# The Social Brain

*Malcolm Pines*

"What is the social brain?" We are social animals embedded in networks of relationships without which we cannot survive. Human beings have the greatest capacity of all animals to create and control their environment, their portion of nature. Humans are cultured animals who have the brain capacity to develop cultural communities.

Writing about the evolutionary origins of our social brain, Merlin Donald, an influential researcher and writer states, "Human beings are cultural entities. We share mind. We construct cognitive collectivities called symbolic cultures. Raised in isolation from such collectivities we have quite limited non-symbolic minds. Culturally isolated human beings are not much different from their large brained anthropoid relatives. However, embedded in the cultural network from birth, human beings become something unique in the biological world; symbolising intellects bonded to a community of minds."

## Contributions from group analysis

Culture is of fundamental importance in forming the mind. In 1991 Romano Fimara, group analyst and neuro-scientist describes the brain in an evolutionary context as a "Darwinian Machine". As a result of natural selection humans are subject to fixed evolutionary laws that guarantee survival and genetic success, along with strategies through which these laws are fulfilled. The mind can be defined as a functional apparatus of the brain. The functions of the brain begin in the babies' intrauterine experience as an awareness of a "bodily shelf" that is contained and limited by the amniotic fluid and uterinel walls. At birth the mental function has to cope

with this sudden transition from its intrauterine state to the totally new experience of being no longer contained in the maternal space; what begins then is the relationship to the maternal to the facilitating environment, to the environmental culture.

Group analysts are familiar with the concepts of the social unconscious which has stimulated much exploration, as this volume shows. The concept of the "social mind" is implicit in Foulkes' writings. Powell (1991) has extracted the passages, which clearly show Foulkes' approach as written in his 1948 and 1957 books. These writings are not included in the definitive study of "The Social Mind: construction of the idea" by the historians of psychology Jann Valsiner and René van der Veer (2000). In the introduction they ask, "how can the mind be social, and why do we need to mention it?" The world brain does not appear in the index; Norbert Elias appears with a reference to his, "The Society of Individuals" (1991) but there is only find one entry and that more of an aside (pp 120). There is an account of the rivalry between the holistic schools of Leipzig and Breslau, which was Elias' town of birth and education. The Leipzig direction was explicitly developmental, as was Elias in his writings. The Berlin school idealised physics. Both directions hailed the unity of the whole, the concept of Gestalt. Kurt Lewin came from the Berlin tradition. Kurt Goldstein is referred to once, for aphasia. The word 'group' is absent.

The Social Mind book charts the intellectual history of the idea of a socially constructed mind through the examination of four key theorists; Lev Vigotsky (Russia), G H Mead and James Mark Baldwin (USA) and Pierre Janet (France). The first mention of the term "social brain" seems to be in the book "Friday's Footprints" by the clinician and neuroscientist Leslie Brother. Michael Gazzanaga, a neurosurgeon who researched the effects of removing the corpus callosum that connects the two brain hemispheres wrote, "The Social Brain. Discovering the Networks of the Mind in 1985

(New York, Basic Books). His very recent book “Human. The Science behind what makes us unique” is a comprehensive presentation of present day how neuroscience can establish how the human brain makes us hugely different from other animals, in particular the higher primates. (ecco. Harper Collins NY).

Since then in the last three decades there has been great interest in the social brain concept; in anthoprimatology, in developmental psychology and in neuroscience which has been able to progress beyond the clinical study of disorders of the CNS into experimental neuroscience as the technique of PET scans and small fMR enable researchers to study functions of the intact normal brain. But the disappointing fact that has to be faced that the school of Foulkesian group analysis is not recognised in writings on the social mind or the social brain, though we can see important convergences in the study of social networks and in our concepts of matrix, mirroring and resonance.

Foulkes wrote of the permeability of the developing psyche to its human environment and to its culture. He challenged the “old juxtaposition of an inside and outside world, constitution and environment, individual and society, fantasy and reality, body and mind and so on are untenable. They can at no stage be separated from each other except by artificial isolation.” Ref:

Presciently, the old has given place to the new, that these issued are now far better understood and accepted. Foulkes’ major psychoanalytic paper “On Introjection” (1938) was written in England where, as a Jew, he came from Germany in 1933 and experienced domination of the psychoanalytic world of the mechanism of projection and projective identification as promoted by the school of Melanie Klein. The dialogical principles of “now me, now you; in and out” escape from the polarities of

projection or introjection and fits well with current developmental studies such as those of Alan Schore, Peter Fonagy et al.

**The Personal as Social**

In “The Social Mind” we find this “in contemporary socio-cultural theorising, disputes about internalisation/externalisation, appropriation, mastery, guided participation, etc. abound. All these indicate efforts to overcome the limits of the either-or thought model that is firmly entrenched in human everyday language. In 1910 the American psychologist Vincent enumerated the terms that relate the person to the social: amongst them are; the social self, the looking glass self, the social mind, the elite as the social brain, making up the group mind, the social process.(Ref:))

In his writings Foulkes does not refer to the four major theorists of the personal as social, that is Vigotsky, George Herbert Mead, James Mark Baldwin and Pierre Janet. He acknowledges Trigant Burrow but not in detail. His reference figures are: from psychoanalysis Paul Schilder, Erik Erikson, Ives Hendrik. From sociology Norbert Elias; from anthropology Malinovsky; Moreno and the social atom; Kurt Goldstein is absent. In 1964 Foulkes asserts that, “Man’s social nature is basic to him” and now Goldstein takes his proper place. Helen Jennings, a sociologist, is acknowledged as introducing the term, “psyche group” in the 1950s. Ruesch and Bateson on communication theory, finally Wernicke from 1906 with his concepts of (1) external world, allopsyche, (2) corporality, (3) autopsyche. In Foulkes’ developmental perspective he turns to Eriksson’s schema of (1) autocosmos where the world is experienced and reacted to exclusively in terms of the child’s body, (2) microsphere when object relations are formed but the child’s psyche is central which Foulkes relates to Melanie Klein’s findings in child play analysis, (3) macrosphere where object relations are experienced in a world genuinely shared with others. (Ref:))

As Foulkes' library was distributed after his death we have little to go on of factors that have been influential in forming his theories. He had received a thorough German classical education and was well versed in Goethe, Schiller and other classical writers. But, as stated above Baldwin, Janet, Mead and Vigotsky are all absent. We do know that he maintained interest in evolutionary biology as presented by Julian Huxley.

