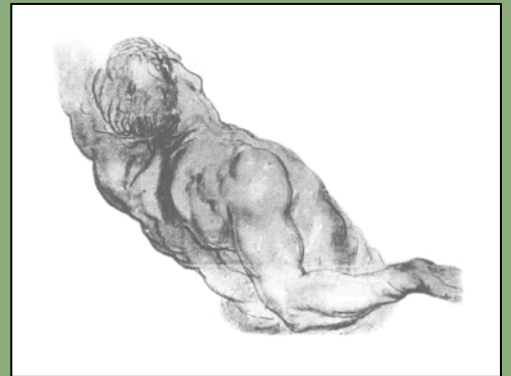


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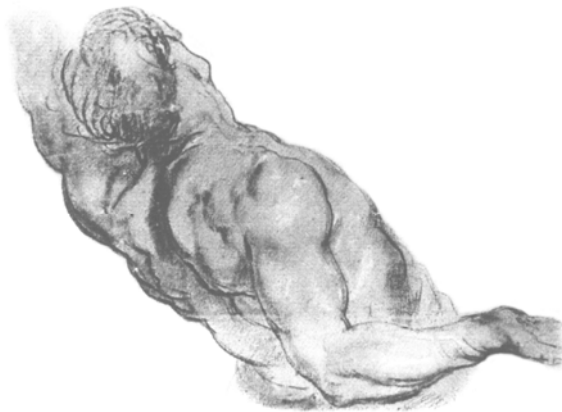
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USABP Mission Statement

The USABP believes that integration of the body and the mind is essential to effective psychotherapy, and to that end its mission is to develop and advance the art, science, and practice of body psychotherapy in a professional, ethical, and caring manner in order to promote the health and welfare of humanity.

# The Science of Body Psychotherapy Today: Part 4: New Science & Research

Courtenay Young

## Abstract

In the first of these four articles, I looked at the history of 'science' in body psychotherapy (mainly the work of Janet & Reich), and in the second article, I looked at what the current situation is in the science of psychotherapy and of body psychotherapy, especially mentioning what published research that there is. In the third part of this series, there was a discussion about what is meant by 'appropriate science' for body psychotherapy; and in this, the fourth & final part, I make a brief and incomplete examination of some new areas of science and research that are increasingly impinging on the field of body psychotherapy – hopefully to our benefit. However, what we really need to do is to find ways to use them properly, and perhaps even to start informing neuroscience, in return.

## Keywords

Neuroscience – Body psychotherapy

## A beach of diamonds

We live in very interesting times ! After years of wandering in the desert, impoverished, abandoned, unrecognized, reviled – a little like the Bushmen of the Kalahari, we suddenly discover that there is a beach full of diamonds – as actually exists in Namibia. Whose are they? Are we going to try to pick these diamonds up, and also let everyone freely use them? The beach of diamonds is – of course – just an analogy for the relatively new branch of science called neuroscience. And it is on our doorstep. And, currently, no one is really quite sure yet how to apply all these wonderful new discoveries clinically.

If you pass a light through a ruby, you can cut steel, or perform laser eye surgery. Wow! We now know – and we have seen the evidence in MRI scans and the like – that the amygdala is definitely damaged through prolonged and unresolved trauma. Wow! Now, how do we, as primary care clinicians, really start to use that piece of information from science?

This article is an attempt at the concept of consilience (the bringing together of two different disciplines) – neuroscience and body psychotherapy. I address some of the available research in various areas of neuroscience that might be of interest to body psychotherapists.

## Autonomic Nervous System (ANS)

A proper understanding of the functioning of the autonomic nervous system (ANS) – as we understood it – was all that was essential, when I originally trained with Gerda Boyesen in Biodynamic Psychology, as we had to comprehend how the digestive system could also digest emotions (Boyesen et al., 1980). Her writings are now mostly out-of-print, somewhat unintelligible, or exist only in French. However this subtle craft of psychotherapy, whilst being gentle and effective, was also somewhat nebulous and intangible. So a need for more detail and hard facts started me off – possibly as an antidote – on the more scientific track of applied physiology, then a diploma in Psychology, and, later on, looking at these sorts of studies in psycho-neuro-biology, now mostly called neuroscience.

There had been only one interesting scientific article mentioned in the whole of our body psychotherapy training (Setekleiv, 1980: about the firing zones of smooth muscles), and then David Boadella (1981) also wrote an article about muscle firing zones and the orgasm reflex, but mostly – as was often the case in body psychotherapy trainings in those days – we focused purely on the experiential; learning and refining techniques, mainly of different types of touch; on the interpersonal relationship; and how to intuitively help the client to regulate the functioning of their ANS, working to help them re-balance it, and thus to get a better sense of their self, their life and their internal (body) functioning: we were learning a craft, not science! (Young & Heller, 2000)

What totally overturned my cozy view of the two halves of the ANS, functioning basically in opposition to each other: one nasty, the adrenaline-based sympathetic half, and one nice, the gentle, laid-back parasympathetic half; was a talk and an article by Stephen Porges (2003; 2007) on his “polyvagal” theory. This theory gave a very different appreciation of the autonomic nervous system as a properly evolved system, with an identification of neural circuits involved in the regulation of autonomic state, and an interpretation of autonomic reactivity as being adaptive:

Foremost, the polyvagal perspective emphasizes the importance of phylogenetic changes in the neural structures regulating the autonomic nervous system and how these phylogenetic shifts provide insights into the adaptive function and the neural regulation of the two vagal systems.

Porges has built up this theory over a number of years: he is currently a professor in the Department of Psychiatry and the Director of the Brain-Body Center in the College of Medicine at the University of Illinois at Chicago and holds appointments in the Departments of Psychology, Bioengineering, and Anatomy and Cell Biology (quite some set of credentials!), and he is also very nice and easy to talk to. His wife is also “*a world leader in the role of neuropeptides oxytocin and vasopressin in social cognition.*”<sup>1</sup> Anyway, here is a quick and dirty version of the polyvagal theory:

[The perception] of danger and safety or life threat triggers 3 neurological circuits. They developed at different evolutionary times. The newest one (Green traffic light) occurs when we understand that we are in a safe environment. When it's on, we have the capacity to be socially engaged, to think, to hear and understand other humans, eat and to play. The second oldest (Yellow light) is engaged when we perceive danger, but we don't think it will kill us. In this mobilized state, we attend only to cues about danger and safety. We can't connect well; we can't even really hear people. We are scanning for danger and predators. The third state and evolutionarily oldest state (Red light) is immobilization in the face of life threat. We shut down completely, can't connect, feign death, and can't/don't have protective reflexes.<sup>23</sup>

Understanding the hierarchy of response and the different functioning of these different neurological circuits, and how they are overlaid upon each other is also essential for working effectively with other things within our clients, rage, trauma, and PTSD (see later). Porges has gone on to develop a concept of “neuroception” (neurological perception) (2004): he writes:

Neuroception describes how there are neural circuits that distinguish whether situations or people are safe, dangerous, or life threatening. Neuroception explains why a baby coos at a caregiver but cries at a stranger, or why a toddler enjoys a parent's embrace but views a hug from a stranger as an assault. Faulty neuroception might also lie at the root of several psychiatric disorders, including autism, schizophrenia, anxiety disorders, depression, and Reactive Attachment Disorder.

