuum from the macroscopic to the molecular. The organism is coherent beyond our wildest dreams. Every part is in communication with every other part through a dynamic, tunable, responsive, liquid crystalline medium that pervades the whole body, from organs and tissues to the interior of every cell. Liquid crystallinity gives organisms their characteristic flexibility, exquisite sensitivity and responsiveness, thus optimizing the rapid intercommunication that enables the organism to function as a coherent whole.

When coherent, this polyglot of flesh, blood, sweat, and tears has dominion over the word, naming animals and stars, the parts of our own innards and atoms, and is the source of poetry and song. In keeping with the ideas presented in part 1 of this book, Mae Wan Ho observes:

The visible body just happens to be where the wave function of the organism is most dense. Invisible quantum waves are spreading out from each of us and permeating into all other organisms. At the same time, each of us has the waves of every other organism entangled within our own make-up.... We are participants in the creation drama that is constantly unfolding. We are constantly co-creating and re-creating ourselves and other organisms in the universe, shaping our common futures, making our dreams come true, and realizing our potentials and ideals.

A radio receiver is a critical part of the radio world—without a receiver the rest of a broadcasting system is worthless. The receiver alone gives those invisible waves their being throughout that broadcast field. But the receiver is not the sending station nor the field itself. The same is as true in the labyrinths of our brain-mind as in the world of radio. A field effect might be registered by a particular brain-body receiver, producing a corresponding experience, but that brain-body, while one of an infinite number of possible loci, is not then *the* locus, genesis, or possessor of that field.

"Not I but the Father within me does these things" said Jesus of his miracles. But without Jesus, there is no Father and there are no miracles. "Without me, God is helpless," was Eckhart's audacious claim.

The Anatomy of Evil

Why Nature's Plan Breaks Down

One of Paul MacLean's most valuable contributions was his insight into what he termed *the family triad of needs*: audiovisual communication, nurturing, and play. As with all mammals, our human nature rests on these three interdependent requirements, without which we could not long survive as a species. These needs bring about and sustain human development from birth and are, I would add, the springboard to transcendence itself. Our failure to provide all three disrupts intelligence and social development but at the same time supplies the means for enculturating us, thereby sustaining culture.

The Model Imperative

The family triad includes by default nature's imperative that a model be given for all aspects of development. Recall that a model is the living embodiment of the child's inherited capacity or talent and that its stimulus—a possibility demonstrated by the model's presence—brings about a like response in the child, building a structure of knowledge, or imprint, within him.

There are no exceptions to this necessity for modeling, and three examples are presented here: our capacities for language and vision and intelligence of the heart. These three unfold as naturally as breathing, are neural imprints, or constructions of knowledge we automatically make, and their need for ongoing model stimuli is exemplary of all of our capacities.

The importance of the model imperative in an infant's initial development, the mother's voice is the model stimulus in utero, which activates the infant's language and sensory-motor system. In the same way, presentation of the mother's face at birth acts as a stimulus to which the infant responds with awareness and the initial development of vision. (In the case of congenital blindness, nature compensates, as always, as best she can.) And so it goes with all forms of human capacity, whether sensory-motor, emotional-cognitive, or intellectual. Outer stimuli bring inner neural-muscular responses and eventual growth of a structure of knowledge or learning. And in all development, given the appropriate model environment, functions unfold automatically, as nature designed. Denied the model, nature must compensate and the function is compromised.

Undermining the Family Triad of Needs

The one aspect of humans that nature couldn't anticipate or prepare for was the development of a male intellect that encroached upon and finally threw monkey wrenches into every aspect of this wonderfully designed birth-and-bonding procedure. This encroachment was slow, devious, and deceptive, but thorough. During the Middle Ages and the emergence of the Inquisition, a growing fanaticism concerning witchcraft centered on the crone, the elderly midwife who passed on to the young women whose infants she delivered the general background of female wisdom handed down through the ages. The crone became a major target of the Inquisition and her body of knowledge suspect.

Among many issues that rankled the cloth was the crone's notion that childbirth was neither a painful nor a dangerous ordeal (and indeed, under the crone's skillful hands it seldom was). After all, churchmen reasoned, the Bible itself said that pain and suffering in childbirth was a sentence pronounced on womanhood by God—of course the crones had to go. Thus their demonization as preparation for their complete elimination became doctrine, and even today the term *crone* brings to mind the archetypal witch, a toothless hag hunched over a fire, stirring a pot of evil brew.