## Major Contributions to Social Brain Theory

Merlin Donald. "Origins of the Modern Mind". Three stages in the evolution of culture and cognition." (Harvard 1991)

This book was and still is a great stimulus of our thinking of how our human social brain emerges from primates. Merlin insists that culture is fundamentally important in forming the social brain and mind. Our human mind evolved through a series of three major adaptations at each of which there emerged new representational systems, leading to our symbolic capacities. The progression is:

(1) From primates by developing gestural, linguistic and thought structures. In this first stage of "mimes" gestural communication, cooperation and social coordination of actions were central to species' survival strategies. Mimetic cultures enable individuals to create group structures with social roles and group norms. Knowledge can be transmitted, acknowledged and shared. "Social brain, distributed knowledge."

(2) The second transmission is from mimetic to mythic cultures. These pass on collective knowledge about survival through a vast heritage; oral lore, totemic art, mimetic song, dance and ritual. Language is in the form of narrative; symbolic art appears.

(3) Humans now coin synthesised symbolic art and symbolic language. Writing emerges, therefore memory can now be held in "external

storage systems"; knowledge can be retrieved, critically examined, leading to theoretic culture.

As humans evolve through these stages, brain structures and capacities appear, not increase in brain mass but in brain capacities; encephalisation, network capacities. (Ref). Biology and technology now are a single evolutionary continuum.

In recent writing Merlin Donald states, "Human beings are cultural entities. We share mind. We construct cognitive collectivities called symbolic consciousness. Embedded in a cultural network from birth, human beings become something unique in the biological world: symbolising intellects bonded to a community of minds. Distributed knowledge, distributed networks engaging other minds, interlinking minds, using technology. Today's world wide web is the latest of these stages, (Ref) emerging from smaller, slower mechanism. The human mind becomes more powerful by its connection to community networks."

Merlin Donald does not refer to Norbert Elias' studies of networks of dependency but expresses similar ideas in writing that it is difficult for us to accept the degree of our dependency, our "grand illusion of individuality" is defined by our fixed places in a particular community network. We gain intellectual status when we are wedded to a community of mind.

**Robin Dunbar**

Dunbar's work is to link brain size and complexity to the ability to live in complex large groups. He uses the volume of the neo-cortex as the measure of brain size because this accounts for most of the brain expansion in primates. Measure of social complexity correlates with relative neo-cortical volume. The volume of neo-cortex imposes a limit on

the number of relationships that individual primates can [1]sustain in their mental model of their social world. Dunbar asserts that the human social group and clique size from neo-cortical volumes are: 150 for social group size, 12 for a more intimate clique size. Dunbar cites as evidence for the 150-group size: average village size in Domseday Book; the common size of self-sustainable military groups such as a company. Within these groups of 150 there are hierarchical structures of friendship. Five intimates for support, 15 for close friendships and sympathy, 50 is the next larger group size, then 150 as the outer limit of relationships.

The primatologist Franz de Waal from his observation of chimpanzee groups in zoos saw how power struggles are constant. If the power structures break rebellions ensue and power shrinks and may shift. The nakedness, the visibility of the power struggle led him to recall Machiavelli's description of the political (R) manoeuvres of the Italian princes, popes and influential families such as a the Medicis and Borgias. Machiavelli was the first man to refuse to repudiate or cover up power motives. Amongst chimpanzees power politics give to the life of a community its coherence and social structure. All parties search for social signs and continue to do so until a temporary balance is achieved.

Since then, "The Machiavellian Mind", as featured in studies of animals principally primates, have been observed and tested to find out their capacities for tactical deception and power manipulations. Primate social systems are much more complex than those of other species, routinely involving the formation of coalitions, tactical deceptions. Much larger brains are needed to accommodate the information needed to cope with the complexity of the larger groups. To live in a large group you need a large brain; to have a large brain you have to live in a large group.

[1] Here we should acknowledge De Mare's writings on human group size, which he derived from the size of the ancient Icelandic parliaments.

So, what does “Social brain mean?” It is the brain, which has developed the structures needed for living in complex large groups. In primates measures of social complexity correlate with the volume of the neo-cortex. This also correlates with the time devoted to social interaction, the level of social skills and the degree of tactical deception practice. The volume of the neo-cortex imposes a limit on the number of relationships primates can sustain in their mental models of their social world. What now can be added is the knowledge of the striking differences between the sexes in social mechanisms and brain units involved. Female sociality is more affiliative, is related closely to neo-cortical volumes whereas male sociality is more competitive and combative, more closely related to sub-cortical units, the limbic system and hypothalamus. This suggests that the male and female brains have responded to different kinds of social pressures. Females to social integration, males to male-to-male competitiveness and fighting. As the level of competition between males increases, the level of cortical control is reduced. (Dunbar 2007).

Byrne and Whiten termed their model of the unusual complexity of the primate social world where tactical deception and coalition formations feature as the “Machiavellian Intelligence Hypothesis”; later this was renamed the “Social Brain Hypothesis” so as to remove it from imputations of political machination. Later Dunbar suggests that story telling and religion are consequences of the capacities for social cognition: they require us to be able to imagine virtual worlds that have no immediate experiential context and requires us that those who we ask to share this imaginary world can genuinely follow us on this journey, this religious journey. In story telling we have to imagine a fictional world. The ability to work in a fictional world is an especially demanding cognition which is only possible to animals such as the great apes and humans who have developed large neo-cortices. The same applies to sharing the ability to imagine the existence of another universe.

Later Dunbar suggests that story telling and religion are consequences of the capacities for social cognition. They require us to be able to imagine virtual worlds that have no immediate experiential context and requires that those with whom we ask to share this imagination of the unconscious can genuinely follow us on this journey. In story tellings we have to imagine a fictional world; the ability to work in a fictional world is especially demanding cognitively, which is only possible to animals such as the great apes and humans who have developed large neo-cortices. The same applies to sharing the ability to imagine the existence of another universe that we cannot directly see and touch.

An important and original contribution to the development of the social brain comes from Sarah Blaffen Hardy, “Mothers and Others: the evolutionary origins of mutual understanding. (The Beltnap Press of Harvard University Press, Cambridge Mass, 2009).

Her stimulating thesis is that homonyms evolved through cooperative breeding, which is made possible by “mothers and others”. The others are predominantly the grandmothers and other alloparents (those who take on parental roles and responsibilities). Homonym females being able to live for decades after the menopause are able to share the care of infants and children, to teach novice mothers how to acquire the necessary skills for their infants’ survival. “If mothers with help are better nourished and safer from hazards, their chances of surviving long enough for genes favouring slightly longer life spans to be expressed go up.

