

Neuroscience and Psychotherapy

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Editor's Note: Marilyn Morgan is a master teacher and Certified Hakomi Trainer who has a special interest in the new and exciting developments in interpersonal neurobiology. In this article she introduces a number of currently relevant advances in neuroscience and weaves their implications effortlessly into the practice of psychotherapy.

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ABSTRACT: Reviews structures of the tripart brain including hemispheric functions. Discusses differences of the brain and the mind in terms of complexity theory. Notes multiple memory systems in relation to attachment theory. Discusses social engagement theory and implications for contact and loving presence in relation to psychotherapy.

Introduction

In recent times there has been exploration into the vast mystery of the brain, such that the ten years of the 1990's were been labelled 'the decade of the brain'. There has also been an upsurge of interest in the impact of trauma and stress on human functioning, including the neurophysiology of traumatic injury, and the developmental changes in the brain that can result from childhood trauma and neglect. Attachment theory, beginning from observations of interactions between infants and their mothers, now includes detail on the shaping of brain structure and nerve pathways, including the wiring up of circuitry that will determine lifetime behaviour patterns. Modern brain imaging techniques have allowed us to see into the living brain in ways that have been impossible in earlier times.

There has been a deluge of new findings on the brain and memory, the brain and behaviour, the brain and trauma, the brain and attachment and the brain and psychotherapy. This research has impacted on the ways we assist people to recover from the effects of unresolved trauma and developmental injury. Even though direct research on neurophysiological activity and change, before, during and after therapy is still sketchy, and much is still hypothesis and tentative conclusions from related findings, some strong possibilities are emerging.

Psychotherapy, especially depth therapy such as Hakomi, and the therapy we provide for trauma relief, for example, have become fundamentally different from the traditional 'talk' therapies inspired from such different roots as psychoanalysis and cognitive behaviourism. In these therapies we recognize the importance of primitive, physiological, survival and emotional mechanisms that can overwhelm the person and exacerbate symptoms. Body

sensations and reactions are recognised and included, as is mindfulness, relationship, safety, careful pacing and providing missing experience. Attunement and contact is maintained, loving presence is vital, and arousal levels are managed. This allows for the 'digestion' of emotional experience, and the flow of information between different brain centres allows for integration and resolution of the painful and traumatic experiences, often held 'unfinished' in the system for decades.

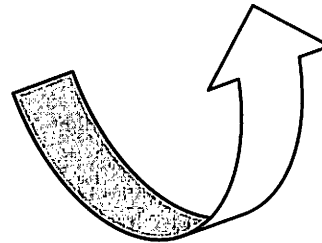
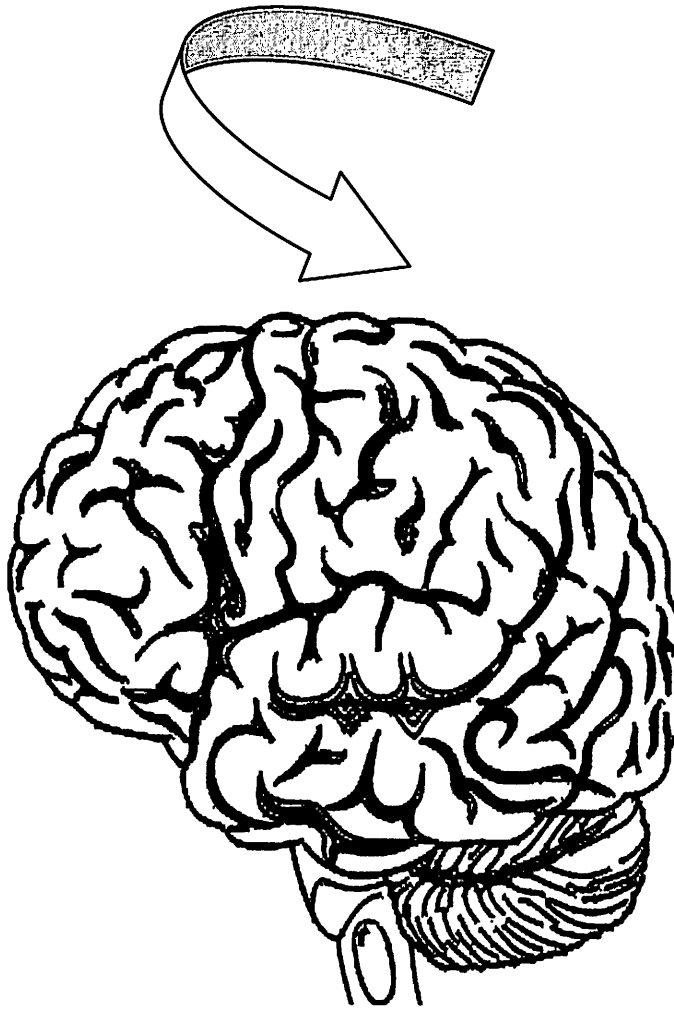
Much of what we have learned from our studies on the brain and interpersonal neurobiology, as it is related to therapy, leads to effective psychotherapeutic practice across a wide range of situations. In many ways traumatic imprints and emotional issues such as grief, loneliness, shame, self-loathing and so on, are not so different. This is especially true for issues arising early in life. Most emotional distress, arising in situations of adult life, that leads a person to psychotherapy, has its roots in the early years. Attachment problems, grief and traumatic stress are deeply intertwined in emotional, unconscious memory and neural pathways.

In this article I intend to show how understandings gained from neuroscience and from trauma and attachment studies both affirm and enrich Hakomi psychotherapy. Having a scientific explanation for therapeutic intervention and change satisfies our more Western, left brain appetites. At times, being able to explain what we do in physical, scientific terminology to educators, to legislators, to colleagues and to clients, is pragmatic and enriches communication. Understanding the very real, physiological constraints on functioning that inhibit our clients can help us be more patient and compassionate. And, delving into the awesome complexity and intricacy of the living brain and nervous system, the myriad pathways and informational interactions of neurons, synapses, and messenger molecules,

Marilyn Morgan

which is a microcosm of our larger human communities, is

an inspiring, breathtaking, and ultimately sacred enterprise.



