

Sen Anjana ,*Neurology of Emotional Intelligence Interpreted for Managers – Vision* (special issue on Emotional Intelligence) 2008 published by Management Development Institute, Gurgaon. ISSN 0972-2629 Vol 12 No 1 Jan-Mar 2008 pg 11-18 *Reprint below*

## **NEUROLOGY OF EMOTIONAL INTELLIGENCE INTERPRETED FOR MANAGERS**

*Abstract :*

*The objective of this paper is to highlight the relevance of fundamentals of neurophysiology in Self Regulation and Management, Creativity and Learning. It explains how Emotional Intelligence safeguards health and helps maximize potential. The difference between 'reaction' and 'response' is also explained through the architecture of the Limbic System. Tissues which actually participate in feelings and consequent decision making processes have become demonstrable due to new imaging technology such as Functioning MRI and PET. The seat of Intuitive Knowledge sometimes referred to as the 'heart' is also found in the Emotional Centre. Proximity to the nucleus of control of physiological processes facilitates direct effect upon body functions and immune mechanisms, explaining profound effect of subconscious events upon health and healing. Awareness of these facts is likely to motivate individuals to take control of quality of life and health through a responsible approach towards using their most valuable asset – the Brain.*

### **Drawing Attention to the Brain**

The study of Neurology and Physiology has been restricted to the Medical profession mainly because of its complexity, not for its lack of applicability in daily life. Physiology is the fabric upon which all emotions manifest and raise living things above the vegetative state. Without the underlying Chemistry to fuel enthusiasm and drive, how would humans actualize their dreams or achieve Excellence? But Physiology, like the mute canvas beneath a brilliant painting, prefers the quiet dignity of invisibility. Like the softly purring engine of the silver Rolls Royce, organs are supposed to go about their business quietly and efficiently without people even knowing that they exist. Still a wise owner never forgets that he owes his power to the engine. Its vitality is unquestioned and however unassuming, it deserves due attention. Basic knowledge about how a system functions helps us take better care of it and use it in a way that maximizes its potential.

## **Evolution and Hierarchy**

Humans undeniably occupy the top of the evolutionary ladder on Earth. This position is based on the supreme criterion of brain structure and function. Evaluated by any other criteria, e.g. sensitivity of sense organs, muscle strength, stamina or bio-adaptability, humans are inferior to many other creatures. So it is the Brain which sets us apart, and in the brain, it is the sheer bulk of the cortex (gray matter) that enables us to evolve a complex language, to perceive time, to learn from mistakes, to reason, to invent tools, control other life forms, and rule.

Each human embryo passes through all the previous stages of evolution as the individual fashions itself from a single fertilized ovum, through a tight ball of rapidly dividing totipotent cell-stage onwards to a disc of three basic layers which eventually folds, unfolds, convolutes, differentiates and blossoms into a beautiful being. It cleverly retains the features of earlier evolutionary stages upon which the human traits were superimposed through natural selection. The retained features of lower animals would have to be the ones essential to survival – so the reptilian vestiges<sup>i</sup> can be found in the brain-stem, the most ancient part of the evolutionary success story. It controls the function of the heart and lungs as well as instincts of territory, reproduction and social dominance.

The archaic brain-stem is topped by its mammalian successor, the middle brain or mid-brain, and houses the Limbic System, home to the emotions, identity, memory, reward systems, bonding needs and instincts relating to protection and love. Riding upon this willful emotional steed sits an excessively top-heavy Neo-cortex. A hundred billion neurons<sup>ii</sup> with a neuron-boggling number of connections make up this spanking smart three tier organization which runs smoothly in our heads. The three levels are capable of over-riding each other, but the cortex, in addition to its obvious size is equipped with a creamy layer of inhibitory neurons giving it an unfair advantage over the others. It is obvious that evolution favours predominance of the thinking levels but the territorial, domineering, reproductive and emotional levels are perfectly capable of calling the shots.