Similarly, with extended life spans the prolonged childhoods and bigger brains of humans also appear to be derived traits that evolved in the context if cooperative breeding. Lengthy childhoods enable children to grow slowly and for increase in brain size to happen. This larger brain enables more learning, to receive transmitted knowledge, to be better equipped for survival. Hardy states that without a doubt highly complex co-evolutionary

processes were involved in the evolution of extended life spans, prolonged childhoods and bigger brains. The cooperative brain was the pre-existing condition that permitted the evolution of the traits in homonym development.

Pro-social impulses are likely to be rewarded with cooperation thus maintaining the survival web of social relations. The helping others is inherently rewarding and there is an inborn predisposition to care about how they related to others. From the start of life human infants avidly monitor others, learning to recognise, to interpret and to imitate.

“To care and share is to survive”. Hardy emphasises the pleasure that is derived from giving and from sharing and that the human infant being the result of cooperative breeding is able to be a slow developer. As for a brain mechanisms that facilitates this, the mirror neurone system embodies the ability to detect similarities.

“Seeing others like me is our birthright” (Meltzof).

The human with the developed cooperative brain develops art and languages as tangible modernities. But there are the intangible modernities the capacity to pay attention to others’ thinking and feelings and develop what she calls emotional modernity.

Hardy describes infants as “little connoisseurs of commitment” (pp 285). From birth attuned through the feeling of being surrounded by responsive caretakers this develops the capacity for empathy, mind reading and collaborative activities. This development is the outcome of both genes and nurture acting together to produce the modern human being. Hardy emphasise that cooperative breeding was the pre-existing condition that permitted the evolution of extended life spans, prolonged childhoods and bigger brains. Creatures may not need bigger brains to evolve cooperative breeding but homonyms needed share, care and conditioning to evolve a bigger brain. Cooperative breeding had to come first for this allowed for the

slower maturation, waiting longer before bodily resources were reverted into reproduction. The result is that we have bigger brains in bigger bodies and more strongly developed immune systems. Brains are expensive materials requiring a high proportion of body energy consumption which can only be met in cooperative living, cooperative hunting and food sharing.

(pp 275) The really distinctive feature of the human story is not longer childhoods per se but a larger mosaic of life, history traits that derive from cooperative breeding: bigger brains that are metabolically more costly than those of other apes; extended life spans for females after they pass menopause; and peculiarly pro-social tendencies, especially where food sharing is involved, that distinguish humans from chimpanzees, bonobos, orang-utans and gorillas.

## Social Brain Pathology

The chapters on “Pathologies of the Social Brain” in “Social Brain Evolution and Pathology” feature autism, ADHD, prefrontal cortical lesions, schizophrenia, psychopathy, paranoia and bipolar affective disorders, borderline personality disorders. Autism has been associated with a mirror neurone deficiency and will be presented in that section of this chapter. These disorders result from severe brain disorders and as widespread disorders of the social brain of a consequence of disorders of social life: social isolation.

**Loneliness.** (Cacippo and Patrick). Loneliness is a social pain. Genetically driven it evokes the awareness of the danger of remaining isolated and unprotected, without social connections. fMR studies have shown that both physical and emotional pain activate the same brain areas, the dorsal anterior cingulate cortex. Secure attachment in infancy and childhood gives the person a sense of safety and resilience and reinforce social bonds. Psychological and physiological self-regulation contributes to the person’s likelihood of maintaining health. Social communication and social

contacts keep us balanced both physically and psychologically and help to contribute to the well being of others.

Cozzolino calls the interpersonal space “the social synapse” that has to be (Ref) bridged and by which we are linked to society, to families, to collectivities. “The sensory experience of social communication, deeply woven into who we are, helps regulate physiological and emotional equilibrium.” The social environment affects the neuronal and hormonal signals that govern our body and behaviour and in turn create changes in the social brain that affect our neural and hormonal processes. The UCLA Loneliness Scale gives us a measure of a person’s sense of interconnectedness or isolation. Research with young and older adults has shown (R) that those who were lonelier had larger numbers of objective stresses in their lives. The consequences of their “self-protective” behaviour over time led to interpersonal and social problems significantly more than those reported who themselves as connected and contented. The chronic heightened stresses can lead to various types of physiological damage shown by heightened cortisol levels.

Looking more deeply at the invisible forces that link one human being to another helps us to see something even more profound. “Our brains and bodies are designed to function in aggregates, not in isolation”. That is the essence of an obligatory gregarious species. The attempt to function in denial of our need for others, whether that need is great or small in any given individual, violates our design specifications. The effects on health are warning signs, similar to the “check engine” light that comes on in today’s cars with their computerised sensors. But social connection is not just a lubricant that like motor oil, prevents overheating and wear, social connection is a fundamental part of the human operating (and organising) system itself”.

Cozzolino writes, “The brain is an organ of adaptation that builds its structures through interaction with others. There are no single brains, the arguments equally apply to the concept of a social mind. (R)

## NEURAL PLASTICITY

Neural plasticity is an important factor in understanding how the brain receives, records stimuli, inscriptions of experience which are both external and internal in origin. “We now take it for granted that the subtler elements of the process of transferring information between neurones, that is, the synapses, are permanently altered in accordance with lived experience. The mechanisms of plasticity operate throughout a subject’s life and significantly determine his future. In neurobiological terms the trace is dynamic. It is subject to modifications. The mechanisms of its (R) inscription give the neuronal network great plasticity in the original meaning of the term. This is how, on the basis of experience, an internal reality is constituted. This reality contains elements of both conscious and unconscious inscriptions. As this is happening continuously the synaptic network is constantly changing and raises a question of how we maintain identity while the networks are changing.

Experience leaves traces that modify what went before. The connections among neurones are permanently modified by experience, thus the brain must be thought of as a highly dynamic organ in permanent relation with the environment as well as with the psychic facts of the subject or his acts. The brain can no longer be seen as a fixed organ, determined and determining once and for all. Plasticity shows that the neuronal network remains open to change, to contingency, that it can be modified by events and the potentiality of experience which can always alter what has come before. Plasticity shows how the brain changes through the stages of life and most importantly how the effects of psychotherapy can stimulate

neuronal changes giving us the opportunity, a way out from repetition or fixed patterns: a biology of freedom.

A bold claim is made by the authors of Biology of Freedom, François Enfermé, Pierre Magistretti, to write, “The trace, which is at the centre of the phenomenon of plasticity, lies at the intersection of the neurosciences and psychoanalysis. What we have to do is show how the synaptic trace is related to the psychic trace and the signifier.