Neurons and humans
are social entities,
cannot exist in
isolation, and can
only be understood in
relationships with
others. (Siegel)

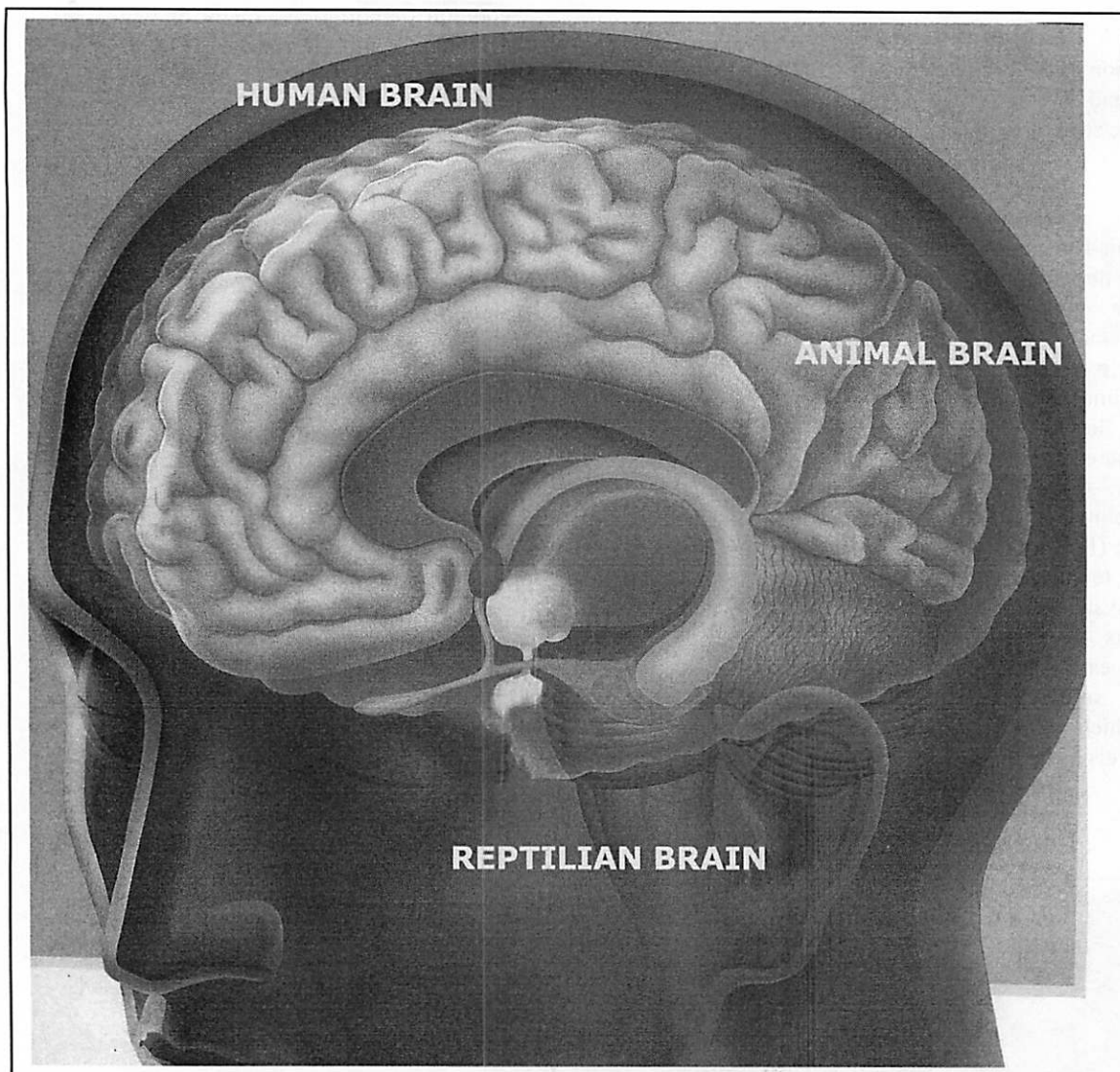
Structure and Function of the Brain

Nerve cells

The brain and nervous system is comprised of billions of interconnecting nerve cells, or neurons. In early development of the child, nerve endings reach out and connect with other neurons to form patterns of neuronal circuits.

The Brain – an Overview

I will summarise the structure and function of the brain, and introduce some basic terminology. A method described by Daniel Siegel, (Daniel J. Siegel, 1999), to conceptualise the brain is useful, as the brain's three-dimensional convoluted shape is hard to follow from two-dimensional diagrams. Make a fist with your thumb tucked inside. Your wrist is the top of the spinal cord at the base of your neck. The brain stem is your lower palm, your thumb the limbic system, and your fingers the cerebral cortex. At the back of your hand would be the cerebellum, and your eyes in front of your middle two fingernails.



The brain is often described in terms of three levels of function. Paul McLean first described the brain in this way. Sometimes these levels are termed the human, (thinking) brain, the animal, (emotional) brain, and the reptilian, (survival) brain. This division is useful to aid our understanding, and to describe functioning to clients. With the brain nothing is simple, however. In any function of the brain, however small, there is a constant, awesomely complex flow of information from one part to another along nerve pathways, through chemical and hormonal release, and influenced by energy.

The brain stem – reptilian brain

This is the most ancient part of the brain, and is similar to the brain of a reptile, hence the term *reptilian brain*. This part of the brain mediates some of our most basic functions and consists of the following structures:

- *Reticular formation* – control of arousal and sleep/wake cycles
- *Pons* – receives visual information en route to the cerebellum

- *Cerebellum* – coordination of movement
- *Medulla* – control of breathing, heartbeat, digestion.