The lower levels are concerned with survival, so only after their needs are met can the work of the thinking levels progress. At different times, any one focus dominates while the rest of the brain assumes a supporting role. Education, awareness and practice help us to decide which level we allow habitually, to dominate most of the time. If needs<sup>1</sup> low down in the hierarchy are unfulfilled, we down-shift to a domination of a lower brain region. In case the lower rung workers go on strike there is precious little the board members can achieve in that period.

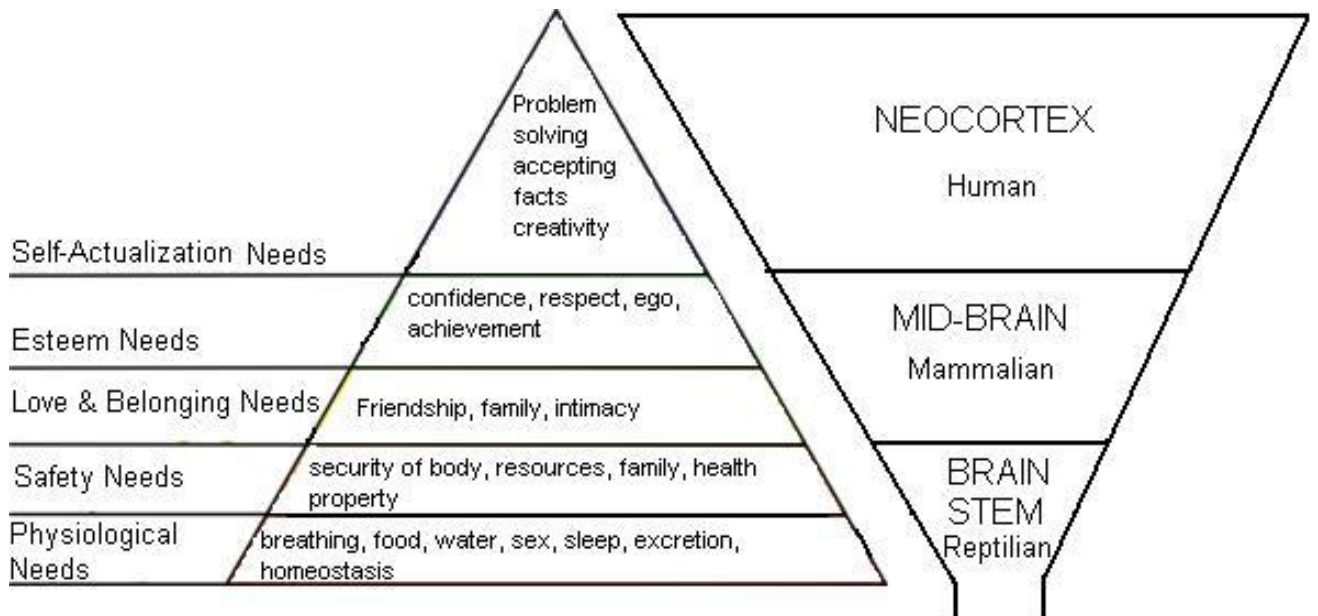


FIG 1  
Maslow's pyramid of Hierarchy of Human Needs matched with a schematic representation of the evolutionary levels of the brain related to these needs (not to scale)

<sup>1</sup> Maslow Abraham, A Theory of Human Motivation 1943 Psychological Review, 50, 370-396.