We can well apply these concepts of constant changes in neural plasticity to Dennis Brown’s reworking of Foulkes’ “Ego Training in Action”. Brown emphasises that the process of self-development in group analysis is circular and spiral: the experience of being empathised with and failed enough – as in early infancy – sets in motion the three stages: fuller *discovery* of our inner worlds, which allows us to *discern* the difference between old internal object relationships and new ones, and in a step towards maturity to *learn* to attune ourselves to *other people’s experience as well as our own*. On the way to more mature, intimate and reciprocal relationships with others, we mitigate the effects of earlier empathic failure and ossification of internal object relationships. I call this *self-development through subjective interaction.* (Ref:))

When Foulkes outlined group specific factors they were, (1) mirroring,

(2) Resonance, (3) group as forum.

<u>The group as forum.</u> From our clinical experience we have learned that optimally we compose a group which has both diversity and similarity in the membership. Similarity is in not including a person who will become an isolate, which might be through age, gender, extreme psychopathology, a person for whom there will be little or no resonance. The task of all group analytic groups is to work with similarities and differences, in time uncovering and discovering their connectedness, moving through cohesion to coherence; linking, fitting together on the basis of mutual adaptation

through understanding; each member's individuality emerges from the group matrix. "Individuality is not to be know without the world with which, in which, by which it is coming to be, and in which it is constantly re-entered by its own activity. Here I emphasise active adaptation which Foulkes had emphasised when he spoke of "ego training on action", which Dennis Brown wrote of as the person's sense of themselves confirmed by the other's responses in a network process of self-discovery.

## MIRROR NEURONES

These were discovered at the beginning of the 1990s and show how recognition of the actions of others, and even of their intentions, depends first of all on our motor repertoire. From elementary acts such as grasping to the more sophisticated that require particular skills such as playing a sonata on a pianoforte or executing complicated dance steps, mirror neurones allow our brain to match the movements we observe to the movements we ourselves perform, and so to appreciate their meaning. Without a mirror mechanism we would still have our sensory representations, a "pictorial" depiction of the behaviour of others, but we would not know what they were really doing.

> It would seem therefore that the mirror neurone system is indispensable to that sharing of experience which is at the root of our capacity to act as individuals and as members of a society. Forms of imitation, both simple and complex, of learning, of verbal and gestural communication, presuppose the activation of specific mirror circuits. Our capacity to appreciate the emotional reactions of others is correlated to a particular group of brain areas that are characterised by mirror properties. Emotions, like actions, are immediately shared; the perception of pain or grief or of disgust experienced by others, activates the same areas of the cerebral cortex that are involved when we ourselves experience these emotions.

This shows how strong and deeply rooted is the bond that ties us to others, or in other words, “how bizarre it would be to conceive of an I without an us” (Rizzolatti and Sinigaglia).

These mirror neurones were first identified in monkeys but have now been also identified in humans. Mirror neurones allow the brain to match movements we observe to the movements we ourselves can perform and so to appreciate their meaning without a need for reasoning. As written above they are indispensable for that sharing of experience which is at the root of our capacity to act as individuals but also as members of society. The presence of this brain mechanism and capacity provides us with the data to support the theories of George Herbert Mead. Mead described what he saw as “the language of gestures” in animals, that seemed to understand and respond to the intentions of another and he extends this to humans. We understand the meaning of the language and the meaning of the gestures of another human being because we ourselves can use that language and make those same gestures. It is interesting that the research with monkey evolved from seeing the neuronal stimulation when the monkey either itself grasped an object or saw another animal or person grasping the same object. We humans speak about understanding and grasping meanings. To understand means to stand under, that is to put oneself physically and mentally into the place of the other and grasp refers to the mental act of understanding a meaning. So mirror neurones enable us to understand the meaning of motor events, of actions performed by others and how to immediately recognise a specific type of action and differentiate it from another. We use the information to respond appropriately to the movements made by another. Thus we perceive the meaning of “motor events” and interpret them in terms of an intentional act. We build up in our brains a vocabulary of acts so that when we see someone replicating this action our motor system goes into *resonance mode* by

which we recognise the intentional aspects of the movements and understand the type of action, which then determines our response. Looking at it from the point of view of evolution this shows how built in to our brain activated motor system is the knowledge how to defend ourselves by parrying the movements of the other. This is beautifully exemplified by Japanese martial arts such as Akaido where the learner is taught how to anticipate and to parry the act of the other. Cozolino describes how in learning Akaido he (Ref) had a confrontation with an Akaido master. He stepped towards the master and in a very short time without having made physical contact with him he found himself thrown to the ground, “My teacher was a master at activating and manipulating balance, reflexes, neuro-systems and resonance behaviours. He was playing my body like a familiar instrument and I understood his calm in the face of attack; I was easy prey. It was a humbling lesson on both my lack of skill as an Akaido-ist and of the power of these automatic and unconscious resonance reactions.” When I was learning Tai Chi I saw the same phenomenon, that is the students stepping towards the master to engage with him and finding themselves repelled without any apparent movement on the part of the master. Merleau-Ponty wrote, “The sense of gesture is not given, but understood, that is recaptured by an act on the spectator’s part. (Ref) There is a reciprocity of my intentions discernable in others. “It is as if the other person’s intentions inhabited my body and mine his. There is a “shared space of action” within which each act and chain of acts are immediately registered and understood.

## RESONANCE BEHAVIOURS

Resonance is one of the group phenomena described by Foulkes and developed by Dennis Brown. In terms of neural networks we can see this as the way in which a situation triggers responses that are determined

by the unique neuronal networks of each person. Thus in a group the neural networks will be activated by emotions, themes, verbal acts. “Resonance behaviours triggered by mirror systems are automatic responses that are reflexive, implicit and obligatory. They communicate potentially important information, advance social cohesion and advance group identification and safety. Resonance behaviours also serve learning by providing an automatic core for imitative learning and the organisation of procedural memory. Resonance behaviours can been as supporting the development of gestural communication, language, and other aspects of social relating. With greater control over mirror systems in the course of evolution, we can now inhibit some resonance behaviours, choose to omit (Ref) others voluntarily and use the information provided by a mirror circuitry in increasingly strategic ways. These are the positive aspects of resonance behaviours but there are strong negative aspects; emotional contagion, mob behaviour, groups becoming the masses that Freud wrote about in his groundbreaking essay on Group Psychology and the Development of the Ego.

Neural systems and resonance behaviours are involved in our ability to attune to the emotional states of others. It is the capacity for resonance that enables a mother to behave “as one” with the infant, to sense the affective internal state of the infant by experiencing it within herself and from that point finding instinctively the appropriate gestures and responses. This form of “attunement” is the building block of a good infant-caregiver relationship; the infant begins to understand that there is out there an other who understands.