The limbic system – animal brain

The limbic system and associated structures lies in a central position in the brain. At this level of the brain – more inner and deeper in position – activation is felt as a *total body experience*. This area is concerned with emotions, but is also a bridge. Impulses pass through limbic structures to and from the senses, the body in general, and brain stem. There is an outflow to the cortex. The body information influences the emotional state, and emotions are essential for our thinking processes. Making a decision without emotional input is virtually impossible. Essentially, emotions are survival mechanisms deeply rooted in the body. They let us know about the significance of input; danger, potential benefit and pleasure. Emotions influence our actions and our decisions as well as providing richness

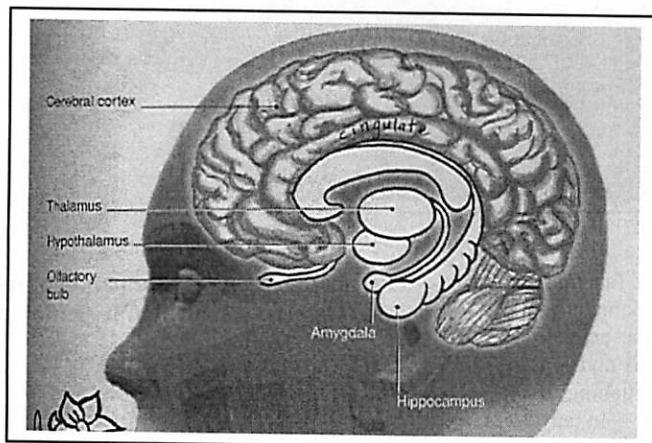
Marilyn Morgan

and flavour to our conscious experience. (see section on somatic markers below)

In your fist representation of the brain, created by folding you thumb into your hand and then covering it with your other fingers, the limbic structures are represented by your thumb.

The structures are:

- **Thalamus** – this is a communication and relay center for nervous pathways from the senses. The thalamus (specifically the lateral pulvinar within the thalamus) operates like a spotlight, turning to shine on a selected stimulus. It sends information to the frontal lobes which then maintain attention. (there is one thalamus each side)
- **Hypothalamus** – the small hypothalamus, which sits below the thalamus above, controls the four 'f's: (feeding, fighting, fleeing and fornication), temperature, sleep, autonomic nervous system reactions. The hypothalamus dysfunction thought to be involved in eating disorders is correlated with high serotonin concentration in anorexics which reduces appetite, and low serotonin levels in bulimics.
- **Pituitary gland** – this gland is vital in the secretion of hormones, many of which set off other hormonal cascades. The pituitary is part of the HPA (hypothalamus, pituitary, adrenal) axis, a vital part of the trauma and stress response.
- **Hippocampus** – This area is essential for the formation of declarative memory, indexing our episodic, personal memories, retrieving newly laid down memories and spatial coding. London taxi drivers have been shown to have enlarged hippocampi. (there is one on each side)
- **Amygdala** – Expressions of fear are picked up by the amygdala. The left amygdala responds more to the vocal expression, and the right to facial movement. The amygdala is the emotional center, the alarm system, and it stores emotional memory imprints, especially fear memory
- **Basal ganglia** – these have a role in movement and procedural memory
- **Olfactory bulb** – concerned with smell
- **Cingulate gyrus** – the center for attention focus, related to cravings and addictions, and, interestingly, also in the initiation and letting go of physical grasping movements.

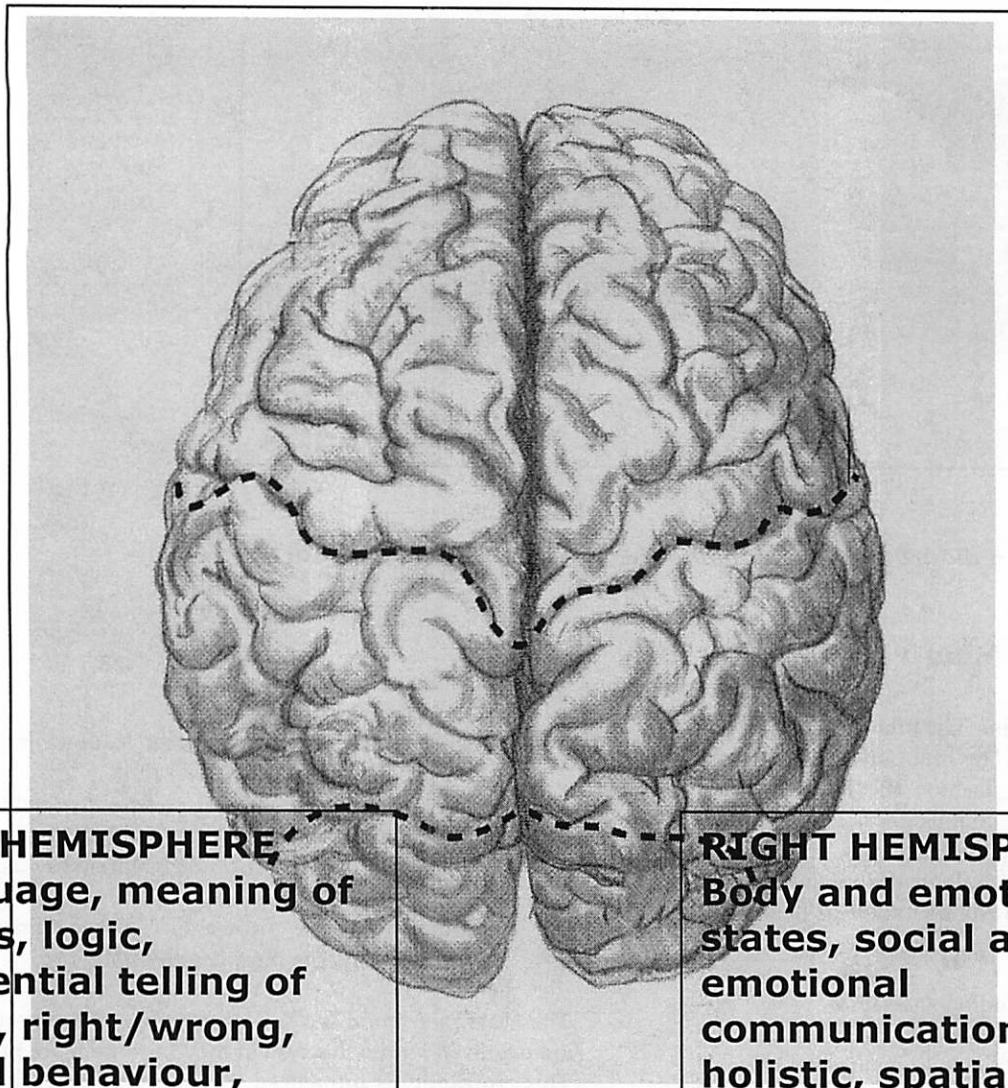


Limbic structures

The cerebral cortex – human brain

There are two specialized cerebral hemispheres, each hemisphere receiving information from the opposite side of the body. Information is shared through a body of nerve fibres connecting the two halves, called the corpus

callosum. There are four lobes in each hemisphere; frontal, parietal, temporal and occipital. The left and right hemispheres have different functions, and in health they work together in balance.