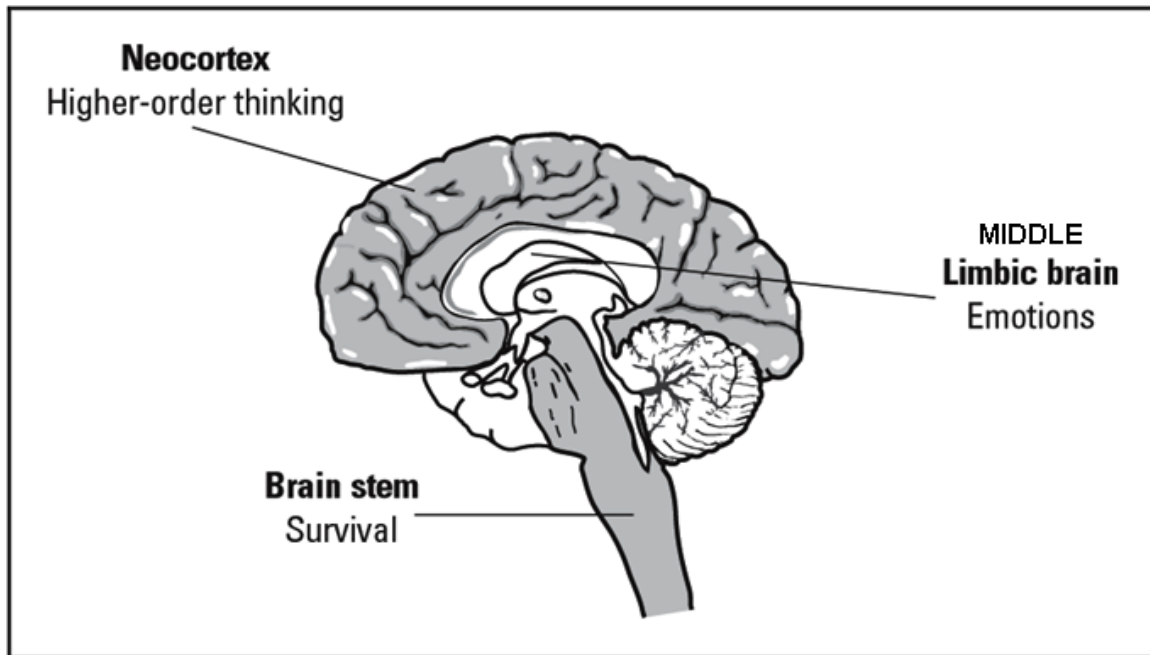


FIG 2  
The human brain in Sagittal Section, diagrammatic representation of Triune Evolutionary Levels

### **Reaction and Response**

The middle mammalian brain, the seat of emotions, memory and intuitive inputs (the limbic system) is what we call the “heart” of a personality. The lower brain levels get the first inputs from the sense organs. These are areas concerned with vital life-saving and life maintaining mechanisms, designed for speed relays enabling a highly efficient mechanism of reflex actions. We withdraw our hand from a hot surface seconds before we realize the danger in the language of thought. Knowing full well that a naughty child is playing with a rubber snake, we still jump and feel fear (accelerated heart, blood pressure and breathing) when he suddenly throws it in our way. It takes time for the analytical neurons to tell the “heart” that all is well and it is just a prank. Most sensory inputs are routed through the Thalamus (Relay Station)<sup>iii</sup> which splits the signal and passes it on to the Amygdala (the emotional centre) by a short path with no branches or

tributaries (expressway), and coaxes the rest of the signal up to the cerebral thinking cortex for processing. The neuron-crowded gray matter has innumerable connections, slowing down the signal (like entering a busy commercial area of a town), and is also physically at a greater distance from the relay station than the limbic structures. The return path for the stimulus brings the signal for action (re-action). The short non-processing loop from the Amygdala brings a quick reaction, based on a speed check of earlier patterns and events stored in emotional memory. The cortex on the other hand meticulously chooses from a range of options after examining the appropriateness of each possible action in the given situation. This is the part of the brain which realizes “I should have said x instead of y, and I could have done b instead of a.” Given a little time the processed response could have been acted upon instead of the instinctive reaction initiated from the middle-level.