Suddenly things began to make a bit more sense, and so I started to latch onto this new world of neuroscience; here – potentially – was the scientific proof of our somewhat fringe and disowned body psychotherapy craft.

A greater understanding of the ANS has helped me work with clients more effectively, particularly in primary care patients in the UK National Health Service (NHS) where we are often limited to 6-8 sessions for people with mild to moderate anxiety and depression, and – of course – as mentioned, such an understanding of the ANS is totally necessary for anyone working with trauma.

Incidentally, Porges has also developed a “Body Perception Questionnaire” downloadable from his website, which could be useful to many body psychotherapists (or even National Associations) to help show an improvement in their clients.<sup>4</sup>

### **The biological bases of stress, anxiety & depression**

Burijon's (2007) excellent book on *The Biological Basis of Clinical Anxiety* can serve as an introduction to the whole new set of scientifically-based concepts that we are beginning to recognize, in that mild to moderate anxiety and depression should not, repeat not, be treated psycho-pharmacologically, nor as any form of mental illness, especially in the first instance.

Modern urban life is very, very stressful: and whilst we may be able to survive, our bodies just did not evolve with the ability to cope with the constant levels of stress that we experience nowadays (especially in the West). So, as an indicator, if our Life Event Stress Index (Holmes & Rahe, 1967) goes above (say) 300 points because of events that have happened to us within an 18-month period, and we did not, or do not, take appropriate actions to reduce our physiological stress levels (essentially a combination of aerobic exercise and relaxation), then the stress hormones will inevitably build up in our system and, at some point, our bodies will react to the overload, and we end up either climbing walls (with anxiety), or disappearing under the duvet (from depression), or a combination of both. Most mild to moderate anxiety and depression is not, repeat not, endogenous; it is exogenous or reactive. Of course, it can also, of course, build up on top of inherited genetic patterns and/or psychodynamic influences.

Initial, reasonably effective and well-researched treatment usually therefore consists of: (i) telling the patient there is nothing really wrong with them, only with what went on around them; (ii) not prescribing anti-depressants too early; (iii) giving them instead some basic information and reading about life stress, and (as a body psychotherapist) I throw in a simple understanding of the ANS here; and (iv) suggesting to them a regimen of aerobic exercise (about four, 30-45 minute sessions per week.) and relaxation (about nine, 20-minute sessions per week) for at least the next 4-5 weeks, so that this pattern can become habituated (Young, 2008). Subsequent counseling or psychotherapy sessions can then happen on a very different basis as the clients/patients are much more themselves, more empowered, and often considerably less anxious or depressed, so we are therefore looking at their problems quite differently. We have dealt with the basics (physiology) first.

<sup>1</sup> Quoted from: [http://en.wikipedia.org/wiki/Stephen\\_Porges](http://en.wikipedia.org/wiki/Stephen_Porges): accessed 21/07/09.

<sup>3</sup> Downloaded on 21/07/09 from: [http://traumatherapy.typepad.com/trauma\\_attachment\\_therapy/stephen\\_porges/](http://traumatherapy.typepad.com/trauma_attachment_therapy/stephen_porges/)

<sup>4</sup> Accessed on 21/07/09: [http://stephenporges.com/index.php?option=com\\_content&view=article&id=21:body-perception-questionnaires&catid=10:body-scales&Itemid=17](http://stephenporges.com/index.php?option=com_content&view=article&id=21:body-perception-questionnaires&catid=10:body-scales&Itemid=17)

Since most pharmacological drug treatments for anxiety happen to be quite addictive, certain anti-depressants are often prescribed for this. Much more effective is a taught course of mindfulness practice, which puts people more in touch with their bodies, calms them down through the meditative practice, brings them more into the present moment (where anxiety is not present), benefits pain relief and other conditions, and also helps them with their self-awareness.

Whilst people like Jon Kabat-Zinn (2001, 2002), and many others, have been prolific in testing the efficacy of mindfulness within the confines of modern science, and usually promoting it as an adjunct to cognitive behavioral therapy, it is really a Buddhist practice that is about 2,500 years old, so (a) I prefer recommending books like Thich Nhat Hahn's (1991) *Peace is Every Step*, and (b) I think that body psychotherapists should reclaim a bit of what they are good at, and promote this sort of practice as an excellent tool for body awareness, that has also been scientifically researched and has shown to be effective for several conditions, like anxiety, as mentioned.

More generally, body psychotherapists could benefit from an increased awareness about the biological bases of illness and disability from an evolutionary perspective (Davey, et al. 2001), and, I think, also possibly from understanding the processes of human evolution and how it has affected our bodies (Young, 2010 b). But, back to neuroscience!

Embodied self-awareness is the ability to feel our emotions and movements in the present moment, without the influence of judgmental thoughts (such as: am I doing this right?). Fogel (2009) provides some of the scientific background and understanding of this type of awareness and explores how we can prevent it from being lost. In so doing, he has "*laid a solid and comprehensive foundation for far-reaching changes in psychotherapy, medicine, and everyday life.*"

Regina Pally's (2000) book on *The Mind-Brain Relationship* attempted to do for psychoanalysts what this article attempts to do for body psychotherapists. In the forward by Mark Solms, it says:

Psychoanalysts who fail to assimilate the new knowledge will be increasingly marginalized both scientifically and professionally, and will be unable to participate in this important intellectual revolution. ... This book makes it possible for the non-specialist reader to grasp – almost in a single sitting – the main thrust of contemporary brain research on a range of topics of vital interest to psychoanalysis. Readers are bound to want to learn more about one or other of these topics and in this way they will be effortlessly inducted into this exciting new era of exploration and discovery in mental science. (Pally, 2004, iii-iv)

So too, I hope, that you will also be led. The book, somewhat predictably for its time and audience, looks at how neural circuitry develops in the infant epigenetically (as a result of early environmental influences); reviews the perceptual mechanisms; examines the structure and function of memory; looks at the embodied basis of emotion; touches on hemispherical asymmetry; and finishes off with some speculations based on research into consciousness.

### **Descartes' Error**

As has been said before, one of the fundamental problems in psychology, psychotherapy and (indeed) the whole of society, was that it largely ignored the body. Descartes' statement "*I think therefore I am,*" and Freud's reactions against the body in psychotherapy have perpetuated this trait into modern psychotherapeutic work. Antonio Damasio (1994), who was head of neurology at the University of Iowa and a prominent researcher on human brain function, was one of the first neuroscientists to challenge this premise. He wrote a fascinating and well-reasoned argument on the central role that emotion and feelings play in human rationality. According to Damasio, the same brain structures regulate both human biology *and* behavior, and both are indispensable to normal cognitive processes. He demonstrates, through a number of case histories, how patients (particularly those with prefrontal cortical damage, and there is also an interesting case study about sensory agnosia) can no longer generate the emotions necessary for effective decision-making.