LEFT HEMISPHERE
Language, meaning of words, logic, sequential telling of story, right/wrong, social behaviour, encoding autobiographical memory

RIGHT HEMISPHERE
Body and emotional states, social and emotional communication, holistic, spatial processes, retrieve autobiographical memory, non-verbal aspects of language.

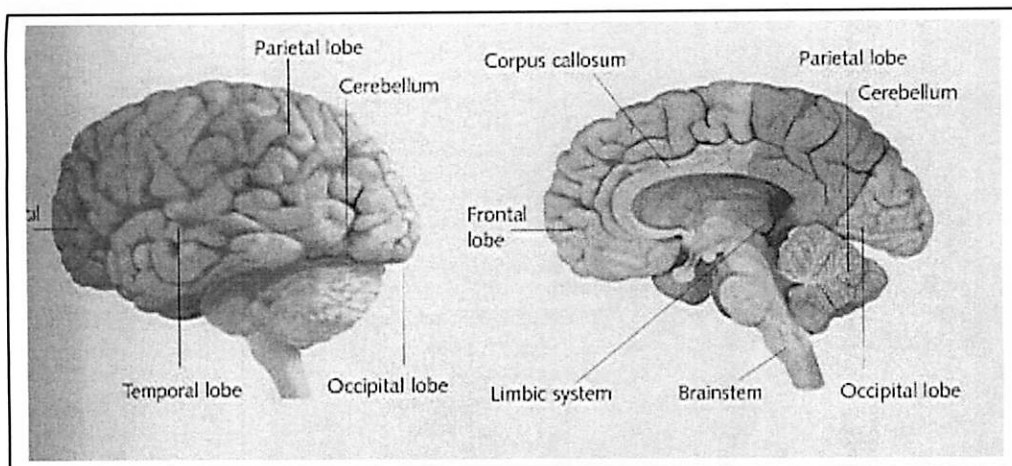
Areas of the frontal cortex are of particular interest.

The *orbitofrontal cortex*, is closely connected to the cingulate. It helps regulate the autonomic nervous system, and hypothalamus, helps inhibit impulsive behaviour and modulate alertness and emotions. It is also vital for social cognition and response flexibility. The orbitofrontal cortex is also important for self-awareness and autobiographical memory. It is sometimes called the 'highest' part of the limbic system, and is a master integrator. Daniel Siegel says, (Daniel J. Siegel & Hartzell, 2003), that 'this

integrative region is the gateway between interpersonal connection and internal balance'.

The *dorsolateral cortex* reconstructs meaning, helps change mental sets, and organizes associations. This is sometimes called the chalkboard of the mind.

The *ventromedial cortex* allows us to experience emotions and meaning and engage motor drives. It is highly active in manic and creative states, and inactive during depression when it seems as if all drive and meaning has drained from life.



The cerebral cortex – diagram from “Mapping the Mind” by Rita Carter (Carter, 2000)

The Mind

The mind arises from the brain. The mind is a constant flow of energy and information. The brain affects the nature of the mind, and in a circular fashion the mind affects the nature of the brain itself. For completeness I believe there is also spiritual essence that precedes brain and mind and permeates physical and psychological functioning. This model is congruent with the Maori model of health which describes:

- wairua (spirit)
- whanau (family including ancestors)
- Tinana (the physical body)
- Hinengaro (the mind including emotions)

It is important to note that the sense of self and well being is likely to be experienced and formed differently in Maori culture, where the self cannot be experienced apart from the whanau or collective.

Throughout life we are working with the two poles of autonomy and togetherness. Both are necessary and constitute our longings. We want to belong and to merge with other, work in together, and feel the same as others. We also want our own freedom and identity and special talents and roles. These tensions are never fully resolved. In a state of mental well being we hold these poles in a dynamic balance.

Complexity

How do we understand brain and mind? Linear thinking involving cause and effect is inadequate. The brain is the most complex structure known in the universe. The human being is way too complex for logic. We need to turn to complexity theory for a better understanding.

Complex systems:

- Are self organising
- Are non-linear – a small input leads to large unpredictable changes over time
- Have external and internal constraints leading to certain states being more likely
- Have a balance of differentiation and integration
- Naturally move towards a maximum complexity, the most healthy state

The brain, and mind are self-organizing. As certain states are engraved within the system they become more probable. This probability is influenced by the history and the present context. The most ‘healthy’ brain has a balance between continuity and flexibility, between rigidity and chaos. There is a constant move towards increasing complexity, including differentiation and integration. A small change in input can lead to huge and unpredictable changes in output. Patterns of organization have both emergent and recursive characteristics. The brain and mind are in a continual state of creating and being created and moving towards more complexity, and more ‘health’.

Narrative

Stories are important. How we make sense of our memories and experiences is linked in to mental well-being and good brain function. Stories seem to play a vital part in ‘cortical consolidation’, where memory becomes permanent, and ‘unfinished business’ is completed leading to a feeling of things being settled within. Dreaming is important for this process. In creation of a narrative, the left hemisphere appears to be driven to make guesses about the logical connection among bits and pieces of information, while the right hemisphere supplies emotional context and

autobiographical data necessary for the personal life story (Siegel, 2003, p51).

Memory

Many people who have had traumatic childhoods have problems with memory. They sometimes can't consciously remember most of childhood, yet unwanted feelings and images from childhood experiences may intrude. It is not uncommon to forget a lot of details in daily life as an adult; appointments, where one has put car keys, phone numbers and so on.

Ron Kurtz, founder of Hakomi, (Kurtz, 1990), described the child as 'the mapmaker'. Neuroscience emphasizes that the connections formed within the brain are experience-dependent. A person is born with approximately 100 billion neurons. If these nerve cells were placed end-to-end they would stretch two million miles. There are many nerve connections already in place at birth, the being brain was hard-wired to seek connection with caregivers, and basic bodily functions proceed. However, the major growth of neurons and the wiring of neuronal circuits are yet to take place depending on experiences to come. Eventually each nerve cell is likely to have 10,000 connections.