From the late Middle Ages on, as detailed by Suzanne Arms in her remarkable book, *Immaculate Deception*, medicine men in general horned in on this mother-child bonding domain. Following Bacon's proposals, dominating nature in all her roles had become the scientific passion (oddly fitting the church doctrine from which the notion arose). After centuries, the practice culminated in modern times in which doctors in twentieth-century America eliminated some 97 percent of breast-feeding and thus the central function around which the multifaceted bonding procedure unfolded. Bonding became the butt of jokes in academic and sophisticated circles and was viewed as a notion adhered to only by hippies and New Agers.

In America the disruption of bonding through the elimination of breast-feeding and the separation of mothers from infants during the long hospital stays that were often required through much of the last half of the twentieth century set the stage for Madison Avenue to turn the breast into the hottest sales gimmick ever discovered, an unconscious cultural collusion between two destructive forces: medicine men and advertising men. If denied the breast at birth and during infancy, a male can become obsessed with breasts. Assuming that marriage assures him permanent rights to a pair, he can become unhinged when an infant comes on the scene and takes over, particularly if the mother breast-feeds. Some fathers object to breast-feeding which is hardly supportive for the mother or surprising for males who were not breast-fed and nurtured themselves. And some of these men, feeling abandoned yet again, may in turn abandon their families—another cultural double bind wherein everyone loses.

Since separation of mother and infant became *de rigueur* practice throughout most of the twentieth century, many of our infants, to say the least, were not given appropriate nurturing or provided appropriate models and stimuli at birth or in the critical first year.

Statistically, infants deprived of early face stimuli and all the attendant benefits showed no signs of visual awareness or consciousness until ten to twelve weeks after birth. This contrasts sharply with the two to three minutes it takes to display these capacities when nature's model imperative is met.

When we look at the mounting crisis in the lives of young people today—the crises in family, education, social structures, deteriorating health and wellbeing, increasing violence in all its forms—all spilling over into the adult world in ever greater quantities, we must factor in our long century of disruptions of natural process on every level, starting with childbirth, bonding, and early nurturing. Our intellectual high brain can rationalize whole volumes of reasons and causes for our mounting disease, but our ancient brains, the foundations on which we stand, are subject to natural process unadorned and have no access to our rationalizations for breakdown as substitute for function.

On many levels contemporary life undermines the family triad of imperatives for development that Paul MacLean so clearly articulated. In so doing, the way opens ever wider for enculturation on ever more stringent levels. The results are not encouraging.

The New Indifference

Back in the late 1960s, professors at the University of Tubingen, Germany, noticed a serious drop in sensory perception and general awareness in their students. (The same drop was noted in 1966 in the United States.) Students didn't appear to be as aware of information from their environment or schooling or didn't seem to register it as young people had previously. A corresponding deterioration in learning patterns was also evident. The German Psychological Association joined the university in a research project to determine if such a shift could be quantified. Tests involving some four thousand test subjects—young people in their late teens to early twenties—were carried out over a twenty-year period. The conclusions can be summarized thus: "Our sensitivity to stimuli is decreasing at a rate of about 1 percent per year. Delicate sensations are simply being filtered out of our consciousness." In order for our brains to register it, "...especially strong stimuli" are required. (The translation of the German reads that in order for our brains to register it, "brutal thrill" stimuli are necessary.)

Most noticeable was this elevation of what is termed the *gating level* of the ancient RAS, or reticular activating system, where sensory input from the body is collected, collated, synthesized into basic world information, and sent up to the higher brain centers for processing. The high-intensity stimuli to which these young people were subjected from birth along with the corresponding lack of appropriate nurturing and natural development resulted in a high level of stimuli that must be received in order for cognizance to form. Sensory information below a certain level of intensity or weight was not registered because it was not of sufficient strength to cross the high RAS threshold into conscious awareness and perception.

Dr. Harald Rau, of the Institute of Medical Psychology at the University of Tubingen, said,

It is apparent that the cross-linkages [networks for sensory synthesis and associative thinking] have been reduced, and that the capacity [to screen out stimuli] has been enormously increased

using direct stimulus carriers working parallel to each other.... Previously, an optical stimulus would be directed through various brain centers and would also activate the olfactory center, for example. Today it appears that entire brain areas are being skipped over. The optical stimulus goes directly and exclusively to the visual center...the stimuli are then processed faster, but the stimuli are inadequately networked [not integrated by other stimulus centers] and not enhanced with emotional input.