I have found it useful to use this concept of neural networks to resonate with and understand the internal experience of a patient.. This also leads to the possibility of activating in the other person a neural

network that has been unconscious through being set aside and attention withdrawn from it.

Bernard, a very intelligent research scientist, has been in therapy on and off for several years including membership of a group. He is dependent on medications for sleeping and has developed a ritual where every evening he enters into a masturbatory sexual fantasy where the woman makes love to him in the ways that he wants without having had to tell her what to do, she understands. In his developmental history for the first four years of his life he was left by his mother with paternal grandparents who gave him a very secure and loving environment. He was abruptly removed from this by his mother at the age of four and his emotional security was immediately badly shaken; his mother was a narcissistic actress and opera singer who frequently left him when she went on tour. Left with her brother and sister-in-law, he was emotionally abused by the uncle and sexually titillated by the aunt who would sit in sexually, semi-nude provocative positions. Later his mother would bring back different men in their shared, room, his mother making intercourse. He has built his mental life round the fantasy of being powerful and wealthy; he has got very deeply into debt through hiring expensive cars and hotel suites. Gradually over the years I have been able to help him to recognise what this fantasy life means to him and how he had lived out this false self, which was not permitting his real self to grow through experience. In a last session before a holiday break he spoke about how pleasure had departed from his life in that he could no longer enjoy the sexual fantasies and pornography. Now what he feels is physical pain, as if he were dragging a heavy weight in his body. He uses his drugs to stay in bed until mid-day. I explored with him his central fantasy of the woman doing whatever he wants without instructing her. He re-visits his experiences when he was nine or 10 years old, his mother having sex in the same room, his aunt tantalising by sitting seductively knowing that he

is looking at her. He sees how sick these experiences were, how they aroused fear disgust and excitement. He can see clearly now how he avoids a real engagement with the world and real intimate relationships with women. However, despite all the pain and sense of loss now that he can no longer indulge in spending money lavishly on himself, he acknowledges that he is beginning to feel “much more together”. This is an important sign that an integration is happening in his inner world and he has noticed also for some time that his dreams now seem to have a coherence rather than being confusing, exciting and frustrating.

Identifying a patient’s neural network involves the usual requirements in a therapeutic relationship, giving attention to the other, attention to one’s own mental state, inviting the patient to explore unknown aspects of the self, doing this by noting particular words that the person is using that seem to offer a pathway to be followed. There are clear similarities between that and the psychoanalytic and group analytic concepts of free floating association and free floating discussion, encouraging emergence of new chains of associations, memories and fantasies. What the neural network concept adds to this is the search for another pattern that is hidden, latent and which can begin to emerge when it is unblocked and in a sense welcomed.

Now Gerald Edelman’s thesis of neural-Darwinism, the theory of neuronal group selection. Edelman, a Nobel laureate for his work in immunology where he studied the self-organisation or organisms, moved on to a theory about how the brain works in making minds. Put simply, some synapses, which are actively communicating eventually form a neural circuit, a pattern through the strengthening which is strengthened through the frequent use of these synaptic connections. Other synapses, which are not frequently used do not form or maintain

these connections and their patterns weaken and eventually die from disuse Neurons in the brain wire themselves up in complex and idiosyncratic patterns during growth and later experience: no two people are wired the same way. The neurones come to compose a number of structures, forming groups, which tend to fire together. For Edelman these groups are the basic operating unit of the brain. The other main structures are maps. An example might be the way some sheets of neurones reproduce the pattern of activity on the retina. Edeman sees similar structures as applying much more widely, mapping not just sensory inputs but each other and other kinds of neuronal activity. The whole system is bound together by re-entrant connections, paths which provide connections from group A to group B and group B back to group A.

The process which makes this structure work is “neuronal group selection,” neural-Darwinism. Some patterns are reinforced by experience, while many others are eliminated in a selective process, which resembles evolution. Edelman draws an analogy with the immune system which produces a huge variety of random antibodies: in an analogous way the theory of neuronal group selection explains how the brain can recognise objects in the world without having a huge inherited catalogue of patterns. The re-entrant connections between neuronal groups and different parts of the brain co-ordinate impressions from the different sensors to provide a coherent, consistent, continuous experience. Edelman also writes about values, a word used to describe inbuilt tendencies towards a particular behaviour. I find myself making a connection between Foulkes’ description of “norms”, shared values which will drive the group away from neurotic patterns towards more mature ones.

When I wrote, “Individuality is not to be found in isolation from the world in which it moves. The individual is a being forever forming and transforming himself in a never ceasing interaction between himself and his sustaining natural ground and social world, a being individualised only by his mental awareness of continuous experience. Individuality is not to be known without the world with which, in which, by which it is coming to be and in which it constantly *re-enters* by its own activity. A self is a self only in its fruitful interplay with its world; it is the self and making the world a part of itself and itself a part of its world. The value of individuality lies less in its separate uniqueness than in its unique way of making itself part of the world”. When I wrote that I did not know about Edelman’s theory of neural networks and of the importance of re-entry by which the brain communicates with itself and is constantly creating new patterns. (unpublished).

In his excellent book “The Neuroscience of Human Relationships” Lewis Cozolino emphasises how interdependence and how we communicate through the space between us through gesture expressions and language. The space between us he calls the *social synapse*. Though Foulkes never used this term, “the social synapse” as he also did not write of the social brain, but these considerations are implicit in his whole approach to both group therapy and our interdependent existence, chains of figurations to use the the term coined by Norbert Elias.

## ANIMAL STUDIES

The eminent neuroscientist Walter Freeman has entitled one of his books, “Society of Brains. A study in the neuroscience of love and hate”. His experimental work is based upon studying the olfactory cortex in rabbit brains and from this work he asserts that brain texture, the neuropil, the tissue formed by neurons, actually stretch out in search of input. Brains consist of neural structures designed by biological evolution to work with

pairs, families, tribes and by evolution from this biological base, in cities, nations and empires. Brains join together in social cooperation through their biological properties. Each brain has a private language, in some sense like the labelling of the self by the immune system (Edelman). Brains arise and are shaped in evolution (Fumara, The Darwinian machine) as units in society ranging upwards from pairs to empires. The progression from pairs to social groups requires the crossing of the solipsistic gap which thus requires the relinquishing of the existing boundaries to merging with the larger structure. The social hormone oxytocin is involved in this progression, the dissolution and reformation of not only language but of music, rhythm and dancing to create and sustain the group bonds (131).