Daniel Siegel describes the brain as an anticipatory machine. The infant's, and child's, interactions with her world are imprinted in her brain circuitry. She is 'wired up' for a particular world. Her brain is coded with all kinds of memory, and most of the early memory will be unconscious. However, this memory will deeply affect later emotions, behaviour patterns, beliefs, and abilities to process information. In Hakomi we call this *core material*, and the shaping of *character styles*. Other models describe 'deep cognitive structures', 'schemata', 'unfinished business', or sometimes 'the inner child'.

When the parent to whom the child goes for comfort and mirroring is also a source of fear this creates massive neural disorganization. Trauma and abuse in the young child has a serious impact on brain structure and function. Those parts of the brain undergoing critical growth at the time of the trauma will be particularly affected. This child is likely to have a smaller brain overall, fewer fibres in the corpus callosum connecting the left and right hemispheres, a smaller hippocampus, and poor development of prefrontal lobe areas. (Teicher, 2002)

Multiple Memory Systems

Neural networks fire in web-like patterns. These are called *neural nets*. The more frequently a particular net is activated, the more likely firing is in the future. This increased probability is how the network 'remembers'. New synapses are formed in response to experience

Implicit memory.

This is generally unconscious, and there is not the sense of 'remembering'. Things feel as if they are happening now, in the present. Implicit memory requires no attention to be encoded. There are different kinds of *implicit memory*:

Procedural memory is the patterns of behaviour and habits we learn. It is mediated by the cerebellum and striatum.

Emotional memory is related to the significance of events, and whether they feel good or bad. This is mediated by the right hemisphere, the amygdala and basal ganglia. There is **sensorimotor memory**, consisting of body sensations, posture and body responses. **Perceptual memory** is implicit, as are our mental schema and **core beliefs**.

Explicit memory.

This is autobiographical and narrative in nature and you have to pay attention for encoding. There is memory for the features of things, such as face recognition and factual data (**semantic memory**). **Declarative memory**, or narrative memory is mediated by the hippocampus and prefrontal cortex. It is stored in the left hemisphere, and hippocampal processes are necessary for its encoding, and sometimes retrieval. Explicit memory material can activate conditioned emotional responses. (Briere, 2001)

John Briere, a traumatologist, describes *deep cognitive structures* that are narrative in nature, but held in a non-conscious way because when these are activated they trigger associated emotional responses that are distressing to the person. (Briere, 2001) These deep cognitive structures may be triggered by events that bear some similarity to the original memories. Implicit memories do not feel like 'memories' as they have a here and now quality to them, and 'blend' with current reality. Distressing emotional or traumatic memories are not consolidated, or resolved, and are therefore not integrated into a coherent narrative.

Memory 'stacks'

The emotional brain circuitry stores memory in a simple way, almost like 'stacks' of similar circuits. When a current event has a particular flavour then the whole 'stack', going back to early events is activated. The feelings and behaviours are generated, often very quickly and powerfully. Because emotional memory is always in the 'now', the old perceptions, feelings and behaviours become blended with the current situation.

State dependant learning

When learning is encoded during a time a person is in a particular state of consciousness, then that memory is more likely to be retrieved when the person is in a similar state in the future. (Rossi, 1986)

Development of memory

The infant can make procedural and emotional memories from birth. He can also start forming memories for features of things. The right hemisphere is 'on-line' at birth. However, the hippocampus, which is necessary for encoding

Marilyn Morgan

the context of memory, is not developed until about 3 years of age, hence infantile amnesia. The left hemisphere, necessary for verbal encoding, and developing narratives, is not functioning until around the same time.

In traumatic and very stressful situations the amygdala increases in function and the hippocampus is shut down. The hippocampus is particularly sensitive to high levels of

cortisol, which causes damage to the neurons there. So for a child enduring ongoing trauma, even if he were old enough to form narrative memories, this function could be suppressed. If explicit memory is not encoded in the first place, then it can never be retrieved. Some may never remember, in a narrative way, some of the traumatic events of childhood.

Brain cells, at every level of the nervous system, represent entities or events occurring elsewhere in the organism. Brain cells are assigned by design to be about other things and other doings. They are born cartographers of the geography of an organism and of the events that take place within that geography. Evolution has crafted a brain that is in the business of directly representing the organism and indirectly representing whatever the organism interacts with."

(Antonio Damasio – p8 *Scientific American* Vol 12, No 1, 2002)

Attachment

The relationship between the mother (or other caregivers) and child is crucial for the development of pathways from the limbic system to the prefrontal cortex. When the child expresses emotion it is important for the parent to respond in a congruent way. This is right brain-to-right brain connection. Secure attachment allows the child to regulate her own emotional states, develop autobiographical narratives, and respond appropriately in social situations. Recent research using brain imaging techniques with very introverted people (avoidantly attached) found that they had no brain response to a smile from another person, whereas more extraverted people showed activity in the amygdala on the left side. Alan Schore describes the pathways that allow the child to tolerate pleasure and excitement, then to deal with disappointment and shame (Schore, 1994). Unresolved trauma and grief in the parent have been shown to be a reliable predictor of disorganized attachment in the child (Siegel & Hartzell, 2003).

Mirror Neurons

'All mammals have evolved limbic circuitry to 'read' the internal states of others; in addition it seems that primates have developed a unique capacity to create an internal state that resembles that of others.' (Siegel, 2003, p75). There are mirror neurons that assist us with empathy and understanding the emotional world of another person. Mirror neurons bridge sensory, motor and affect circuitry allowing us to be activated with movement and emotion due to the visual stimulus of watching others (or even a picture of a movie).

Somatic Markers

Damasio describes how we use body sensations to assist us in decision-making. In fact, he argues, that reasoning and

efficient decision-making would be well nigh impossible without their help. These sensations are generated by the emotional brain, based on prior experiences, and they give us immediate messages about the significance of the options we are considering for the future. He calls these sensations 'somatic markers'. For example, when thinking of going to a particular social event, you might perceive an immediate sinking in the stomach. It just doesn't feel right to accept the invitation, so you decline. It saves hours of weighing the pros and cons. The negative somatic marker has acted like an alarm bell, giving you a warning. On another occasion you think of going out with a friend and you feel a warm expansive feeling in the chest. You know you want to go, and after some thinking about practicalities, you decide to go. You have experienced a positive somatic marker which acts like an incentive. Frequently these somatic markers influence us even when we are unconscious of their operation. (Damasio, 1994)

Psychotherapy

The brain and nerve circuitry are much more plastic than previously supposed. Rewiring is possible in adult life. Maybe not easy, but it is possible. Mindfulness is a basic principle and technique of Hakomi psychotherapy, and increasingly other counseling and psychotherapy modalities. In excessive arousal the higher processing is shut down, and the tendency is to be overwhelmed by input from the emotional and sensory systems. The left brain and verbal centers are under-active and distressing memories are likely to be brought forth by the more active right hemisphere. The hippocampus is under-functioning so a sense of sequence, context and ability to make a story is dampened.