This book, and Michael Gazzaniga's (1994) slightly more readable study, *Nature's Mind: Biological Roots of thinking, emotions, sexuality, language, and intelligence*, started the concept that neuroscience had something quite realistic and serious to offer psychotherapy, and also to wider society. Gazzaniga more recently presented the 2010 Gifford Lectures at the University of Edinburgh titled *Free: The Science of Mind Constraining Matter*, which explored issues of free will, mental causation, and the meanings behind patterns of our emotions, behavior, thoughts, and the choices we make, which are central to understanding the relationship between our brain and our strong sense of self. The recordings of these lectures are still available.<sup>5</sup>

### **The Emotional Brain**

A colleague in spirit of Damasio's, Joseph LeDoux's, is a neuroscientist and professor of Neuroscience and Psychology at New York University. His research interests were mainly focused on the biological underpinnings of memory and emotion, especially the mechanisms of fear. His seminal work (LeDoux, 1996) was *The Emotional Brain: The Mysterious Underpinnings of Emotional Life*, showing that, despite the hegemony of cognitive studies that ignored the emotions, we really need to understand how crucial emotions are to our evolutionary survival, as they (are designed to) cut through conscious reasoning whenever speed and rules-of-thumb are much more important and effective than logic. This approach also provided the scientific background to books such as Daniel Goleman's *Emotional Intelligence* (see below).

<sup>5</sup> Gifford Lectures 2009-10: [www.hss.ed.ac.uk/giffordexemp/ProfessorMichaelGazzaniga.htm](http://www.hss.ed.ac.uk/giffordexemp/ProfessorMichaelGazzaniga.htm)

Much of our emotional life is lived unconsciously, and this unconscious life is far richer than our conscious feelings - for example, our conscious mind will already be reacting to situations of danger some time before we begin to be afraid. Even Socrates stated that: *The unexamined life is not worth living for a human being.*<sup>6</sup> If we – perhaps with the assistance of therapy – start to make this unconscious life conscious (through examination), then what riches can pertain? So, not only did LeDoux present a fascinating insight into how our emotions function in normal situations, but he also provided a new understanding of some of the emotional disorders. Since neuroscientists have been relatively slow to probe the biological basis for our sense of self, focusing instead on states of consciousness, his next book, *Synaptic Self: How Our Brains Become Who We Are*, (LeDoux, 2003) attempted to fill that gap.

In this book, despite the ongoing debate about the root cause(s) of psychological disorders, most people agree that the development of a healthy sense of Self is central to the distinction between normality and psychopathology. Starting with a description of a person's basic neural anatomy (including: how neurons communicate; the brain's embryological development; and some of the key neural pathways), LeDoux reviewed a mass of research and experiments, and concluded that the brain's synaptic connections provide the biological base for memory, which makes possible the sense of continuity and permanence fundamental to a normal conception of self: hence, the synaptic self. He came up with a theory: it's the neural pathways, the synaptic relationships in our brains that make us who we are. He also provided some insight into the shortcomings of psychopharmacology, and suggested new directions for research on the biology of mental illness.

Again, as we shall see, the basic assumption is that it is the brain that is key. Nevertheless, this work – and others like it – started the ball rolling in directions that we, as members of the field of body psychotherapy, probably want it to go in. LeDoux has, of course, written and edited several other books, the latest being a book on trauma and PTSD (Shiromani et al., 2009).

### Trauma work

In the field of trauma, one of the first clinicians who had done significant work in the First World War with shell-shocked soldiers (including Siegfried Sassoon and Wilfred Owens) was W.H.R. Rivers, at Craiglockhart Hospital in Edinburgh: interestingly, he had a fairly multi-disciplinary background, being an anthropologist, neurologist, ethnologist and psychiatrist. War trauma (and other severe trauma) has been known about since the time of Herodotus (who described a traumatized soldier at the Battle of Marathon in 490 BC), but Rivers brought it to modern attention and showed that it could be worked with: many soldiers, probably with PTSD, were shot in the First World War for alleged cowardice: *pour encourager les autres!*<sup>7</sup> A little clinical work was done post-WWII with Holocaust victims, but not much significant research work on severe trauma and PTSD happened until after the Vietnam War.

In a chapter in *Emotional Intelligence*, Goleman (1996) reports on findings from people who have suffered severe trauma: Holocaust victims, Vietnam War veterans, children involved in traumatic situations like school shootings or school bus kidnaps. The condition has now, relatively recently, been labelled as PTSD. There are a number of different symptoms associated with PTSD including hyper-vigilance, flashbacks, nightmares, panic attacks, etc. There is also a significant amount of evidence coming out of neuroscience (MRI scans, etc.) that show actual damage to the emotional circuitry in the limbic system of the mid-brain, particularly around the amygdala, but also including the *locus coeruleus* (a structure that regulates the production and secretion of the catecholamines, adrenaline, and noreadrenaline), the *thalamus* and *hypothalamus*, and the connections with the *pre-frontal neo cortex*. However, under the right conditions, this damage can also heal as the brain seems to have a degree of plasticity. And there are certain conditions that can facilitate (or prevent) healing: Goleman references Herman's (1992) three main stages to healing trauma and writes:

The first step, regaining a sense of safety, presumably translates to finding ways to calm the too fearful, too easily triggered emotional circuits enough to allow relearning. ... Another early step is to help patients regain some sense of control over what is happening to them, a direct unlearning of the lesson of helplessness that the trauma itself imparted. ...

Another step in healing involves retelling and reconstructing the story of the trauma in the harbor of that safety, allowing the emotional circuitry to acquire a new, more realistic understanding of and response to the traumatic memory and its triggers. As patients retell the horrific details of the trauma, the memory starts to be transformed, both in its emotional meaning and in its effects on the emotional brain. The pace of this retelling is delicate: ... (Goleman, 1996, pp. 210-211)

These findings have been replicated and reinforced by other neuroscientists (van der Kolk et al., 1996; Seigel, 2003) and by a number of clinicians (Rothschild, 2000; Ogden et al, 2006; Bremner, 2002). Ogden's book is excellent, and Bremner is good (especially in his 3<sup>rd</sup> chapter) on historical and current research in PTSD, but he becomes perhaps a little bit too polemic at other places in his book.

<sup>6</sup> As stated in Plato, Apology 38a: "ho de anaxetastos bios ou biotos anthrōpōi — ὁ δὲ ἀνεξέταστος βίος οὐ βιωτὸς ἀνθρώπῳ"

<sup>7</sup> This is a quote from Voltaire's 'Candide' with reference to the court-martial and execution of Admiral Byng after the Battle of Minorca: Voltaire wrote, "Dans ce pays-ci, il est bon de tuer de temps en temps un amiral pour encourager les autres." ("In this country, it is wise to kill an admiral from time to time to give courage to the others.")

Rothschild actually lists ten “foundations for safe trauma treatment”: creating a sense of safety; establishing a good therapeutic relationship; having the ability to slow down the process; identifying and building on the client’s internal resources; regarding defenses as resources, so that you don’t get rid of them, you create more choices; ... etc. (Rothschild, 2000, p. 98-99). However, what all of these seem to agree on is – in order for it to be absolutely necessary to overcome the fear conditioning associated with PTSD, is the formation of new neural pathways from the limbic system to the prefrontal lobes of the neo-cortex: i.e. emotional re-learning.

Left to itself, the traumatized limbic system, and in particular the amygdala, triggers the fear response again and again, which occurs every time something similar to, or vaguely reminiscent of, the original trauma happens, (and, also spontaneously, as in dreams/nightmares, perhaps in its own attempt to heal). In PTSD, there is no natural or spontaneous re-learning, as normally happens over time. Each re-triggering re-traumatizes and strengthens the fear pathways: this is the disorder. The level of traumatization can actually increase: the original phobia, possibly associated with a real traumatic incident, can get added to with a number of other associated phobias. There is, therefore, no emotional re-learning; and no healing of the trauma. This can only happen when a situation of safety and calm is created, and when the patient’s affect levels are kept well within normal bounds: what Ogden calls the “staying within the comfort zone.”