There is no effect—no emotional intelligence. Information is processed without evaluation, thus without reference to areas of knowledge or meaning and without emotional response. The claim of the research people is that those born before 1949 show “old-brain” reactions—that is, the norm of the time. Those born between 1949 and 1969 show modified brain action. Those born after 1969 show new-brain functioning. The new brain can tolerate extremes of dissonance or discord. In a perceptual process that would otherwise be harmonious, disruptive and inappropriate stimuli are processed without the individual noticing the discrepancies. Gert Gerken notes that new-brain people have “grown up with contradictions and they can handle them. That which used to produce a split or division of consciousness, today is the norm.” Gerken refers to the ‘new indifference,’ the mental ability to unite elements that are not logically related and the failure to recognize severe logical fallacies—which results in a young person meeting everything with equal indifference. Because the brain can’t bring contradictory pieces of information into any kind of relationship, it treats everything with a relative uniformity of low-grade response.

Consciousness is becoming more restricted, the research claims—the brain processes more intense levels of information and less of it reaches our consciousness. The brain has always adapted to changes in its environment by changing its own organization. “But now...our brain is not adapting. It is rebelling against the world and changing [the world experienced] by changing itself.”

The studies show that enjoyment and aesthetic levels have dropped dramatically. Fifteen years ago people could distinguish 300,000 sounds; today many children can’t go beyond 100,000 and the average is 180,000. Twenty years ago the average subject could detect 350 different shades of a particular color. Today the number is 130. The brain “loses its standards and degenerates into a kind of dialectic processing of sense impressions.... The brain stores opposing and contradictory information without creating a synthesis.”

These young people must have a steady input of high-level stimuli or else sink into sensory isolation and anxiety. Natural settings such as parks and rural areas are avoided because they don’t offer sensory input intense enough to keep awareness functioning. German psychologists have speculated that a generation with such changed brains will create an environment of such intense stimuli that a normal brain might not survive.

As a means of comparison, the total sound level of a preliterate jungle society is about that of a modern refrigerator.

What ‘Fortunate’ Children Lack

In my book *Evolution’s End*, I related Marcia Mikulak’s research on sensory registration in children in the mid-1980s. Ashley Montagu and French physician Alfred Tomatis had both reported on our failure to physically nurture infants through touch, leading to increasing sensory deprivation and neural impairment. Mikulak, an independent child psychologist, employed standard Gessel tests to determine the level of a child’s sensory awareness, eventually devising more extensive tests of her own. She examined young children from a wide range of cultures—from the preliterate societies of Brazil, Guatemala, and Africa, to the highly literate countries of Europe and America—and found that the children from primitive settings averaged levels of sensory sensitivity and conscious awareness of their surroundings that were 25 to 30 percent higher than those of the children of industrial-technological countries. Preliterate children were more aware of what was taking place among the people around them and what was said to them and asked of them, as well as the general sights, smells, tastes, and touches of daily life. They knew the names and characteristics of the flora and fauna in daily life. They knew the names and characteristics of the flora and fauna in their environment, which few if any of our

industrialized children or adults do. Mikulak's studies were ignored. Those of Tübingen and the German Psychological Alliance, published in 1995, have equally been ignored.

In *Evolution's End*, I also quoted from studies made in the late 1980s of the learning ability of children in so-called primitive groups such as those in Guatemala and similar countries that have severely low standards of living. When these "deprived" children were put into a learning situation equal to those provided for our well-cared-for children, the deprived children showed a three to four times higher learning capacity, rate of attention, and comprehension and retention than our "fortunate" children. Deprived of advanced electronics, these primitive children were given the most necessary things—love and nurturing—and they played continually and developed to the maximum their society afforded.

World Deterioration

For thirty years I have made the unpopular proposal that our treatment of our children has made them increasingly uneducable by the time they reach school age. Mark, then, a further prophecy, made by a score of better heads than mine, that computerizing schools will bring this whole mounting chaos to its terrible, irreversible conclusion. Age-inappropriate use of electronic devices undermines the very value of those devices.

Bioculture and the Model Imperative

Research published in 1998 provides a clue to our evolution and development, and perhaps to the slowly swinging cycles of civilization. This research concerns brain growth during gestation and, in addressing its subject, manages to cast a light that illuminates our current personal and social dilemmas.