Marilyn Morgan

Mindfulness calms the system, allows the person to *focus attention*. The hypnotic quality, present in mindfulness induction, has been shown to heighten mental imagery, disconnect attention from external senses and increase the blood flow to the anterior cingulate cortex. This is the brain area that allows attention to be focused on internal events. Candace Pert, in her discussion on neuropeptides, talks of the system being able to digest information when there is focused attention on the body. This allows information to flow upwards, be filtered, and be processed. When the client *reports experience* to the therapist the verbal areas are kept active, which will help balance the two hemispheres. Memory fragments are gathered by the hippocampus, and the frontal lobes and these fragments can be brought together in a meaningful way. Movement between the left and right hemispheres is crucial for memory consolidation. This could involve a process of feeling something, speaking about it, expressing emotion, linking this to a remembered event, feeling the body, or making some sense of the feeling. Freezing in the body can then melt, and energy can then be released in movement, heat and trembling. *Going*

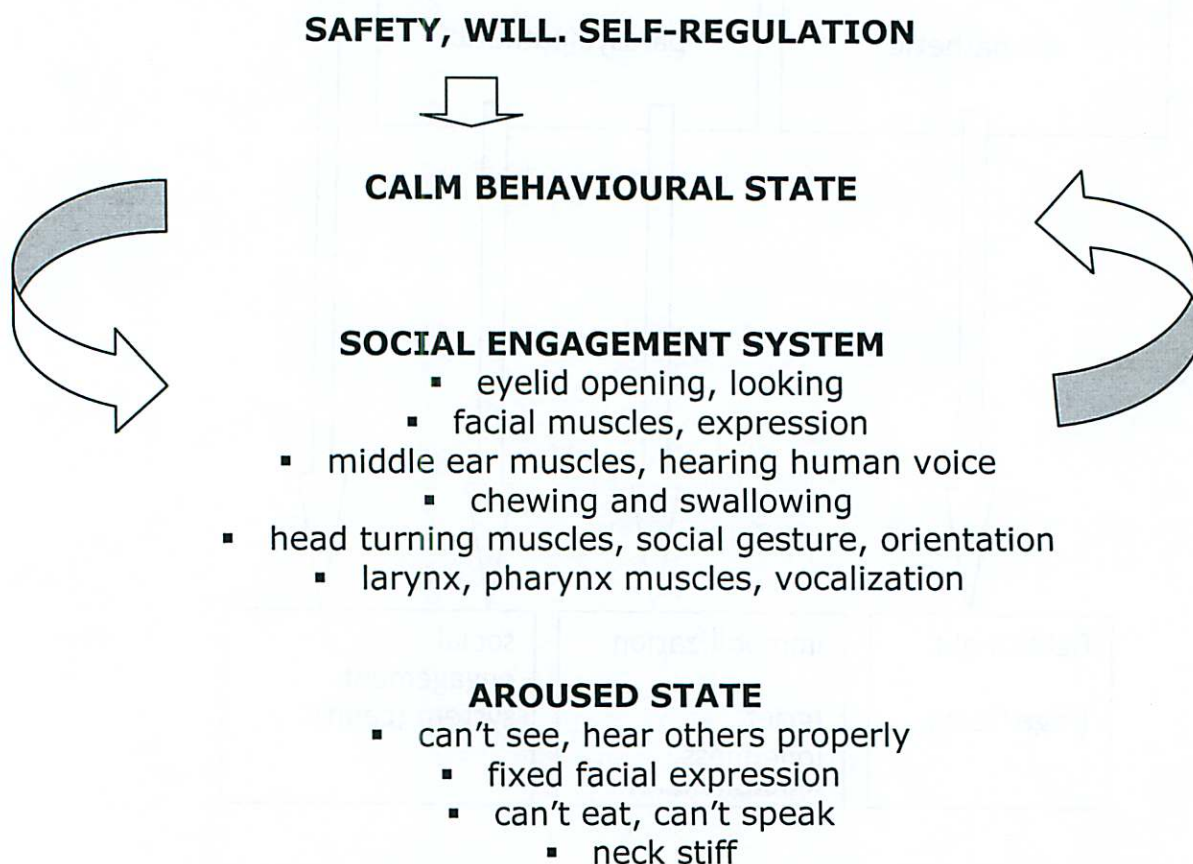
slowly, mindfully gives time for these processes to sequence through and complete.