The re-telling of the trauma, which seems to be absolutely necessary to create an understanding of the affects and even an integration of the trauma into the greater scheme of things, has to be done by creating new neural pathways from the autonomic responses of the limbic system to the consciousness of the neo-cortex. Any re-triggering, or levels of increased affect, will cause too much distress and this flooding of emotion will block the person’s understanding and the process of integration. So, as one works with the traumatized person (let us de-role them from being a patient), the therapist needs to be highly aware of the emotional state (affect) of the client, on a precise moment-to-moment basis, and with a finely tuned awareness of body symptoms and emotional affect.

At any moment when the affect seems to rise too high so as to disturb the healing process, the therapist needs to have the client slow down the re-telling process, or take some time out from it with an aside or an integrative connection, or suggest that the person pauses and breathes for a moment, or really feels what’s happening within their body.

These body psychotherapeutic interventions not only calm the level of emotional reaction, and the associated affect, but also allow the neural connections from the emotional limbic system to (re)form toward the conscious cortex. The brain is surprisingly plastic in this way and emotional re-learning and the building of new neural connections and pathways can really happen. As this transpires over a number of sessions, over some time, the PTSD symptoms do diminish and become less frequent and the traumatized person can start to lead a more normal life, and integration seems to be able to happen then quite effectively.

So, to summarize, what seems to be clear is that the brain disturbance seen in PTSD patients – associated with disturbed behavior and concomitant somatic symptoms – will not, or cannot, often heal without proper therapeutic intervention; that the intervention has several pre-conditions; and that the intervention needs to be done in a particular way, and from a particular perspective – to conform with the deep understanding of the bodily processes. The key point is that the bodily symptoms are key, and the process is both a somatic and a cognitive one, **with the somatic one being paramount**. However, psychotherapy, done this way, can also be effective and long-lasting. There are, of course, some people who have been so badly traumatized and emotionally damaged that, whilst there can perhaps be some healing and improvement, it is also quite likely that significant levels of damage may remain - but then this is also true for severe physical damage.

So, in this respect, the scientific findings of neuroscience about the brain damage in people with trauma have been translated into effective clinical work, and, indeed, what is interesting is that a scientific expert, someone like Bessel van der Kolk, who has also investigated several different clinical methods of working with trauma, states clearly and forcefully, and not without controversy, that we cannot – we *absolutely* can not – do effective work in psychotherapy, (especially with people with trauma or PTSD) *without* significantly using a number of different body psychotherapy techniques, supported by body psychotherapy awareness and training. He goes on to say, somewhat idiosyncratically:

As long as people sit on their **tochas** and simply move their tongues around, they may not be able to make enough of a difference to affect internal sensations and motor actions. People need to learn to regulate their physical states in order to get their minds to work. Once they shift their physiological patterns, their thinking can change. (Sykes Wylie, 2004)

## Psychopathology

Oliver Sachs (1986, 1991, 1996), a well-known neurologist, had also begun to show us, in his compassionate case studies, that there were wonderful people with fascinating stories and amazing talents locked up inside some quite damaged minds.

The writings of V.S. Ramachandran (e.g. Ramachandran & Blakeslee, 1999) are interesting in this context as well. Ramachandran is one of the world's leading brain researchers. He is professor and director of The Center for Brain and Cognition, University of California, San Diego and adjunct professor at the Salk Institute, La Jolla.

(He) has seen countless patients suffering from anosognosia, phantom limb pain, blindsight and other disorders, and he brings a remarkable mixture of clinical intuition and research savvy to bear on their problems. He is one of the few scientists who are able and willing to explore the personal, subjective ramifications of his work; he rehumanizes an often too-sterile field and captures the spirit of wonder so essential for true discovery.<sup>8</sup>

Another author who investigates malfunctions in brain chemistry and especially the relationship between these and brain functioning, structure and behavior is Scott Kraly, in his book, *The Unwell Brain* (Kraly, 2009). This well-written book gives a balanced account of the pros and cons of treating mental illness with an integration of psychopharmacology and psychotherapy. However, it has to be mentioned especially here, that there are also many, many studies – and much empirical evidence – of how some people with mental illness can be treated successfully without the use of any pharmacology at all (Podvoll, 1991 & 2003; Mosher, 1999).

Peter Manu's book (2004) entitled *The Psychopathology of Functional Somatic Symptoms* examines the link between mental illness and physical syndromes that lack organic disease explanations. It states that it "*examines the best research work of the past 20 years to determine the association between psychopathology and functional illness*", but this book is not all that it could be or should be, at least according to one reviewer.<sup>9</sup> If this comment is accurate, then this book is a classic example of bad science.<sup>10</sup>

There have been many other studies into the psychopathology of certain conditions, and I have chosen not to delve further into this (more specialist) field, in this general, introductory article. But it should be noted that the mind-body unity that we, as body psychotherapists, hold central to our professional work has a gradually increasing number of advocates: maybe some of those psychiatrists, doctors, psychologists or scientists in white coats aren't too bad!

## Emotional Intelligence

Goleman's revolutionary book (1996), mentioned already above, covers a whole mass of other findings and research studies, told in an easily readable and instructive way. It seems that emotional intelligence is a much better predictor of success in life than IQ. He is particularly strong on what works (better) in healthcare and healing – e.g. a degree of compassion; that children who display empathy at an early age do better than those who don't; – and also he explores the roots of empathy and the studies that support his developing argument. He delves into the neurological bases of anger management, rage, toxic thinking, and the ability to calm distressing emotions in others: one told in a charming story that really sticks in the memory about how (not) to use Aikido.

He also holds, as does Stern (1987) and others, the concept that the formation of a good mother-baby attachment bond is crucial to the development of a child's emotional intelligence. He discusses the neurobiology of excellence, which could revolutionize school practices, if it were applied. He examines studies on depression that show that helping to cut the automatic pattern of rumination (which doesn't result in action), breaking isolation, scheduling in distractions, exercise, and several other strategies are extremely effective in helping to lift people out of depression for a variety of biological and emotional reasons, (and he gives indications of the research and the scientific basis behinds these strategies), and these are not all cognitive strategies as many of them tap into the emotional body and the field of neuro-psycho-biology. He is strong in suggesting the outlines for possible strategies for prevention, rather than cure, and also what makes an effective treatment. It is a well-researched and delightful scientific study that should be fairly central on any body psychotherapy training school's reading list.