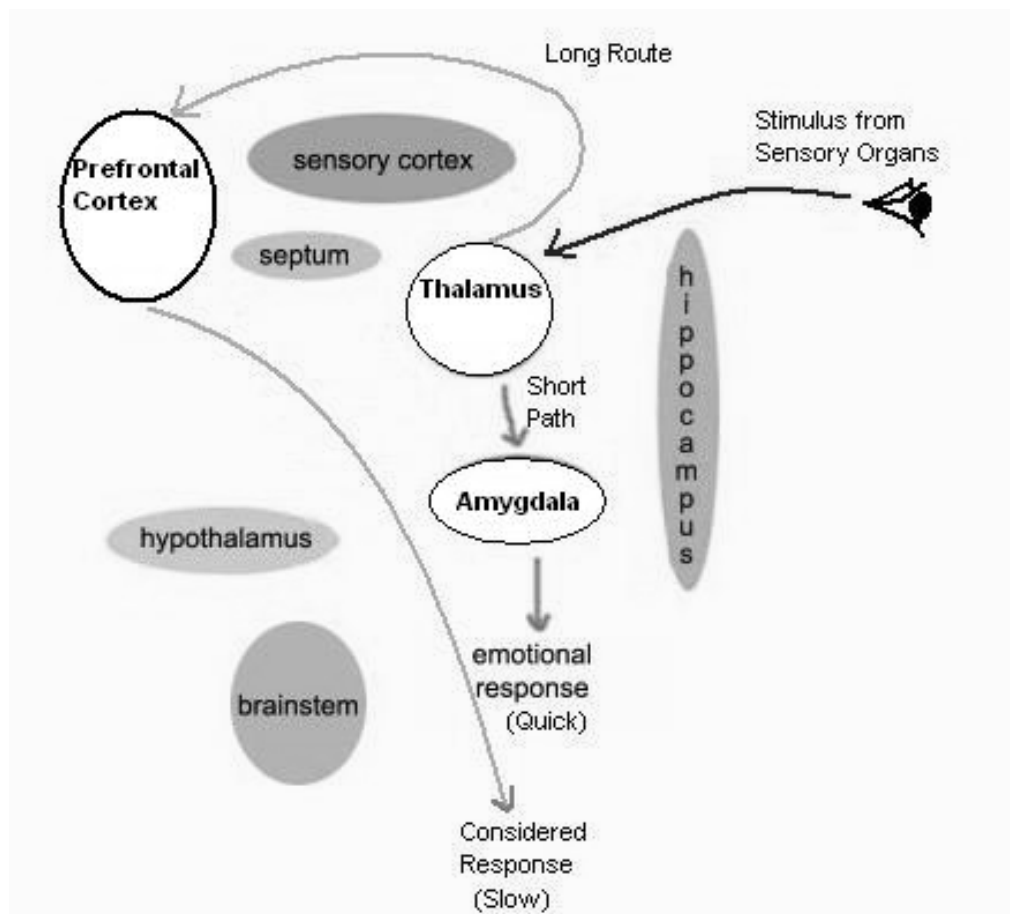


FIG 3 The short and the long paths taken by incoming signal from the sense organs; The short path initiates an emotional reaction while the slower path from the decision making cortex initiates the considered response.

## The “Heart” of the Organization

The hierarchical structure is designed for convenience, organized work-flow and “Safety First” override. It does not imply that the members occupying the middle or lower levels are inferior in any way. Therefore, do not underestimate the Amygdala. It can give valuable counsel at phenomenal speed. It has a wealth of emotional memory, some from a time when the episodic memory of the hippocampus was still too immature to record. Emotional knowledge arises from the way the body feels. The brain senses the feed-back from the body and connects the feeling in the form of a pattern of firing nerve impulses, with the causative factor in the environment, which is also perceived in patterns of neural stimulation in the sense organs e.g. patterns of retinal excitation give rise to the sensation of sight.