Social Engagement System

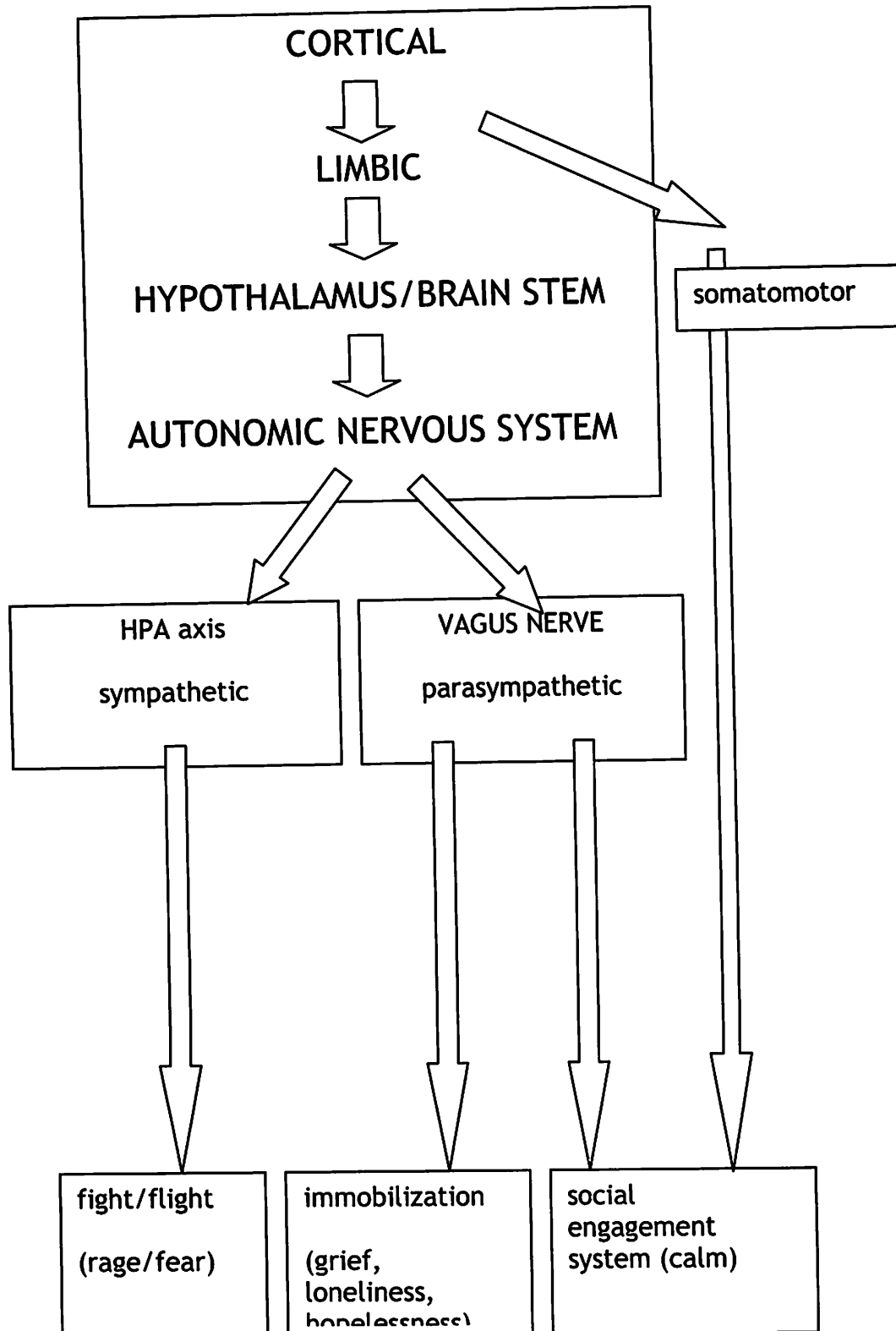
A calm state is necessary for mindfulness which can greatly facilitate the therapeutic alliance. This involves the myelinated branch of the vagus nerve. Steven Porges (1995) describes the social engagement system and its link to the vagus nerve. Calm behavioural states are mediated by this part of the vagus nerve, which with several cranial nerves controls:

- Eyelid opening (looking at the other, eye contact)
- Facial muscles (expression)
- Middle ear muscles (extracting human voice from background noise)
- Muscles of mastication (ingestion)
- Throat muscles (vocalization)
- Neck muscles (social gesture and orientation)

PORGES (1995) POLYVAGAL THEORY



SOCIAL ENGAGEMENT SYSTEM



Physiological states are mediated by the autonomic nervous system, and the primitive (reptilian) circuits regulate fight, flight and immobilization. Mammals belong to social groups, and survival also depends on social engagement. The newer circuits (mammalian) have developed to mediate this.

In mammals the vagus nerve has two branches;

- Primitive unmyelinated mediates shutdown
- Newer myelinated mediates social engagement

Calm behavioural states are fostered by social engagement system, and social engagement is fostered by calm behavioural states. Calm behavioural states are necessary for mindfulness, and calm behavioural states in a therapist can induce a similar state in the client through limbic resonance processes.

The range of social behaviour is limited by a person's physiological states (rage, grief, depression), and he can find it hard to relate, and even see and hear accurately when the social engagement system is not operating.

If a calm behavioural state can be restored then social engagement emerges organically. As the client becomes more at ease, and has been nourished, you can see the activation of social engagement system, with facial aliveness noticeably more apparent.

When left and right brains operate in a disconnected way, the left brain makes up causal explanations without the emotional and sensory data, and the right brain gets lost in feeling and confusion. Together they can come to an insight and understanding that feels deeply true and satisfying. Given time, the orbitofrontal cortex will light up if a memory or explanation is not accurate. The system has to be quiet enough for the person to notice the signal.

"The Zen meditative way presents several potential advantages. It proceeds very slowly, voluntarily. It acts spontaneously from the inside, discretely. Overall, the meditative mental landscape is much calmer, clearer. Nerve cells will have been liberated from much of their usual irrelevant synaptic clutter. In this setting, signal can stand out high, soaring briefly above the background noise. And a sharp sudden surge through the pathways of self-preservation can penetrate more deeply and into recesses not usually open." (p658)

To be effective in facilitating deep change and transformation it is important to work with 'here and now' processes. Seen through the lens of neuroscience this could be understood in the following way. A client, Sam looked at me with wide, child-like eyes. She is experiencing unconscious, implicit memory. If I am attuned to her I feel

Contact and loving presence is an essential foundation to therapeutic change. For an excellent source on the importance of relationship and limbic resonance read *A General Theory of Love* (Lewis, 2001). Hakomi therapists become very skilled in *tracking*. This is essential for the contingent communication that activates resonating brain states and corticolimbic connections. Therapists need to be adept at tracking their own body processes as these are vital in connecting deeply with another. They also need to be willing to compassionately repair empathy lapses as these repairs pave the way to self-regulation in the client. Attuning to and managing shame states allows for new growth in limbocortical pathways. This is important for trainers to facilitate in students, as well as for therapists with their clients. Students can also be helped to develop attunement through mindfulness practice in their training. Research has shown that meditation over four weeks greatly improved counseling students' capacity to feel empathy. (Austen, 2001)

In a way the therapeutic process needs to mirror the developmental so the client can form new imprints and pathways. James Austen, in *Zen and the Brain*, (p654), describes how selected neural circuits could be destroyed, and others potentiated. He describes how cells in the hippocampus release glutamate and cause cell death. He describes it as 'etching' and postulates that if the selected neurons were key links in a chain of dysfunctional, over-emotionalized behaviour, then an enduring change could result. He describes how a meditative approach could facilitate this. A 'meditative' approach, or mindfulness, such as is used in Hakomi psychotherapy, and the attuned presence of the therapist is likely to greatly increase the possibility of change.

the longing of the child she once was to be believed and recognized. This implicit memory was activated by Sam talking about her childhood, but it could have been triggered in a number of ways, or by *hanging out mindfully*, and sensing a gesture or body sensation. (Associations linked to a procedural or emotional memory).