## Affective Neuroscience

Jaak Panksepp (1998) is a distinguished research professor emeritus of psychobiology, and adjunct professor of psychiatry. He is a scientist, not a clinician – and he has developed a number of insights from his studies into: the neural basis of emotions; displeasure and fear systems; the sources of anger and rage; the neural control of sexuality; maternal care; social loss; social-bonding and play mechanisms in the brain, and how these can relate to childhood disorders, such as ADHD; that can significantly influence clinical work with children and adults, with sleep and arousal issues, separation, loss and grief issues, social bonding difficulties, and with sexuality. We are extremely fortunate that he, himself, has decided to make the bridge between his scientific and laboratory work and our clinical world. His work is also not without critics. He writes:

I have tried to steer a middle course between the various polar views that presently characterize different schools of psychology. My attempt at a synthesis is bound to receive some criticism from colleagues who have strong antireductionist biases, for many do not feel comfortable trying to explain complex psychological phenomena in neurological terms. My approach may also go against the grain of a long-standing tradition in

<sup>8</sup> Review by Rob Lightner: retrieved on 21/07/09 from Amazon.com: [http://www.amazon.co.uk/Phantoms-Brain-Human-Nature-Architecture/dp/1857028953/ref=sr\\_1\\_1?ie=UTF8&s=books&qid=1248247426&sr=8-1](http://www.amazon.co.uk/Phantoms-Brain-Human-Nature-Architecture/dp/1857028953/ref=sr_1_1?ie=UTF8&s=books&qid=1248247426&sr=8-1)

<sup>9</sup> John Sayer: <http://www.sayer.abel.co.uk/MES-Nmanu.html>

<sup>10</sup> See Goldacre, B. (2008). *Bad Science*. London: HarperCollins 4<sup>th</sup> Estate.



behavioural neuroscience, which mandates that we should not talk about processes that we cannot see with our eyes. (Panksepp, 1998, p. x)

I am not going to attempt to summarize the 450 pages of his book: the author index alone runs into 16 pages, each with three columns. Let me just say that, as body psychotherapists, we would be totally foolish to ignore such a massive and significant piece of work, or leave it out of the essential reading list for any trainees. In a conference presentation,<sup>11</sup> Panksepp (2004) explored his fundamental position:

A guiding premise of the affective neuroscience approach is that various emotional feelings and other affective states reflect primitive states of consciousness that emerge substantially from the neurodynamics of brain circuits that control instinctual emotional behaviours in animal brains. (p. 14)

Another neuroscientist and presenter at that conference, Mark Solms, wrote:

My aim here is briefly to summarize the emotional affect aspects of various neuropsychological equations that can lead to psychiatric disturbances. ... It is often a relief for clients to learn that they have fundamental affect generating and mood regulating systems in the brain that can be overwhelmed. By blending the neuroscientific affective and psychological cognitive knowledge, we can achieve a more robust understanding than by either alone, leading to blended disciplines such as the robust emerging synthesis known as neuropsychoanalysis. (Solms & Turnbull, 2002; p.16-17)

One different aspect of affect has been summarized by Teresa Brennan (2004) in *The Transmission of Affect*. Her theory is based on the premise that there is constant communication between individuals and their physical and social environments, and that we are sensitive to atmospheres, energies and others' emotional states. Whilst this is somewhat more in the realms of belief than pure science, some effects of this are being studied scientifically.

This nicely leads me into my next topic: the psychoanalysts (or, at least, some of them) seem to be beginning to integrate neuroscience and psychoanalysis better than some of us body psychotherapists. They also seem to be walking around on this diamond beach picking up precious stones for themselves. Cognitive neuroscientists (neuropsychologists and behavioral neurologists) are doing the same thing on a different part of the beach.

Other writers (Fonagy et al., 2002) attempt to develop these sorts of findings into a more scientifically-based sense of self – to a limited degree of success. This book is perhaps a little too obtuse and psychoanalytically-oriented, but they do promote:

... a comprehensive theory for the way in which the abilities to mentalize (make and use mental representations of your own and other people's emotional states) and affect regulate (control one's own emotions as is appropriate to environment) can determine a person's successful development.<sup>12</sup>

## Neuroscience and psychoanalysis

Mark Solms (Solms & Turnbull, 2002; Kaplan-Solms & Solms, 2000) is a leading force in the development of links between psychoanalysis and neuroscience. He is both a doctor (neurosurgeon) and a psychoanalyst, so also bridges the two fields, and has written many books and articles on how these two disciplines can be integrated. Psychoanalysis rests largely on the clinical method: the methods of neuroscience are more scientific. Yet there is a method, which started to combine the two: the method of clinico-anatomical correlation, which involves making clinical observations about mental changes in a patient, following from disease or damage to a particular part of their brain. The clinical observations of how the patient's mind changed are correlated with anatomical observations with the site of the lesion in the brain. This correlation teaches us something about what the mental functions were of the part of the brain now damaged.

Although this method of study has now been supplemented by many other methods, Broca & later Wernicke formally introduced it into early neuroscience in the 1860s & 1870s, with their neurological studies on aphasia. Charcot also championed it in his studies on hysteria and neurasthenia, which influenced Freud. Pierre Janet, the first real body psychotherapist, also studied with Charcot (Boadella, 1997; Young, 2009). One of the bases of Freud's early psychoanalysis was that:

... every mental process must **somehow** be represented as a physiological process that occurs in the tissues of the brain, but he also held to the view that it was an error to localize complex mental faculties within circumscribed neurological "centres." The reasoning behind this point of view was that mental processes are complex **dynamic** entities, which therefore cannot be correlated isomorphically as static centres with the

<sup>11</sup> UKCP Professional Conference 2004, 'About A Body', Robinson College, Cambridge, (see also Corrigan et al., 2003).

<sup>12</sup> Review by Ed Tronick, World of Books: <http://world-of-books.com/?id=EDHi3N-eykC>: downloaded 14/9/10.

individual structures of cerebral anatomy. He concluded, therefore, that it would not be possible to understand mental phenomena in neurological terms until (1) their dynamic psychological substructure had been laid bare and (2) until neuroscience was capable of identifying the physical correlates of such **complex dynamic** entities. Freud himself then devoted his scientific energies to the former (purely psychological) task and deferred the latter, correlative (neuropsychological) task to future investigators – anticipating future methodological advances. (Kaplan-Solms & Solms, 2000, p. 60)

It is perhaps a pity that Freud did not follow this latter pathway up with Reich's work, and so we have had to wait 100 years or so. One of the fundamental problems was that the scientific information that Freud and others had to work with was very limited. Until the relatively recent developments in brain scans, there was no hard data on the physiological side: and that limited their – and everyone's – way of thinking about research. However, from a quite self-referential and even promotional perspective:

Neuropsychology has begun in very recent years to grapple with something that it previously excluded: the problems of personality, complex emotions and motivation. This provides a unique opportunity for psychoanalysis to build a bridge to neuroscience, because psychoanalysis has a highly elaborated theory about these very aspects of mental life, which neuroscience is now starting to grapple with. I believe that psychoanalytic theories might be of particular help to neuroscientists who are beginning to tackle these problems of human subjectivity. I align myself in this respect with the most recent winner of the Nobel Prize in Medicine, Eric Kandel, who stated in an article entitled "A new intellectual framework for psychiatry" that this is the future of cognitive neuroscience. In order to grapple with this aspect of mental life, cognitive neuroscientists need to make a bridge to psychoanalysis, which still offers, in Kandel's words, "the most coherent and intellectually satisfying view" of personality, motivation and complex emotion (p. 105). There are enormous advantages both for neuroscience and psychoanalysis. If we can find links between our psychoanalytically derived concepts on how the mind works and the concepts of neuroscience, then we can open our theory to an entirely new range of methodological possibilities, for testing hypotheses that we had previously been content only to generate. The psychoanalytic method is very useful for generating hypotheses about how the mind works and for making inferences, but psychoanalysts have historically not been very good at testing their hypotheses. There is a limit beyond which the psychoanalytical method cannot go. By making links to the neurosciences, we create the possibility of testing some of our hypotheses in ways that might make it possible to move forward in what Freud called our metapsychology, our general theory of how the mind works. (Solms, 2002)

Another very respected neurobiologist, professor, and clinician, Eric Kandel (2005) has edited a good collection of essays that cover: the mechanisms of psychotherapy and medications, showing that both work at the same level of neural circuits and synapses, and the implications of neurobiological research for psychotherapy; the ability to detect functional changes in the brain after psychotherapy, which enables us, for the first time, to objectively evaluate the effects of psychotherapy on individual patients; the need for animal models of mental disorders (for example, learned fear) to show how molecules and cellular mechanisms for learning and memory can be combined in various ways to produce a range of adaptive and maladaptive behaviors; the unification of behavioral psychology, cognitive psychology, neuroscience, and molecular biology into the new science of the mind, charted in two seminal reports; the critical role of synapses and synaptic strength in both short- and long-term learning; and the biological and social implications of the mapping of the human genome for medicine in general and for psychiatry and mental health in particular.