The Amygdala (“heart”) never lies. (Have you realized that it is not possible to lie without engaging the conscious mind?) Present education systems and priorities have overshadowed the development of the Amygdala and sometimes purposefully suppressed its voice. When someone says “Listen to your heart” he means be still and silent for a moment and acknowledge the information coming from the Amygdala. Somewhere in these archives there lies the deep inner knowledge of one’s own potential and value. This knowledge resides in regions of the brain which are below the level of cognitive thought, and may therefore be inexplicable (I just *know*) and difficult to express. This is intuitive knowledge (gut feeling). Inability to reach the standards set by this deep self-knowledge leads to deep sadness.

*The unhappiness, unease and unrest in the world is because people are living far below their capacity*

-- Abraham Maslow 1908-1970

The subconscious, emotional and quick to sense Amygdala is closely linked with the basal brain via the Control Room (Hypothalamus) which exerts changes in physiology through heart-rate, blood pressure, breathing, hormone release and clamp-down. It can

bio-chemically alter basal metabolism and has profound effect on immune processes<sup>iv</sup>. The emotions, of which we are unaware, dwell in the subconscious and have far greater influence on health, healing and physiology than the thoughts and moods of the cognitive grey matter. Your thought processes may get to crank up your heart rate and blood pressure too, like when you think about a grave ecological problem like global warming, but the rise in blood pressure would be little compared to the levels you can touch when a child darts across your path when you are driving a car.

Lower levels of the human brain have been retained through aeons of selection and elimination. The resultant human basal and mid-brain is lean, but vital. Without it there would be no passion, enthusiasm or inner motivation, so the thinking brain would be lackluster, thus rendered superfluous. It would be wise to acknowledge and respect the middle levels despite the top-heavy structure of this brainy organization.

The mid-brain feels, remembers,<sup>2</sup> reacts, empathizes and recognizes intentions, senses non-verbal communication and gives feed-back about physiological well-being. This is the 'Heart' of the homo sapien. It is essential to relationship-building, reward recognition and is the hearth of the driving force. This is what makes us tick.

To encourage your "heart" to speak up, I suggest you make a mental note or better still, scribble on the margin of your notepad or diary. Intuitive information maybe true, but needs to be corroborated. The detective may have a hunch that the butler did it, but he cannot arrest the man on that hunch. From my clinical experience I recall making a mental note of hepatic disease before a patient spoke. The patient complained of some unrelated minor problem. A glance at the long queue of waiting patients tempted me to write out a prescription and send the man on his way, but much to his dismay I indicated the examination table. Many a barely legible scribble on the margin of my notes has helped uncover metastatic cancer, chronic malaria and harmless cysts. Hats off to the Amygdala!

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<sup>2</sup> People won't remember what you did. People won't remember what you said. But people will remember how you made them feel--Neale Donald Walsch

## The Head Office

The brain is spatial, like your office. Imagine a sheet of spongy gray matter roughly the size of a newspaper, crumpled to fit inside your skull. The space assigned to various tasks is hierarchical (vital lower and processed function higher) and according to the sensitivity or intricacy. For example, the number of cells responsible for finger movements are many more than those governing the muscles of the thigh. There are defined areas for function and activity and some are asymmetrically distributed through the right and left hemispheres. Though these discreet centres have their work cut out, the ubiquitous network of loosely connected and branched nerve cells (neurons) ensures that no part of the brain is isolated. There are conduits of connecting fibres, innumerable synapses and complex networks which enable this organization to function as a unit. Consequently every activity of the midbrain and vital brain-stem *can* be brought up to the thinking level, just as we can make us aware of breathing which, however, proceeds seamlessly whether we are aware of the activity or not.

A band of nerve fibres connects the emotional centre to the frontal cortex just above the eyes, which is home to the Manager (Emotions)<sup>v</sup>. This Manager senses the emotion (brings it into the conscious arena), considers the available response options and initiates the appropriate action. This connection raises us above animal status and ensures that we are not hi-jacked by our own emotional centre (Amygdala). It just needs a little longer time to process inputs in grey matter. Reflex mechanisms of the lower reaches are quick and thoughtless (as there are very few connector nodes). To allow for slower processing speed of grey cells (due to innumerable connections), considering the gravity of the task of choosing from numerous response options, give your Manager a generous six seconds<sup>vi</sup>. This ability to pause and consider enables the Manager to ‘respond’ – not to ‘react’.