Marilyn Morgan

One needs to go slowly to allow the associational neural nets to be activated. The unconscious is brought into consciousness by applying focused attention, and through contact, and resonating, contingent, right brain responses. The 'child-like state' is a pattern of unresolved, unintegrated memory associations. Pacing, attending to safety, and *loving presence* keeps the arousal levels down so the frontal lobes and hippocampus can mediate a context and new meaning. Links are made as the 'adult' part of Sam gives new information to the 'child' part. Impulses are moving across from hemisphere to hemisphere, from amygdala to hippocampus, and on to the orbitofrontal cortex. The dorsolateral context helps change the mental set. The medial cortex starts making connections.

We are constantly storing, activating and re-storing our memories. Lynn Nadel, a researcher on the function of the hippocampus, describes a new finding. When memory trace is activated it is vulnerable for a short time, and can be changed before it is re-coded (Nadel, 1994). This would affirm the importance of working in the *here and now*. The hippocampus can make a new memory, this time putting it in context and time sequence. Sleep and dreams will help turn the new memory into a permanent one.

Generally we as counselors and psychotherapists want to help our clients move towards greater mental well being. Mental well being, as defined by Daniel Siegel, shows the following dimensions:

- *Life energy and vitality*
- *Stability and flexibility*
- *Coherence and adaptability*
- *A balance of autonomy and connectedness*

When a person is able to achieve these capacities they will have less distress and pain, better relationships, and more satisfaction with life. It also means that they can be more effective parents, thus passing on their own well being to their children, and breaking the intergenerational cascade of insecure attachment. To understand mental 'health' it is helpful to have an idea of the nature of mind, and the relationship of the mind to the brain.

The more we are 'integrated', or in this dynamic balance, the better we feel and the better we function internally, as individuals and as groups. How do we achieve this neurological, mental and social integration? To understand this we turn to complexity theory.

To achieve integration, or harmony, or well being, we balance the two dimensions of complexity – chaos and rigidity. Rigidity is security and order and predictability which is an important base, but can lead to monotony and lack of energy when the structure is too tight and not differentiated enough. Chaos includes stimulation and spontaneity and change, which can be exciting, but too much makes us anxious and overwhelmed and fragmented.

In some ways rigidity is more left brain and chaos more right brain. Integration moves between these extremes, incorporating more and more of each in the dynamic drive for maximum complexity. To allow this all the specialized brain areas need to be 'on line', and information flowing between them so they work together as a whole.

As psychotherapists we want to assist our clients with more than problem solving, we want them to achieve mental well-being and integration. We do this in the following ways illustrated by the Hakomi principles:

- *Organicity*: having an attunement to the client's rhythms and keeping a trust in the natural drive toward maximum complexity. In this way we facilitate increasing well being and allow an 'earned' secure attachment to 'wire in' to the nervous system.
- *Mindfulness*: allows us as therapists to reflect on our own processes and the development of the witness in the client, allows for accessing of early imprints, and for the tracking subtle signals (indicators) of these, and is necessary for supported self-study and the bringing of core material into awareness where it can be integrated into the sense of self.
- *Mind-body holism*: we recognise the important role of touch and sensation, how the body and brain circuitry, and mind are intimately related, and how 'unfinished business' can be accessed and processed through mindful attention to body states.
- *Unity*: we affirm the connectedness of therapist and client, the importance of social engagement in development and relationship, change and well being, and how systems exist within systems. Contingent communication is vital for establishing the safe context in which change can happen. We recognise how our mental states directly impact on our clients, assisting them to develop self-regulation, and influencing their brain structure and function and sense of self. The brains of our clients are mapping the attuned, contingent responses we give them, and this is incorporated into their sense of a coherent self. The experience of being deeply understood, being held in the mind and heart of the other is very important.
- *Non-violence*: we honour the need for safety, matching our client's pacing, intensity and

Marilyn Morgan

rhythm, and silently making space for the client to make sense of own experiences. Gently we engage in a process of conscious co-construction of a meaningful narrative, while directly influencing implicit learning that aids maximum complexity in the brain, body and mind of our clients. Defences are no longer needed in the same way, natural flow and harmony can occur, and essence can be more fully embodied.

To be able to assist our clients integrate, and free their own natural drive toward maximum complexity, we ourselves need to have developed the capacity to self-reflect, to attune to another and to hold the other person in our hearts and minds in a loving, gentle way. We need to have, or have 'earned' our own secure attachment. Daniel Siegel defines the abilities of a well functioning, integrated mind, which is dependent on well functioning, integrated orbital prefrontal cortices:

- emotional balance
- autonomic nervous system balance
- response flexibility
- attunement
- empathy
- self-knowing awareness
- fear extinction
- intuition
- morality

These are the same abilities characteristic of a secure attachment style, the same abilities developed through mindfulness practice, and are the aims of good psychotherapy.

Conclusion.

The brain mirrors our complex human systems. For example in the avoidantly attached child there seems to be a disconnection in the integrative functioning of the two hemispheres that parallels the emotional disconnection within the mother-child relationship (Daniel J. Siegel, 1999), p190). As the father or mother reaches out to the baby, and the baby fixes his gaze upon the parent, nerve endings and dendrites reach out to each other in the microscopic landscape of the brain forming neural bonds that match the human bonds.

There is so much more richness to be explored in linking brain research to psychotherapy processes and understanding our clients' mental and emotional experiences. There is the exploration of chemicals and neuropeptides and how they influence emotion and behaviour. There are exciting ideas postulated in *The Heart's Code* on the information communicated by the heart and the flow of information from the brain to the heart and

the heart to the brain (Pearsall, 1996). Maybe the next decade will be the 'Decade of the Heart'.

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