From the other direction, as a psychoanalyst, the ultimate goal of the cognitive sciences is to understand how the brain works - how it turns matter into imagination. In a classic book, *Imagination and the Meaningful Brain*, Arnold Modell (2003) claims that subjective human experience must be included in any scientific explanation of how the mind works. His view, supported by people such as Jan Panksepp, Walter Freeman and Mark Solms, is that the construction of meaning is not the same as information processing.

The intrapsychic complexities of human psychology, as observed through introspection and empathic knowledge of other minds, must be added to the third-person perspective of cognitive psychology and neuroscience. ... (He) emphasizes evolutionary continuities and discontinuities of emotion. The limbic system, the emotional brain, is of ancient origin, but only humans have the capacity for generative imagination. By means of metaphor, we are able to interpret, displace, and transform our feelings. ... (He also) draws on a variety of disciplines, including psychoanalysis, cognitive psychology, neurobiology, evolutionary biology, linguistics, philosophy of language, and philosophy of mind.<sup>13</sup>

<sup>13</sup> Extract from the "Product Description": downloaded 17/09/10 [http://www.amazon.co.uk/Imagination-Meaningful-Brain-Bradford-Books/dp/0262633434/ref=sr\\_1\\_3?ie=UTF8&s=books&qid=1284763944&sr=8-3](http://www.amazon.co.uk/Imagination-Meaningful-Brain-Bradford-Books/dp/0262633434/ref=sr_1_3?ie=UTF8&s=books&qid=1284763944&sr=8-3)

However fascinating the studies in Depth Neuropsychology or Neuropsychoanalysis may be, one difficulty for many body psychotherapists is that the fundamental mind-body split is still very apparent, as these authors tend to consider what is happening in the brain ; the other difficulty is that, since they often root themselves totally within the perspective of psychoanalysis, to be of any use therefore to other psychotherapists, another degree of translation has to happen. Still, it is sometimes worthwhile to do this and one can glean something from these parallel fields.

## Science is Changing

The paradigms of modern science are changing. Whilst much of neuroscience is within traditional science, new science is causing people to think very differently about how we think, how we view the world, and what are we really seeing. Books like Michael Talbot's (1996) *The Holographic Universe*, and the work of Stephen Hawking, Richard Feynman and others are introducing radical new ways of envisioning the universe and the world we live in.

Kelly et al. (2006) try to go beyond the reductive materialism that pervades much of modern psychological science and examine phenomena that are otherwise inexplicable or unable to be accounted for.<sup>14</sup> They base themselves on the perspective of F.W.H. Myers (founder of the Society for Psychical Research) and William James and their filter theory of mind/brain relationships, modifying A.N. Whitehead's "process philosophy." It is a good analysis of many of the problems of traditional science, but they haven't found an authentic solution – yet!

The Nobel prize nominee, Ervin Lazlo (2008), takes this whole area one step further and sees the world as being in a macro-shift: in that the reality we are experiencing today is substantively a new reality. So he tries to give us a map to view phenomena such as multiple universes, sub-atomic micro levels and the interconnectedness of all things. There are many other examples of the new forms of science, but most of these take us much too far away from the topic of this article.

## Neuroplasticity

Then comes the much more relevant concept of plasticity – that maybe, just maybe, people damaged by trauma or even physiologically damaged, can actually develop new structures and pathways in the brain – and that, once we left childhood and adolescence, our brain structures were not set in stone, but remained relatively plastic, and ways around, even quite significant areas of damage, could eventually be found; that re-learning and healing could perhaps really happen. This would give us a scientific foundation for what we already know as clinicians: fundamental change can actually happen.

In the classic book, *The Neuroscience of Psychotherapy*, by Louis Cozolino (2003), another scientist demonstrates how "linkages between the theoretical domains of the self and the social brain can deepen our understanding of various psychopathologies, including trauma and severe personality disorders." As a clinician, a professor of psychotherapy and neuropsychology, he has done for mainstream psychotherapy (psychodynamic, cognitive & behavioral), rather what I am attempting to do in a very small way in this article, but for body psychotherapy. But, he again falls into the mind-body separation a little bit:

The power of psychotherapy to change the brain rests in its ability to recognize and alter unintegrated or dysregulated neural networks. ... As knowledge of neural plasticity increases, so will our ability to impact and alter the brain. The possibility exists that sensitive periods can be reinstated in the context of psychotherapy, and that stress can be used in a controlled manner to reedit emotional memories. Although the practical applications of these principles to humans remains on the distant horizon, the possibilities of psychotherapy's involvement in brain sculpting are obvious. It is not too much of a stretch to say that psychotherapists are already enhancing plasticity without the help of genetic manipulation or chemical interventions. (Cozolino, 2003, p. 320)

He therefore argues that the brain is an organ of adaptation, built by interpersonal experiences and capable of change during one's life, which encourages us to consider the activity of the brain when attempting to understand others and indeed our selves; he demonstrates cases where a two-pronged therapy really makes sense and emphasizes how psychotherapy works, and how the brain works, and the dynamic relationship between the two. However great this book is, or whatever its limitations are, the 34 pages of references make up for a lot for the lack of recognition of what also is happening in the body.

Brain development has traditionally focused on early childhood. Recently, we have learned that the brain continues to develop throughout adulthood. Cozolino (2008) has also written a neuro-scientifically based account of how our brains age and change over time, in which he explains the social brain over time, emphasizing neural plasticity and growth, and giving some skills and strategies for maintaining and enhancing a healthy brain throughout our lives.

So, the brain is no longer being viewed as a machine that is hard-wired early in life, unable to adapt and destined to wear out with age. Instead, we learn that scientists are beginning to unlock the secrets of the powerful, lifelong adaptability - or

<sup>14</sup> There is a good review of this book by Ulrich Morhoff in *AntiMatters*, 2007, Vol 1, No 1, pp. 161-191: downloadable (16/09/10) from: [http://anti-matters.org/ojs/index.php?journal=am&page=article&op=view&path\[\]=12&path\[\]=12](http://anti-matters.org/ojs/index.php?journal=am&page=article&op=view&path[]=12&path[]=12)

plasticity - of the brain. The implications are enormous for treating neurological conditions, for addressing the aging process, and for dramatic improvements in human performance (Doidge, 2008).