Decision making is a process similar to the work of the Manager (Emotions) since it is also a process of choosing the best option. Neurologists can now find out which part of the spatial brain-map participates in the activity under study using new imaging



technology such as Magnetic Resonance in Functioning MRI<sup>vii</sup> and Positron Emission in PET scans. When they discovered during their painstaking studies that Manager (Emotions) has to double up as Decision Maker they should not have been surprised. Fourth generation diagnostic technology is now confirming what we suspected all along i.e. - People who are able to regulate their emotions make good managers and good decision makers. Others trust and respect them and like to work with them.

### **Neurology of Relationships**

In addition to being in charge of our own feelings we can tune into emotions being felt by others (which frequently, even they are unaware of). This ability is named ‘Empathizing’ and is strong in infants and children. This valuable gift of nature ensures bonding and cohesion, another vital function for survival of the species. Such a vital capability should be honed and sharpened. Instead it has been taken for granted, ignored, overshadowed, and allowed to wilt and weaken. In the animal kingdom, members who are unable to respond to the needs and feelings of others are turned out of the herd and left to fend for themselves.<sup>3</sup> In the business world inability to feel the pulse of the industry is known as lack of political awareness. If you are feeling left-out today, you need to check out your level of Empathy.

Parts of the brain responsible for empathy also participate in interpreting intention<sup>viii</sup> of others and the initiation of responses to the social overtures of others. If these tissues are intact, healthy and used to empathizing, social responses turn out to be appropriate, so relationships take root and blossom. The ability to strike up and maintain relationships is therefore an important function of certain tracts of brain tissue.

Clumsy response mechanisms leave us socially challenged and our relationships seem shaky and wanting. If you find yourself continuously repairing relationships you could benefit from exercises in reading facial expressions and body language. Try playing a movie with the audio off and guess what the dialogue may be, or watch a foreign or

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<sup>3</sup> “We are exquisitely social creatures, our survival depends on understanding the actions, emotions and intentions of others” – Dr Giacomo Rizzolatti, University of Parma (Discovered Mirror Neurons)

unfamiliar regional language film without sub-titles. One of the important laws of the Life-Sciences is '*Use it or Lose it*'<sup>x</sup>. Use these parts of your brain or they will shrivel and disappear.

Relationships are as important to organizations as they are to individuals. Quality of relationships is reflected in the health of a business as well as in the physical and mental health of the individual. Take five persons who face roughly the same amount of stress and strain at work. Some thrive, some have to take care and others succumb to the stress and develop diseases or unexplained symptoms. Studies have proved that satisfying relationships at home, at work and with the doctor, reverse the harmful effects of stress on the body<sup>x</sup>. The mechanism through which satisfactory relationships protect and boost the physiology has been discovered. Receptors for neurotransmitters have been found in the gut, endocrine system and in the immune system.<sup>xi</sup> The brain can transmit its feeling of well-being to the rest of the body.

Feel Well = Be Well

Transmission of the feeling of well-being (or other negative feeling) works both ways – brain to body or body to brain<sup>xii</sup>. Thus improved levels of physical fitness achieved through exercise, yoga, active relaxation techniques and laughter can enhance brain function and result in better decisions and creativity. If you want employees to give you the fruits of their best brain function, then put a premium on physical fitness and periodical checks to hunt out hidden and insidious diseases. Most companies are too busy processing medical bills, detecting and deterring fraud to notice that they could have invested more in Health and reaped wholesome dividends; not so much in Disease.

Mental well-being can similarly be transmitted to the body through the immune system. The molecular details of a connection between the nervous system and the inflammatory response to disease has been uncovered only recently<sup>xiii</sup> although voluminous data on the effects of positive thinking, mood elevation and guided imagery on healing has been

available for some time<sup>xiv</sup>. It is common knowledge that stress is a danger to health and well-being.