If a pregnant animal is subjected to a hostile, competitive, anxiety-producing environment, she will give birth to an infant with an enlarged hindbrain, an enlarged body and musculature, and a reduced forebrain. The opposite is equally true: If the mother is in a secure, harmonious, stress-free, nurturing environment during gestation, she will produce an infant with an enlarged forebrain, reduced hindbrain, and a smaller body.

The oldest evolutionary brain in our head (and body), you recall—the reptilian or hindbrain—provides for fast physical reflexes; is geared to brute strength driven by primary survival instincts hardwired for defense; and is reflexive, not reflective and not very negotiable. The forebrain, on the other hand, gives rise to our intellectual, verbal, and creative mind, functions more slowly, is reflective, and is far more intelligent and negotiable than the defensive, hair-triggered, and reflexive hindbrain.

In her evolution, nature didn't add a forebrain with its reflective, creative intelligence until she had worked out the logistics of a protective, survival-oriented brain upon which she could build her new one. So nature's shift in uterine brain growth toward the kind of environment that a new life must deal with follows an established, adaptive common sense that would please the most ardent Darwinian. Note, however, that nature shifts from an emphasis on physical survival to an emphasis on intellectual enhancement whenever she gets the chance. That is, she moves for a bigger forebrain at each opportunity, asking in effect, at each conception, can we move for greater intelligence this time, or must we protect ourselves again? This is, after all, an organic and most intelligent life process, not a rote chemical mechanism. Perhaps at times of catastrophe our general brain structure suffers a setback, but because evolution obviously moves toward higher forms of intelligence, nature can recoup quickly whenever the environment is favorable, responding even to individual cases and the internal environment of just one mother.

The Bioculture Dynamic

For years Bruce Lipton and other enlightened biologists have observed that environment influences genetic coding every bit as much as conventionally recognized hereditary factors. Lipton found that from the simplest cell on up, a new life unfolds in one of two ways: It can either defend itself against a hostile environment or open, expand, and embrace its world. It can't do both at the same time, however, and environment is the final determinant in the decision.

That neural growth will shift from a defensive, combative stance to one that is reflective and intellectual—or vice versa, according to the mother’s emotional state—offers us the chance to make a profound shift in our history and to take our evolution in hand. Even in the middle of pregnancy, if there is a change from negative to positive in the mother’s emotional life, the direction in fetal brain growth changes accordingly.

That a mother in a safe space produces a strikingly different brain and child physiology than one who is anxious clearly illustrates nature’s model imperative. The mother is the model of the eventual child on every level and a new life must shape according to the general models life itself affords. For, as is true in all cases of nature’s model imperative, the character, nature, and quality of the model determine to an indeterminable extent the character, nature, and quality of the new intelligence that manifests.

This all indicates a bio-cultural dynamic—our biology influences our culture and our culture influences our biology. A sufficient number of children born predisposed toward defensiveness and quick reflexive survival reactions will tend to change the nature of the society in which they grow up.

Culture has been our principal environment of mind for many millennia, and through the dynamic of culture and biology, humanity fell into a vicious cycle long ago, a trap from which only the prefrontal-heart dynamic can deliver us. Nature has continually offered us this escape, but, time and again, circumstances breeding fear in us have turned her down.

Culture as a Field Effect

Accept for sake of discussion this definition of culture as an aggregate of ideas about survival, a taxonomy that lifts disparate notions into a coherent and powerful whole. Culture as a field effect is thus inviolable, its contents or expressions interchangeable and even incidental because culture absorbs and transforms any content into its own formative structure. Similarly, anxiety is a state of chronic, free-floating fear—fear without an object. Such a state acts as a catalyst, changing every object, every event into its target, making an event fearful whether or not it deserves to be considered so. Anxiety can become the lens through which we interpret our ongoing experience.... Culture, then, is a mutually shared anxiety state, a powerful catalyst of thought that converts all events to its own nature.

Once set in motion and locked into our ancient reptilian brain and its hardwired survival memories, this cultural effect reproduces itself automatically and is thus passed on.... Our greatest fear, the late philosopher Suzanne Langer said, “Is of a collapse into chaos should our ideation fail us.” Culture is that ideation, or set of ideas. The foundation and framework of our worldview, self-image, mind-set, faith, and belief are culturally determined. Our grounding in culture and culture’s grounding in survival are so intricately a part of our mental fabric that such roots are seldom ever exposed, and even then can hardly be recognized for what they are. Culture is the mental environment to which we must adapt if we are to survive, and in our adaptation and survival we automatically sustain culture.... Threaten our current cultural body of knowledge and you threaten our personal identities, our core being. Such a threat can lead us to behaviors that go against survival—at least for the victims of our reaction.