Sharon Begley (2008) takes this one step further and even engages in a dialogue with the Dalai Lama. The issue under discussion was whether we can truly change or not; i.e. by changing your thoughts (belief system), can you make a lasting and fundamental change to your brain, your body, and your being? Neuro-plasticity supports the view that that this is possible. Begley isn't a neuroscientist, but she is the author of a science column for the *Wall Street Journal* and *Newsweek*, and as such, her science awareness, along with her Buddhist sympathies, provides useful support for the *raison d'être* of psychotherapy: long-lasting change. Tim Dunne, in a recent article, writes:

Another key finding to emerge from the research on the brain is the idea of “neural plasticity”. It used to be thought (and I was certainly taught this in my psychology training course back in the 1970s) that there were a finite number of neurons that we were given at birth, and that was it. From all the CT scans, SPECT analyses, fMRI scans, EEGs and PET scans, we now know that the brain is constantly adapting to new information, threats, challenges, excitement and feelings, and that new neural networks are created with each experience. (Dunne, 2009)

Another neuroscientist and colleague of Ramachandran, Blakeslee (2007) also explores neuro-plasticity in relation to the concept of body maps, which is very close to some body psychotherapy work:

... your many body maps represent all aspects of your bodily self, inside and out. In concert, they create your physical and emotional awareness and your sense of being a whole, feeling self in a larger social world. Moreover, your body maps are profoundly elastic. Your self doesn't begin and end with your physical body but extends into the space around you. This space morphs every time you put on or take off clothes, ride a bike, or wield a tool. When you drive a car, your personal body space grows to envelop it. ... The story of body maps goes even further, providing a fresh look at the causes of anorexia, bulimia, obsessive plastic surgery, and the notorious golfer's curse “the yips.” It lends insights into culture, language, music, parenting, emotions, chronic pain, and more.

## The Molecules of Emotion

As a contrast to the above, the work of Candace Pert (1997), almost totally incorporated in the one book with the above title, tends to be a little more inspirational to body psychotherapists. In an extremely personal account, Pert, a pure neuroscientist with impeccable credentials, discovered the opiate receptor, which led to the discovery of the natural substance in the body that uses that receptor, endorphin. A receptor is the part of the cell that recognizes and binds with a particular chemical neurotransmitter. Besides discovering the various receptors, there was a big debate as to whether there are receptors in cells in various parts of the body, as well as the brain, and vice versa, for all the variety of hormones and neurotransmitters.

There are a whole variety of hormones and neurotransmitters, formed from combinations of various proteins or polypeptides, made up of various combinations of the 20 different basic amino acids. These peptides are put together in particular pairs and chains and have many functions throughout the body. The peptides that interest us here are the neuropeptides: “*small protein-like molecules used by neurons to communicate with each other*” and they “*influence the activity of the brain in specific ways and are thus involved in particular brain functions, like analgesia, reward, food intake, learning and memory.*”<sup>15</sup> Some of the commonly known ones are: adrenaline, noradrenaline (norepinephrine), endorphin (enkephalin), oxytocin, insulin, prolactin, vasopressin, gastrin, etc.<sup>16</sup>

The significance of the work on neuropeptides, particularly for psychotherapists, is that this aspect of neuroscience includes – not just the activity in the brain, composed mainly of synaptic connections – but activity throughout the whole body. Pert was the first to really point this out.

Miles (Herkenham) has estimated that, counter to the collective wisdom of the neuropharmacologists and neuroscientists, less than 2 percent of neuronal communication actually occurs at the synapse. It was so radical an idea that for several years his observation of the mismatches was ignored and attributed to artifacts of the mapping techniques. In fact, the way in which peptides circulate through the body, finding their target receptors in regions far more distant than had ever previously been thought possible, made the brain communication system resemble the endocrine system, whose hormones can travel the length and breadth of our bodies. The brain is like a bag of hormones! Our view of the brain, and the metaphors we used to describe it, were permanently altered. ...

Frances Schmitt ... introduced the terminology of “information substances” to describe a variety of transmitters, peptides, hormones, factors, and protein ligands. Alongside the conventional model of synaptic

<sup>15</sup> Wikipedia: Neuropeptides (<http://en.wikipedia.org/wiki/Neuropeptides>, accessed 20/07/09)

<sup>16</sup> For more technical information on peptides, see: [www.neuropeptides.nl/tabel\\_neuropeptides\\_linked.htm](http://www.neuropeptides.nl/tabel_neuropeptides_linked.htm)

neuronal circuitry, Schmitt proposed a parasynaptic, or secondary parallel system, where chemical information substances travel the extracellular fluids circulating throughout the body to reach their specific target-cell receptors. ...

Neuropeptides could be found not only in the rows of nerve ganglia on either side of the spine, but in the end organs themselves. ... If we accept the idea that peptides and other informational substances are the biochemicals of emotion, their distribution in the body's nerves has all kinds of significance, which Sigmund Freud, were he alive today, would gleefully point out as the molecular confirmation of his theories. The body is the unconscious mind! Repressed traumas caused by overwhelming emotion can be stored in a body part, thereafter affecting our ability to feel that part or even move it. The new work suggests there are almost infinite pathways for the conscious mind to access – and modify – the unconscious mind and the body, and also provides an explanation for a number of phenomena that the emotional theorists have been considering. (Pert, 1979, p. 139-141)

She continues to describe hot spots or nodal points : a variety of locations where there are high concentrations of peptide receptors and these are locations where information from any of the five senses enters the nervous system.

Emotions and bodily sensations are thus intricately intertwined, in a bidirectional network in which each can alter the other. Usually this process takes place at an unconscious level, but it can also surface into consciousness under certain conditions, or be brought into consciousness by intention. (Ibid, p. 142)

This is a cue for us, body psychotherapists, if we care to take up the challenge. We are constantly dealing with emotions that we claim are present in the body ; we now have scientific evidence that this is an actuality. Emotions are not just the result of processes of the limbic system in the brain: they are chemically and neurologically embodied.

## **Oxytocin and Touch**

Another very reputable neuroscientist, Kerstin Unvas-Moberg, describes the work that she has done in her laboratories, and with animals, with one of these neuropeptides, the hormone oxytocin (2003) on which she is the world authority and she has published over 400 papers. Oxytocin is a powerful hormone involved in bonding, sex, breast-feeding, and childbirth, as well as in relaxation and feelings of calm and love: it is not exclusive to females, though there are some strong connections to the production of estrogen, just as the hormone vasopressin is linked to testosterone, but is also found in females. To an extent, oxytocin is the mirror-image of adrenaline: it calms rather than triggers the fight or flight stress response. Moberg explores the potentially beneficial applications of oxytocin and how to trigger the natural production of this hormone (without having to have a baby), so as to reduce anxiety states, stress and addictions: would you believe that this can be done by a simple type of touch, especially to the ventral area of the body?

And is this not particularly relevant to our work as body psychotherapists? Thankfully, Kerstin Moberg, like several other neuroscientists mentioned here, is really interested in the practical and clinical application of her work, and has come to a couple of body psychotherapy conferences, where she was a delightful and very welcomed speaker.

One of the foremost scientific authorities on touch is Tiffany Field, director of the Touch Research Institutes at: the University of Paris; Philippines Medical Center; UCLA and the University of Miami School of Medicine. Up to 2003, they had conducted 93 separate studies on touch and touch therapies. Her relatively small book, *Touch*, has five chapters describing “recent research on the value of touch therapies for everyone, from asthmatics to autistic children, from cancer patients to those with eating disorder.” (Field, 2003, p. x)

Given the phobic reaction towards professional touch, or indeed almost any touch, that seems to exist in the Western world (and particularly in America), it is a remarkable body of research and should be included as compulsory reading in any body psychotherapy training course. I look forward to the next volume as the research continues and can only hope that it starts to involve body psychotherapy, as well as body therapies: that would be quite something! However important this area is, we have veered slightly away from neuroscience, though Field's book is loaded with very scientific research studies.