In his recent book, “How Brains Make up their Minds” Freeman writes that the process of unlearning is a remarkable achievement of biological and cultural evolution of mammals and to account for the unlearning that necessarily occurs in early life, he suggests that unlearning happens every night during sleep through the release of the requisite neuro modulators. Freeman draws our attention to the need to distinguish between private meaning, which comes by individual action into the environment and meaning learned through interaction with others. The permeability of our individual boundaries so that we can confirm our similarity to others is done by shared gestures and invitations to cooperate. The inability to allow ourselves to be open to and to cooperate with others produces the curse of loneliness which has been explored fruitfully by Cacioppo and Patrick. We do this through gestures and language. Building on Darwin’s expression of emotions in man and animals he writes that, “Reading the new answers of others’ expressions allows us to see only the surface of the deep ocean of meaning that lies within each of us.” Revealing and reaching to the deep knowledge requires trust, the unquestioning acceptance of another person as being what he or she appears to be, because of trust we can reasonably predict the behaviour of people we know well. The formation of cohesive

social groups is based on deep trust which built on the unlearning and relearning that takes place through social activity, military training, sports teams, training programmes intended to induce team spirit. Freeman's conclusion is, "Each brain, and the mind that is its function, is a unity that is isolated within a solipsistic barrier. This is a barrier only in the sense of a horizon, which endlessly recedes as it is approached." We cannot directly experienced the meanings that exist in another brain nor can any other outsider enter your own private world. You have to learn to understand and unlearn to empathise. Through the long educational processes of childhood by which the capacity emerges for cooperative social action based on a high degree of shared perception and understanding, i.e. knowledge. When we act together we "assimilate: meanings can be made to be similar in people who work, dance, sing and play together which results in "assimilated meaning". Assimilated meaning support cooperation and are the basis for knowledge in social, cultural and political groups, beginning with families. Words are merely cognitive and cannot lead to the sense of trust that comes with deep assimilation of meaning. Joint action is the real glue that holds societies together beginning with socialisation in infancy, extending throughout life as the midlife of meaning in each of us. Each of us is a source of meaning, a wellspring for the flow of fresh construction within our brains and bodies, sheltered by the privacy of isolation. Our intentional actions continually flow into the world, changing the world and the relation of our bodies to it. This dynamic system is the self in each of us.

## BRIDGING THE SOLIPSISTIC GULF

Humans have learnt how to use chemical mechanisms (oxytocin, vasopressin, endorphins) to manipulated their own and each others' behaviour in order to build the channels of communication that are required to overcome the "solipsistic gulf" in forming societies. Music, dancing and

sports provide the archetypal techniques. Neurons are designed by biological evolution to work in pairs, families, tribes and by cultural evolution from this biological base into cities, nations an empires. There are biological properties by which brains join together in social co-operation. Intentionality is central to Freeman's thesis: in his usage intentionality means the process of the brain in action having properties of unity, wholeness and intent (the tension of taking in by stretching forth: (pp. 18,19)

An *intentional structure* is a living brain having the capacity to actualise these properties by purposive behaviour.

*Unity* refers to a state of integration by which a self distinguishes itself from non-self. This property attaches to bacteria, neurons, brains, and the immune systems of multi-cellular animals.

*Wholeness* refers to a bounded process by which through stages a self actualises its mature form, ultimately to die, holding for plants, animals, brains and healing bodies.

*Intent* refers to a relationship in which the self modifies itself into conformants with aspects of non-self.

Intentionality is a central concept for Freeman. He asserts that the brain substance, the neuropil which consists of nerve cells, axons, dendrites and the surrounding glia, demonstrate this intentionality and the search for communicating between one brain and another is shown by this "stretching forth". Piaget shows that children learn about the world using their bodies to explore it by "stretching forth". Merleau-Ponty shows that human mental activities shape themselves by adapting bodily movements towards biological goals in everyday tasks. "To perceive is to render oneself present to something through the body". Merleau-Ponti describes the *intentional arc,* which constitutes the effort to achieve maximum grip. The self adapts to an object and learns about it by shaping the body and by

re-shaping or re-positioning the object, e.g. manipulating a new tool. We are moved to action by disequilibrium between the self and the world. Freeman does not refer to Paul Schilder and his concept of body image where Schilder shows that the body image is constantly changing in relation to experiences in the world, particularly by emotional and physical contact with other bodies.

Freeman writes: each of us is a source of meaning, a well-spring for the flow of fresh constructions within our brains and bodies, sheltered by the privacy of isolation. Our intentional actions continually flow into the world, changing the world and the relation of our bodies to it. This dynamic system is the self in each of us. It is the agency of charge, not our awareness, which is constantly trying to catch up with what we do. We perceive the world from inside our boundaries as we gauge it and then change ourselves by assimilation. (pp 139 How Brains make up their minds)

**The mind of animals** Baboon Metaphysics. Dorothy L Cheney, Robert M Seyfarth. The evolution of a social mind.

This remarkable book conveys the findings and ideas made by authors who are both distinguished researchers in primatology. But why this remarkable title, Baboon Metaphysics? The answer is in a statement by Charles Darwin in 1838 notebook M. “The origin of man now proved – metaphysic must flourish – he who understands baboon would do more towards metaphysics than Locke”. This was written two years after returning from the round the world journey on the Beagle, 21 years before The Origin of Species. Darwin was thinking about the working of the mind. Locke believed that the mind acts simply to associate events that have been joined together through proximity and repetition. Anything we think or do can ultimately be traced to our experiences. Instincts have no place in this schema but Darwin’s theory of evolution by natural selection was

beginning to take shape in his mind, that animals act by instinct, governed by hereditary tendencies accumulated over generations, not behaving according to Lockeian reason. In the same notebook (M for metaphysics) Darwin wrote, “we can thus trace causation of thought…(it) obeys (the) same laws as other parts of structure.

With growing excitement Darwin began to see that his theory might allow him to reconstruct the evolution of the human mind and thereby resolve the great debate between rationalism and empricism. The modern human mind was to acquire information, organise it and generate behaviour in ways that have been shaped by our evolutionary past. Our metaphysics must be the product of evolution. The key to reconstructing the evolution of the human mind must come from comparative research on the minds of our closest animal relatives.

Before reading this book I had no idea that the sophisticated research on the social lives of baboons could reap such rich results by the ingenious experimental methods used by the authors. Their conclusion is “that like the beak of a finch, the mind of a baboon has been shaped by natural selection – in the baboon’s case by natural selection acting in a social environment” (pp 273).