Culture can become a kind of psychic entity that can possess and/or inflate a person or even an entire country and achieve its violent ends through such possession and inflation.

Enculturation and Socialization

Socialization in this sense is instinctual, while culture is not. Our social impulse arises from the so-called herd instinct inherited from our mammalian ancestors. The pleasure in gathering together with our own kind, found in most mammalian and avian life, is the source of community and fosters the model imperative, extended nurturing and care; mutual sharing of aesthetics, events, dreams, hopes, ideas, and ideals; mutual appreciation of works, skills, creativity, cooperative ventures; and the sharing of the higher, broader expanses of love—love of neighbor, self, and God.

Enculturation, on the other hand, is not instinctual but instead the result of conditioning, our enforced learning and adoption of ideas about survival, including techniques believed necessary in our particular cultural environment in order to survive. Our imitative monkey-see, monkey-do compulsions actually arise from our oldest reptilian brain system, which is linked to survival and fight-or-flight injunctions of

the old mammalian brain. Ironically, this combination provides the principal tools employed in enculturating our children. Enculturation is not instinctual; we must capitalize on and use our survival instinct to bring it about. With regard to enculturating our children, lacking all conviction otherwise, we move with total, passionate intensity. Convinced we must pass on this survival knowledge, we pound it into our offspring “for their own good” as it was pounded into us for our own good. Schooling is treated in a similar fashion—no matter how much pain schooling may have caused us, to save our sanity over having lost the richest, loveliest years of our life to the process, we rationalize that it must have been good for us! And we then subject our children to it in turn; they prove our point by becoming like us, confirming our worldview, joining our mass anxiety, and verifying it by coming on board. We have very little choice in the matter, but hope springs eternal that this time we will make schooling work.... It never has.

Our Children’s Growth: Joyful Learning of Cultural Conditioning

A child’s socialization, which can be characterized as learning in its most complete form, encouraging reflective thought, is instinctual and arises spontaneously on its own. Culture is something quite opposite: an intellectual, arbitrary conditioning and enhancement of automatic reflexes that must be both induced and enforced. A society—the product of socialization—is made of spontaneous nurturing and love, while culture can bring quiet hate, which can lead, sooner or later, to a child’s subtle or flagrant rebellion. Such rebellions are forcibly put down through the infliction of pain, fear, guilt, and shame, or, if none of these works, then through isolation, exclusion from the group, or the labeling of the rebellious child as dysfunctional or unfit.

Many parenting books focus on how best to enculturate your child, carefully cloaking advice with the current politically correct phrasing and playing on parents’ concerns over the child’s education, place in society, career, fame, and fortune, and constant threat of failure to achieve these.

Without exception, these cultural techniques involve carefully masked threats that prey upon the child’s rapidly learned fear of pain, harm, or deprivation, and more primal anxiety over separation or alienation from parent, caregiver, and society. No matter how we camouflage our intent both to ourselves and to our child, most parenting and education (except, perhaps, Waldorf and the best of the Montessori’s) are based on “Do this or you will suffer the consequences. This threat, in fact, underlies every facet of our life, from our first potty training through university exams, doctoral candidate orals, employment papers, income tax, on and on ad infinitum down to official death certificates and burial permissions, no matter how high on the cultural totem we climb. Culture is a massive exercise in restraint, inhibition, and curtailment of joy on behalf of pseudo-safety and grim necessities. We live out our lives in the long shadows its casts.... Such cautious directives continually activate our instincts of defense, which enculturation plays upon so well.

The Enucleated Self: The Power of the Negative

All mammalian young are genetically driven to interact with the objects and events of their environment, upon which they build their neural imprints. Any new, unfamiliar object or event powerfully signals our young to interact with it to build such a structure of knowledge. As a rule, in their initial encounters with their environment, infant animals check for their mother’s okay, which she gives through a variety of subtle sensory cueing, before they interact with a new phenomenon.