### **Bad News First**

Stress is the devil that creeps in and corrodes health, upsets well-being, causes us to fly off the handle, makes us infertile, unfeeling and arrogant. We have almost justified our misdemeanours and blamed it all on stress. We have accepted the existence of stress and devised programs and therapies to relieve it. Stress has acquired the ‘status-symbol’ hype and we have tamely accepted that we must get stressed out and then indulge in relief measures, just as we have justified our wounded relationships and constantly indulge in damage-control. To those who revel in and are possibly addicted to stress, I would like to write out this warning – Stress kills Neurons. The stressed out brain is significantly lighter than a healthy one<sup>xv</sup>.

### **And the Good News is...**

As a medical student I was made to understand that nerve cells never grow or regenerate. I watched the concept change as orthopaedic surgeons began painstakingly to sew severed ends of nerves together and achieved renervation. When Elizabeth Gould and her team first thought they had mistakenly counted more cells than expected, they serendipitously stumbled upon the phenomenon of Adult Neurogenesis<sup>xvi</sup>. We are now certain that nerve cells die and new nerve cells are born<sup>xvii</sup>. Don't use your brain cells they get pruned away, use certain pathways and connections and they consolidate and thrive, learn something new and your newly born adult neurogenesis cells live on and plug into existing networks and build new ones. This news is refreshing and motivates us to keep learning, to use the whole brain and hike up creativity to levels never before.

## **Emotional Intelligence Safeguards Health**

An understanding of Emotional Intelligence is the one shield which protects from stress at a preventive level. Larger than life phenomena like ego, anger, anxiety and fear shrink to appropriate proportions on being addressed and confronted. The mountain of Unmet Emotional Needs that we keep sweeping under the carpet from infancy takes its toll on our psyche because Nature does not tolerate being ignored. If you cannot see the bump in your carpet, you will just keep tripping. Emotional awareness can explain and sweep away old grudges and open up the path to further development, bringing you closer to maximizing what can be achieved with your quiver full of talents and skills.

Where there are humans there must be Emotional Intelligence regardless of age or profession. The scales of demand upon Emotional Competencies vary at different stages of life and position on the hierarchy. Higher positions on the organogram in any organization (family, politics, industry) demand more and more Emotional Skills and it is never too early to learn. But who is to teach it? Early experience with care-givers has a formative role in the maturation of the orbito-frontal cortex, which is responsible for self-regulation and processing of emotional information as somatic markers. Deficits in emotional and social competencies in early life result in psychiatric problems and social maladjustment. Children of emotionally mature and aware parents start off with a significant advantage<sup>4</sup> that could be further offset by education systems which integrate brain science, child-care, and neuro-psychiatry to support brain development through infancy, childhood and adolescence, aimed at equipping the emergent generation with emotional competencies and resilience that will prevent social and psychological problems that are of epidemic proportions at present due to the misinformed practice of treating mind and body as separate entities. Social maladjustment and psychological

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<sup>4</sup> *"It is now clear that psychological and physical health are inextricably intertwined, and that emotional development is the integrating link between mind and body."* Dr Schore Allan N. Schore, Ph.D., of the Dept. of Psychiatry and Biobehavioral Sciences at the University of California Los Angeles School of Medicine The Powerful Parent Infant Connection. This article, published in the *Journal of Prenatal and Perinatal Psychology and Health* (Volume 16(3) Spring, 2002)

instability result in inability to realize the potential indicated by IQ because of frequent conflict within the levels of the Brain Organization.