Natural selection has favoured in baboons a mind that is specialised for observing social life, computing social relations, and predicting other animals’ behaviour. The brains of monkeys contain areas that are particularly sensitive to other individual’s orientations, movements, gaze direction and intentions. Much of this work is based upon studying the vocalisation of baboons and recognising that when a female baboon hears another female’s vocalisation she does not just hear a sound. She perceives a signal that provokes representation of the caller, what she is doing, her rank and family membership. “Just as we cannot hear a word without thinking about its meaning, so baboons cannot hear a vocalisation

without thinking about the animal who is calling and the events the call describes". They have a social mind that is innately computational and judgemental. Their minds have been overwhelmingly shaped by social life, baboons have only a limited ability to recognise the mental states of others. Though they have at least a rudimentary understanding of other individuals' intentions and motives, they seem oblivious to others' beliefs. They extract rich causal narratives from other animals but these narratives remain private. Unlike humans and even very young children, they feel no urge to gossip or share information. Baboons, like dogs, chimpanzees, and many other species, understand much more than they can say. Their language and thought is impressive; their ability to articulate their thoughts much less so. Baboons teach us that it is possible to have a complex society based upon cognitive processes that are both computational and representational without either language or a theory of mind. Concepts (of a sort) can exist without words; computation can occur without grammar. Along with many other species of animals, baboons provide us with a natural experiment that allows us to ask, "What is thought – what can it possibly be – without language and a theory of mind?"

Comparing the human mind with that of the baboons, human brain size is dramatically larger, including in particular the pre-frontal and temporal association cortices, the areas associated with complex cognition. "We suspect that, as our uniquely human traits began to appear, the continuing evolution of the theory of mind played the crucial role as catalyst and prime mover, facilitating a leading to the evolution of all of the traits that are uniquely human, including speech, teaching, elaborate tool use, and culture." (pp 279). They accept the suggestion that a theory of mind and the urge to share knowledge with others drove the evolution of flexible vocal production in humans. Comparing baboons and chimpanzees, the baboons do not manufacture or use tools "baboons adaptive specialisation is their social intelligence; their technological skills are decidedly

underwhelming. Baboons are not motivated to change their physical world." Their brains are smaller than some of the great apes that live in smaller groups but use and manufacture tools.

**Leslie Brothers Friday's Footsteps. OUP 1977.**

Leslie Brother is a psychiatrist, neuro-scientist and psychoanalyst. She makes the strongest case for the social brain and possibly was the first to use that term.. She uses Defoe's fictional character Robinson Crusoe, who lived in isolation for 25 years until he saw the footprints of another human being which led him to the native whom he gave the name Friday, because that was the day upon which he discovered him. Brothers uses Robinson Crusoe as a metaphor for the belief in the isolated human mind that was current in the 18th century biology. Brothers emphasises that culture arises from a network of meanings from the interactivity of human brains. This network forms the living content of the mind so the mind is communal is very nature. Brains work jointly to create culture, human conversations hold the key to the mind. Primate brains evolved to send and receive facial gestures, which eventually led to discourse. The interchange of expressions is a jointly created performance whose nature is essentially public. The concept of the person always belong to a network of persons.

The "social order": the social order is intrinsically moral for it is made up of "oughts and shoulds", good and evil, pride and shame, villains and heroes. When we hear words we experience not only the meaning of the word but that it indicates the presence of a person who has both subjectivity and location in the social order. This is what was already discovered in the vocalisation of baboons, that when a baboon hears a vocalisation it knows which family that one belongs to, position in the social order in the hierarchy. A characteristic of autism is that autistic children do not attend to the social situation, therefore do not receive social information and are not drawn to the sights and sounds of others. Understanding

utterances, attributing them to persons are fundamentally intertwined. This is what autistic persons do not register as they avoid looking at facial gestures and do not read from the eyes of others. Peter Hobson from the Tavistock believes that autistic children lack what is necessary for reciprocal and emotionally charged relationship with others.(Ref)

Social neurones. Single neurones have been identified in brain areas traditionally associated with emotions and form a brain mechanism that has evolved to respond to significant gestures and expressions and form what can be called a “social module”. The primate brain evolved a specialised system for producing mutually regulated behaviour in complex social environments. The gestures of others is included in brain areas that index it by automatically linking it to the appropriate response. Thus an innate “social alphabet” is built up. This leads to knowledge of what the other means by immediately linking it inwardly with a response. So it seems that through evolution brains evolved in a highly social environment, therefore beyond primates humans added the conceptual level to perception of a fellow human being’s mind developed that through its tie to the social order (: instead of snarls and grimaces the mind registers “shoulds and oughts”. I suggest that we can link this development to Foulkes’ emphasis on “norms”, the social shoulds and oughts, the dynamic that moves groups towards the social norms even though each person might represent a deviation from the norm.

Brothers shows us how in animal experimentation on the single socially isolated animal produces false results. Kluver and Bucy studied the results of damage to the amigdala resulting in animals performing abnormally when they are returned to their original group. They may be listless, apathetic, unable to recover a place in the social hierarchy and may be set upon by the others. However when Kling repeated this work on monkeys living in a natural environment in Zambia none of these

phenomena were repeated. This demonstrates how we must always consider the animals' position in a social network and not regard it in its isolated state. This of repeats the lessons that Goldstein, Schilder and Foulkes had shown. Again sadly there is no reference to any of these persons in Brothers account of the development of social brain and mind. This is the final paragraph of Friday's footsteps:

"Many scientists suspect that what goes on in the brain has very little relation to the everyday language of the mental. At the same time, they intuitively appreciate that our everyday understandings make us what we are, that we live for the most part in the language of the mind. What I have tried to do in this book is to convey the richness and power of everyday interaction, showing it produces the language of the mind, reasons and selves. In contrast to contemporary cognitive neuroscience, which views the mind as a kind of closet with entities like emotion, linguistic rules, and memory arranged inside, I take mine to be irreducibly transactional. Rather than something packed inside a solitary skull, it is a dynamic entity defined by its transactions with the rest of the world: Like industrial regions, theatre districts and shipping ports, minds are best characterised by reference to the larger forms of life in which they play a part. Just as gold's value derives not from its chemical composition but from public agreement, the essence of thought is not its isolated neural basis but its social use." (pp 146)

## PSYCHOGENSIS AND SOCIOGENESIS

A major contribution of Norbert Elias to the issues of how culture moulds the brain is this thesis: the constant evolution of society leads to changes in the personality of persons as they adapt to the evolving environment. Hence society, social processes, both frame and enter into its members from the start of life. Attitudes towards pregnancy, sexuality, maternity; child-rearing, education, gender roles, family life; rituals marking

the person's move from being a child to adolescence and adulthood. Each is immersed in the culture of the community.