In the nest or home all objects and events are safe for interaction, but in the great outdoors, caution is the rule. Our toddler points to something unknown and checks his caregiver’s response. If positive, the toddler follows through with a complete sensory inventory of that phenomenon, tasting, touching, smelling, listening, and talking to it, in order to build from it a structure of knowledge. Such imprints include the name, if given, and the emotional state experienced during the exploration. Thus, the world the child constructs will be one shared with the mother.

Seldom will a young wild creature disregard a mother’s cues that an object or event might be dangerous. Such warning is the primary signal on which mammalian life has depended throughout history. In our evolutionary past a child disregarding the danger signs of a caregiver was tiger’s lunch and left no progeny.

Problems arise, however, when the child follows his genetic encoding and explores an unknown in the safe space of home but meets with an emphatic NO! or DON'T! from the caregiver. What was automatically safe to do seems suddenly and arbitrarily not safe—a conflict of signals.

Thus NO! becomes a powerful and terrible word to the child and is generally one of the first words he speaks as he tries to get a handle on that malevolent negative force. Countering negative with negative, like fighting fire with fire, may be our first learned survival strategy. Sooner or later survival overwhelms the most rebellious will; the toddler conforms to NO!, ceases his exploration in proper fashion, and becomes one of us.

This explanation might strike you as overstated, but the youngster, caught in a serious contradiction of terms, experiences ongoing confusion, ambiguity, and uncertainty. If the safe space is no longer safe, where do we turn? Using negatives to correct behavior is at the very heart of enculturation, however, and the logic never improves. “Thou Shalt Not” is a wellspring of law and religion, the cement holding together, the source of all legal systems, prisons, war, and our downfall.

The enculturated mind is cued to respond to the negative as a point of focus, which largely screens out or ignores a quiet stable base, and, because it sharpens and maintains our alert awareness, we actually begin to look for the negative.

Toddler At The Crossroad

In human development the early toddler stage is the fountainhead of cultural renewal. At stake is the activation and development of the child's sensory system and knowledge of the world, and the equally important building of his emotional-cognitive system's knowledge of what relationships with that world are like. By about the eighteenth month after birth, the child's emotional-cognitive system has formed patterns of response that will determine the nature of his relationship for life, the neural foundation of all learning. Maria Montessori claimed that “a humankind abandoned at this earliest formative period becomes the worse threat to its own survival.”

Allan Schore's research shows that we all experience abandonment of a kind, which perpetuates our culture and seriously impairs our emotional-relational system itself. Recall how the emotional state of the mother determines the actual character, nature, and shape of the infant's brain in utero. Allan Schore shows how this relationship exists through the first two years after birth as well, further determining the growth, shape, and nature of the child's developing brain. One of the major growth spurts of the brain takes place after birth, and the fate of the new neural material introduced at this time is subject to the same model imperative as that introduced before birth. The way the brain is used, based on its model, is the way it forms and grows.

Schore's study concerns affect regulation, or our ability to modify or modulate initial impulses from our sensory or emotional system, and the role this plays in the organization of our self system, that unique sense we have of being an individual distinct from the world out there. Growth and development of the connections between the prefrontal lobes and the emotional-cognitive brain, with its direct connections to the heart, are what is at stake here.

A Caregivers Prohibition

Although the sizes of the hindbrain and forebrain are determined by the mother's emotional state while a child is in utero, the growth of the prefrontals is determined by mother-infant interactions in the first eighteen or so months after birth, and, you recall, the prefrontals are critical to all higher intelligence and to transcendence itself.

Allan Schore points out that growth and development of the prefrontals is experience-dependent, which means that the actual cellular growth and functioning of the prefrontals is dependent on appropriate stimuli from the environment. For a child in the first year and a half after birth, that environment is the mother: “Interactions with the mother directly influence the growth and assembly of the brain's structural systems that perform self-regulatory functions in the child...and mediate the individual's inter-personal and intra-personal processes for life.”

Not only does the extent of cellular growth depend on environmental stimuli, but the character or nature of what does grow and develop is determined by the same model imperative. “The physical and social context of the developing [child] is . . . an essential substratum of the assembling [brain] system.... The tenth to eighteenth months mark the final maturation of the system in the prefrontals essential to regulation of affect [emotion or relationship] for the rest of that person’s life.”

(This observation must be qualified based on evidence that the prefrontals undergo a major growth spurt at adolescence, a discovery not commonly known when Schore was developing his theory.)