### **Can Emotions be Intelligent?**

“Isn’t that rather contradictory?” people say after hearing the term “Emotional Intelligence” for the first time. They have customarily linked emotions with irrationality and are now surprised to hear the word “intelligence” used with just a space in between. Emotional Intelligence is the first of the multiple intelligences, and is functional at birth. Nature is very wise indeed. Emotional abilities of the new-born ensure its survival while it is incapable of anything else. The ability to count, verbalize and analyze, also nature’s gifts, which develop gradually, but in our presumptuousness about emotional intelligence we have left out training and practice in emotional competencies from formal education. Emotional Competencies still help adults survive in a world of competition and globalization and only if you survive can you use the other intelligences and live a useful life.

Studies in patients with selective damage to their emotional systems (ventro-medial pre-frontal cortex) have shown that these individuals are perfectly capable of solving complex linguistic and numeral problems but fail to make the simplest decisions, plan defectively and are low on judgment and social appropriateness<sup>xviii</sup>. New tools like fMRI have enabled neuroscientists to demonstrate that personality, passion, compassion, positivity and decision making capability reside in the brain. Emotions link body and mind and transmit the health of one to the happiness of the other. Emotions direct the flow of energy by activating arousal systems. They also provide information through somatic markers which form the basis of intuition and gut feeling. Emotions are therefore central to rationality and do not “get in the way” of processed thinking, unless you let them.

It is heartening to think that we have billions of thinking cells working for us in a highly organized, smooth functioning organization that we do not even have to bother about. It is a highly evolved yet significantly finite organization. There is a certain bandwidth of

light<sup>5</sup> which we perceive, a short range of sound waves we can hear<sup>6</sup>, a limit to the concepts we can visualize and assimilate<sup>7</sup>. Yet scientists have discovered that we hardly ever use all the cells and fibers in our brain (just like the myriad features of our hi-tech gadgets). People use about one to ten per cent of the total capacity of their brain.<sup>xix</sup> Networks between regions exist but are not always used. Compartmentalized working leads to restriction of creativity. The connections are strengthened and become more efficient with use. What could be said about accountability of a person who heads a vital organization, when it comes to light that 90 per cent of its capability is left idle most of the time?

It is time to take responsibility for running the brain as an organization. I/Q is a numerical expression that reflects potential, which may or may not be realized. Persons with high I/Q are not always academically and professionally successful. Usually, repeated tests at different stages of life show that I/Q remains more or less static after the age of six. Emotional Intelligence on the other hand never ceases to grow (unless one becomes cynical) and cannot in essence be given a numerical value. Another name for EI is ‘Maturity’. It is not a numerical entity and not a destination but a journey. In terms of brain structure Emotional Intelligence is a vehicle upon which the thinking brain is borne towards its goal. If the Higher Centres are in control of the vehicle, their purpose will be met, if not, the slender mid-brain may hi-jack the grey matter into initiating the stupidest actions regardless of its impressive bulk and I/Q. Since this fat rider can never get off its mount, the earlier it learns to harmonize and team up – the better.

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<sup>5</sup> Visible light region consists of a spectrum of wavelengths, which range from approximately 700 nanometers (abbreviated nm) to approximately 400 nm; that would be  $7 \times 10^{-7}$  meter to  $4 \times 10^{-7}$  meter. This narrow band of visible light is affectionately known as ROYGBIV. Source Glenbrook South Physics Resource

<sup>6</sup> Humans can generally hear sounds with frequencies between 20 Hz and 20 kHz (the audio range) although this range varies significantly with age, occupational hearing damage, and gender; the majority of people can no longer hear 20,000 Hz by the time they are teenagers, and progressively lose the ability to hear higher frequencies as they get older. Most human speech communication takes place between 200 and 8,000 Hz and the human ear is most sensitive to frequencies around 1000-3,500 Hz. Source Wikipedia

<sup>7</sup> The manifest universe is a very small part of His power and glory. –We try to grasp this truth with our puny little mind and senses, and all we can clasp is a pebble – Swami Venkatesananda

As CEO of the Self you would like to achieve close to maximum potential. To do this you will have to reconnect mind and body. It makes sense to treat mind and body as one unit and the two halves of the brain as a complete whole.

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