Elias traced the descent of manners using as his source material the books of etiquette used to instruct young noblemen on how to behave in courtly society, laying down behaviours to be followed and behaviours to be avoided: how to control the body, its appetites and excretions, how to find one's place in the social hierarchy of the court. Elias showed the development of courtly life, of what was expected, allowed, or disallowed. The sense of privacy develops as living quarter arrangements allow private spaces; thresholds for what is allowed are disallowed are gradually raised with the growth of civility; civility imposes ways of behaviour: how to keep the peace, to recognise, respect, the lives of others. What in the past was allowed is now disallowed as the barrier of shame rises so that one does not indulge in the cruel practices towards other humans and towards animals; jeering at mentally disturbed people or criminals is modified and channelled via the media rather than personally going to the asylum or to the prison.

How neuroscience can be applied to these social processes can be seen through the concept of neuroplasticity. This concept names the realisation that our brains are constantly engaged in dynamic processes throughout the whole of the lifespan. Norman Doidge writes that not only does the brain shape culture, culture shapes the brain. Culture is not just produced by the brain; it is also by definition a series of activities that shape the mind. The definition of culture in the Oxford English Dictionary is, "The cultivating or development…of the mind, faculties, manners,…improvement or refinement by education and training, the training development and refinement of the mind taste and manners. This is precisely what Elias shows us and which can now be translated into the concept of the culturally modified brain. Changes in culture make for changes in the brain. We all

have what might be called a culturally modified brain. The evolution of cultures, the evolution of societies is through the transmission of knowledge. This non-genetic transmission has been entitled, “Memes, culturally transmitted knowledge. The powers of culture in determining our very basic functions such as perception has been demonstrated by experiments into how persons from the individualised western cultures and from the more inter-related eastern cultures perceive situations. The general assumption has been that persons from these different cultures interpret scenes differently, not because they have been perceived differently. In one experiment students in USA and Japan were shown coloured animations of fish swimming under water. Each scene has one “focal” fish that was bigger brighter or moving faster than the others. When asked to describe the scene persons from the USA usually referred to the focal fish whereas Japanese refer to the less prominent fish and to features of the background. Similarly when they were shown objects from reviewed scenes the American students could recognise them whether they were or were not in the organised scene whereas the Japanese were better able to recognise objects when seen in the original scenes. Thus Americans were more able to separate figure and ground whereas the Japanese were better able to recognise an object if it was shown in the original scene. They perceived the object in terms of what it had been “bound” to. Easterners perceive holistically, viewing objects as they are related to each other or in a context, whereas westerners perceive them in isolation. Easterners see through a wide-angle lens; westerners use a narrow one with a sharper focus.

Similar conclusions were arrived at by the use of the frame-line test (FLT). This was designed to measure one’s capacity to both incorporate and ignore contextual information in a non-domain. In the FLT people view a square frame with a vertical line embedded in it: then they are shown a similar frame of the same or different size and are then asked to draw in it a

line that is either identical in size to the line in the first square (absolute condition) or proportionate to the size of the second frame (relative condition). In the absolute condition you are asked to ignore the context, in the relative condition to are asked to take the context into consideration when viewing the line. The results are in line with the fish experiment; those living in the individuate North American culture were better at ignoring contextual information whereas the collectivistic Japanese are better at incorporating contextual information.

Modulation of visual experiences by cultural beliefs is thought to arise from the fronto-parietal regions associated with high-level attentional modulation. During scanning when performing a modified version of the FLT task it could be seen that when the subjects engage in a task incongruent with their community values there was more brain activity in those fronto-parietal areas. When a Japanese person was asked to ignore contextual information; when people of European descent were asked to incorporate contextual information, they similarly showed an increase in brain activity. Hence the conscious perception of a vertical line embedded in a square frame and its underlying neural circuitry is affected by experience with and identification in a given cultural context (Whitehead pp 63).

In his important book ”Brain and Culture. Neurobiology, Ideology and Social Changes” psychiatrist and psychoanalyst Bruce Wexler writes that “human beings alter the environment that shapes their brains to a degree without precedent among animals. These human alterations in the shared social environment include physical structures, laws and other codes of behaviour, food and clothes, spoken and written language, and music and other arts. In recent decades, children in Euro-American societies have been raised in an almost entirely human created environment. It is this ability to shape the environment that in turn shapes our brains and has

allowed human adaptability and capability to develop at a much faster rate than is possible through alteration of the genetic code itself. This transgenerational shaping of the brain function through culture also means that processes that govern the evolution of societies and cultures have a great influence on how our individual brains and minds work."

Wexler reviews animal studies and comes to this conclusion: "These studies provide evidence, then, that our brains (and minds) develop concrete perceptual structures, capabilities, and sensitivities based on common reaches of the environment in which we are reared, and then are more able and more likely to see those features in a sensory mix of new environments we encounter. Or conversely, we have a limited ability to see even common features of new environment if those features were absent from our rearing environment."

An important point that Wexler emphasises that "through instrumental parenting, adults create the physical world experienced and acted in by children, and interactively intervene in the object-activities of children. In these interventions adults provide frontal lobe functions of which the child is not yet capable (e.g. memory, planning, organisation and strategy) and that enable the earlier maturing sensory, motor, and association areas of the brain to develop as components of more complex functional systems. The frontal lobes, which are so much larger in humans than in other primates, then develop under the influence of activity from the externally structured, earlier maturing, cortical regions as well as from continuing social interactions. Language, itself a social and cultural development of brain capability, has radically increased the power of adults to increase the development of the brain in children." (136).

The psychoanalyst Hans Loewald has made the same point in psychoanalytic terms: adults and children live in a shared psychosocial field in which the adult is at the more developed and more structured pole and

the child at the less structured pole. In the course of development, also in the course of psychotherapy, these positions alter as the child, or the patient, acquire capacities that previously were found only in the adult. This is a move towards autonomy for the child and a greater capacity for self-analysis in the patient.

## NEUROBIOLOGY AND GROUP ANALYSIS

1. The brain is a social organ.
2. Big Groups require big brains to follow the complexity of relationships.
3. Vital learning takes place during interdependency. Neotenicty.
4. Relationships provide the brain's environment.
5. Eye to eye contact contributes vitally to attachment.
6. Neural networks are formed by the interaction of organism and environment.
7. The brain is a social organ dedicated to receiving, processing and communicating messages across the "social synapse".
8. The right brain develops first; organises and stores many social and emotional experiences: shared unconscious dialogues. Medial prefrontal cortex (OMPFC) activated in scaffolding. Left brain is biased to positive emotions, the right to negative.
9. Experience-dependent phenomena. The growth of the brain is activated through emotional availability and reciprocal interactions.