So, with the mother present to fulfill the model imperative, the toddler learns to walk, plunging with spontaneous excitement and abandon into his exploration of his new world and the interaction of his body and self with it, only to be met with an unexpected obstacle. Schore reports, “The mother of the eleven- to seventeen-month-old toddler expresses a prohibition on the average of *every nine minutes*, placing numerous demands on the infant for impulse control.” (Italics are mine.)

By prohibition, Schore means the mother’s NO! or DON’T—and, all too often, physical punishment—concerning some action the toddler undertakes, such as reaching for an object in the grocery store. The impulse control demanded by the mother is selective and arbitrary, determining what is permissible to be learned through exploration and what isn’t. While there are times when a mother is genuinely and legitimately concerned for a child’s safety and wellbeing, above all she is concerned that the child learn to mind her and obey her commands as a matter of principle more than practicality. A good child is one who obeys and a good mother is one who has a good child. Both judgments are levied by culture.

In turn, the process of breaking down a child’s resistance to these restrictions, which is equivalent to breaking his will, constitutes what is conventionally called socializing a child. Of course, as covered in our last chapter, this is not at all socialization, but enculturation.

And here Schore goes into great detail explaining, “Shame is the essential effect that mediates the socializing function.” The authorities Schore quotes assume axiomatically that this “socializing” must be enforced; that prohibiting self-generated impulse actions is absolutely necessary; and that instilling a sense of shame is absolutely essential to such impulse control, leading to proper socialization.

In the final analysis, parental prohibitions extend to virtually all forms of tactile interaction. The untouched child is met with the command DON’T TOUCH! more than any other—and we adults are met with the same words regarding children.

Threatening the Bond

The mother can accuse and shame a child simply through her look. An accusatory or scolding look becomes a substitute for verbal command and warns the child that his action could break his bond with the mother and bring isolation. This shuts down the child’s positive emotional state on which exploration and learning depend, leading to his withdrawal from that exploration out of fear of further threat to the bond with the mother. Schore puts it this way: “The mother utilizes facially expressed stress-inducing shame transactions which engender a psychobiological misattunement.”

Schore describes over many pages how each prohibiting NO! or shaming look brings the shock of threat, interrupts the will to explore and learn, and produces a cascade of negative hormonal-neural reactions in the child. Schore then describes at length the child’s depressive state brought about as a result of these episodes of shame stress.

Passing on the Shame

Most of this shaming isn’t so much from parents’ concern for their child, as rationalized by all of us, but from the parents’ own enculturation and serious concern that their own social image might be tarnished by their child’s behavior. This personal concern of parents can far outweigh concern for the child’s welfare. If their child doesn’t conform to cultural expectations, they, the parents, will be criticized, by neighbors, other parents, grandparents, in-laws, the psychiatrist, maybe even the law! This personal fear cloaked by an overtly displayed concern for the child is a major way by which culture perpetuates itself.

Shore points out, “shame is internalized and becomes the eye of the self looking inward.... The other person [the caregiver who originally induced the shame] is then not needed.... Shame becomes an imprint, a mental image of a ‘misattuned’ mother face.” Such misattunement between child and caregiver “engenders a rapid brake of arousal and the onset of an inhibitory state.” Inhibition is a form of depression; the same hormones are involved. “‘Signal shame’ results, an internal mentation alerts the child that [an] external event might be a painful affect.” That is, the child develops awareness that an action he is about to take could bring painful emotional reactions.

What occurs as a result of this entire mechanism is that nature’s imperative to explore the world at large is overwhelmed by the greater imperative to avoid the pain of a broken relationship with the life-giving caregiver. What will be developed in the child is a capacity for deception as he tries to maintain some vestige of integrity while outwardly appearing to conform. Living a lie to survive a lying culture, the child forgets the truth of who he really is.

The Work of Shame

Shame breaks into this natural process and the premature awareness that results is a split between self and body, an inner rejection of body rather than an acceptance of self as the whole being nature intended. From this will grow our rejection of the larger body of man and a rejection of the living earth demonstrated in the rape and desecration of our planet.

From citing Darwin, Schore moves onto citing heavyweight Sigmund Freud, who states that the shift occurring at the end of the toddler period moves the child “from the pleasure principle to the reality principle. And this shift takes place through shame.” Note that the toddler is being extricated from the darkness of the pleasure principle and moved to the light of a “reality principle” through the “enlightening” principle of shame! Freud’s logic sets “reality” against pleasure in an either-or opposition typical of the dark cultural and religious inhibitions of life. Herein looms the lifelong cultural verdict driving both East and West: Pleasure is bad! Pain is good for you!

Jean Piaget spoke of a major characteristic of childhood being “an unquestioned acceptance of the given. “To the young child everything is as it is—wonderful, exciting, inviting, and entrancing—and all of it draws him into an intimate rapport and total involvement and interaction with the world. Once shame is imprinted, however, there will never again be “unquestioned acceptance of the given.” Instead there will be a faltering hesitancy as doubt intrudes and clouds his knowledge of self and world.

The work of shame does not stop with doubt, however. Shame stress brings the same overload of cortisol and depression and withdrawal found in children who experience psychological abandonment or separation anxiety.

“Increased cortico-steroid levels are also found in twelve-month-old infants undergoing separation stress from the mother,” Schore notes, and, “[t]his condition results in avoidance of mutual facial gazing.” Mutual face-gazing is the foundation of all audiovisual communication and is primary in all brain development. In some autistic and many depressed children, eye contact, so critical to development in these earliest months, was not available when required and, when offered later, too often indicates hostility. As a result, eye contact is regarded by such children as threatening and is avoided.... Schore’s words should be writ large; they articulate the fall of the human from grace into culture.

The Great Neural Pruning

This brings us to the most critical of all Schore’s observations from his twelve years of work and 2,300 research citations. Delving into the negative aspects of our biology, this observation is the pivotal point of part 2 of this book. But first a reminder: The prefrontal lobes are experience-dependent; the environment must furnish the appropriate stimuli if full growth is to take place.

Yet, shortly after that major preparatory growth spurt in the prefrontal-limbic connection, nature deconstructs those very neural structures—and thus the very orbito-frontal loop that she has just established! Recall that the prefrontals are nature’s latest neural creation, and this orbito-frontal

connection is the fourth brain's link with the ancient emotional-cognitive brain and, through it, with our heart.

Schore relates that the emotional shaming experience the toddler undergoes brings about a "degeneration and disorganization of earlier imprinted limbic circuit patterns...[and] produces a wiring of orbitofrontal columns." He then details not only how the actual neural growth of structure and hormonal balance in the child are impeded by shame, but also how shame actually brings about the deactivation, severance, and pruning of those very superabundant connections that have just been established between limbic and prefrontal systems. In Schore's words, "a period of maximum synaptic excision occurs within the human prefrontal cortex at the end of the first year and thereafter declines.... Such alterations are known to be related to functional use-disuse."

The worst is yet to come, however. Far more devastating than this pruning is that nature then brings about a corresponding increase of the connecting links of the emotional circuits in this cingulate gyrus with the lower survival fight-or-flight structures of the amygdale, that neural module linked directly with our ancient defense and survival system in the reptilian brain. In this way, a sharp curtailment of connections with the higher, transcendent frequencies of mind and heart is brought about in order to shift growth toward the lower, protective survival systems."

This is, again, just what we observed happening to the brain of the infant in utero when the mother is subjected to anxiety. Nature has again provided an excessive amount of neural material for a movement toward higher intelligence, and again has had to retreat on behalf of survival. This will happen again and again, particularly in the parallel adolescent period when corresponding growth spurts once more take place between the emotional brain and prefrontal lobes. (Occurring at adolescence is an advanced form of maturing analogous to that of the early toddler stage, when emotional connections are again uppermost in importance.)

There is a precise devolutionary process occurring here. At this most critical time, when the toddler begins exploring the world, the prefrontals lose the very synaptic connections they have just made with the limbic system and, through it, with the heart, the connections prepared for during the in-arms period and throughout the general nurturing period of that first year. When all the rest of the brain is growing at its greatest rate and enormous world exploration is supposed to take place, the prefrontal-emotional connection is cut back, withdrawn. Which area of the brain is instead receiving that energy, attention, and stimulus for growth? Of course, it is the hindbrain and its emotional loop, busily building defenses against a world that betrays and can't be trusted.

This loss of prefrontal material is brought about because as the caregiver becomes the "socializing" parent, emotional deprivation takes the place of nurturing in that second year—and the excited, exuberant child is turned into a "terrible two." More is involved here than use it or lose it—we witness a major shift from higher levels of intelligence to lower levels of defensive instinct, a natural survival reaction of the child's system must make to a harsh emotional environment. And we applaud this as successful "socialization" of a child.