## **Infant Development**

One of Field's collaborators in the Touch Research Institutes was Ed Tronick, a developmental and clinical psychologist, an associate professor of Pediatrics at Harvard Medical School and chief of the Child Developmental Unit at the Boston Children's Hospital:

[who is] recognized internationally for his work on the neurobehavioral and social emotional development of infants and young children, parenting in the U.S. and other cultures, and infant-parent mental health. Over the course of his career, Dr. Tronick has co-authored and authored more than 150 scientific papers and chapters. [He] developed the Still-face paradigm, which has become a standard experimental paradigm for studying social emotional development in the fields of pediatrics, psychiatry, clinical and child psychology, and nursing.

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He focuses “*on the nature of how people live in the world and how they change both themselves and their relation to the world over moments, hours, days and years.*” (Tronick, 2007, p. 1) Tronick’s main book on emotional development in infants is another standard text, I hope, and follows on from the classic earlier research on separation and attachment by Bowlby (1997, 1998 & 1998) on maternal deprivation.

John Bowlby was a British psychiatrist and psychoanalyst, notable for his interest in child development and for his pioneering work in attachment theory. His original publications on maternal deprivation date back to the 1950s; especially the damaging effects on the separation of mother and child (particularly in-hospital) emphasized that children’s experiences of interpersonal relationships were crucial to their psychological development. This was reinforced by the classic animal laboratory work done in the 1960s with primates on maternal deprivation by Hinde and Harlow & Harlow. Yet, children are still separated from their parents, and we, as therapists, then have to cope with the psychological disturbances that result. These people are often our clients.

Daniel Stern (1985) described, in very coherent and meaningful ways, the subjective world of the infant, yet called his book *The Interpersonal World of the Infant*, as he recognized that the two-person interaction between the caretaker and the infant creates a matrix which nurtures the inner world and psychological development of the infant. Stern’s conclusions shatter some of the misconceptions of early developmental theory based on the psychoanalysis of adults and adult behavior, but he still does not go quite far enough for body psychotherapists.

Another neuroscientist of interest in this field is Feinberg (2009), who asks what dementia, delusions and other neurological disorders can teach us, and about how the brain creates personal identity and a unified sense of self.

Sue Gerhardt (2004), not a neuroscientist but a psychotherapist, has also written an important book, based on a synthesis of neuro-scientific findings, *Why Love Matters: How affection shapes a baby’s brain*. One reviewer writes, “*The author trades in the hard currency of neuroscience when describing how different kinds of parenting affect brain chemistry.*”

Gerhardt admirably describes the development of the social brain in the first years of life, that part which learns how to manage feelings, our immune response, and our neurotransmitter systems, as well as the development of a person’s stress response, all of which affect our future emotional life. All of this is as much physiological as emotional. The second half of the book looks at the particular conditions such as anorexia, psychosomatic illnesses, addictions, antisocial behaviors, personality disorders and depression: all from the perspective of how poor parenting can affect our brain development. She nicely links many of the people already mentioned in this article, as well as some effective body-oriented perspectives, and concludes, in the Introduction:

Ironically, what has now been discovered by these scientific processes is that “feelings come first” as the poet e.e. cummings puts it, and that our rationality, which science from its inception prized so highly, is built on emotion and cannot exist without it. It is increasingly being recognized that cognitions depend on emotions, as Damasio has argued. As he points out, the rational part of the brain does not work on its own, but only at the same time as the basic regulatory and emotional parts of the brain ... The higher parts of the cortex cannot operate independently of the more primitive gut responses. Cognitive processes elaborate emotional processes, but could not exist without them. The brain constructs representations of internal bodily states, links them to other stored representations, and then signals back to the body in a process of internal feedback, which may then trigger off further bodily feelings in a cyclical process. (Gerhardt, 2004, pp. 5-6)

Ed Tronick has a fairly radical clinical perspective, has brought a lot of this research up-to-date, and has expanded on it. He explores infant neuro-behavior; the effects of culture; infant social-emotional reactions; natural and experimental perturbations; and the expansion of consciousness and meaning-making through dyadic infant-adult interactions; the infant capacity to self-regulate and self-organize; and the effects of disturbed interactions. Whilst being very scientific, his mutual recognition model (MRM):

... sees humans as complex systems, as hierarchical multileveled psychobiological systems that constantly work to gain energy and meaningful information to make sense of their place in the world. This sense-of-oneself in the world equals the totality of meanings, purposes, intentions and biological goals operating in every moment on every component and process at every level of the system from molecules to awareness. ... This totality of meanings can be characterized as a psychobiological state of consciousness. (Tronick, 2007, p. 2)

<sup>17</sup> Retrieved on 21/07/09 from: [www.childrenshospital.org/cfapps/research/data\\_admin/Site440/mainpageS440P0.html](http://www.childrenshospital.org/cfapps/research/data_admin/Site440/mainpageS440P0.html)

Tronick was one of the researchers who have explored the emotional capacities of infants and was able to show that babies can be remarkably pro-active in one-to-one communication and that they can also be profoundly affected by their parents' emotional states and behavior. He has filmed moment-by-moment interactions between depressed mothers and their babies for years and came to see depression as a communicable disease, transferred in a vicious cycle by a mother's communication to her baby and then back from the baby to the mother. To be able to see this, using split screen films, is truly eye-opening, especially for pediatricians and other clinicians.

Another researcher who collaborates with Ed Tronick, although he is also a clinician and has been (is) a body psychotherapist, is George Downing, who is involved in various research projects in mother and baby mental health units in Salpêtrière Hospital, Paris and the University of Heidelberg (Downing, 2008; Downing et al, 2008). He has also presented his work at several body psychotherapy conferences<sup>18</sup>, using split-screen video work, often slowed down, which he uses clinically with disturbed or disadvantaged mothers to demonstrate their affect motor schemas and disturbances, so that the mothers can start to correct these and form better contact with their children. It is fascinating to see this and is obviously very valuable preventative work.

The psychotherapy profession's attention to affect is becoming increasingly popular, though Downing says he now prefers to use the phrase "baby micro-practices" as he claims the baby develops these from birth in conjunction with its caregivers. There is a lot of material now about how important affect exchange is in the first year of life (Stern, 1987; Beebe & Lachman, 2002, and others). Beebe states that this is the "*origin of relatedness and patterns of nonverbal communication that continue to operate in similar form across the life span.*" But, in the 2<sup>nd</sup> year of life, something different happens (or should happen) and Ed Tronick claims to have worked much of this out.

An important new focus appears – if there has been sufficient back-and-forth, emotional affect exchange. If there hasn't, the child has already built-up strategic ways (body micro-practices) to defend itself from the lack of contact. The new developing focus is joint attention, where the baby wants the mother to respond to something it is holding or doing, so as to give the baby cues as to whether it is nice or nasty. This is the beginning of the child's interaction with the outside world, as mediated through the mother's attention and response. Joint attention leads to new developmental pathways, a capacity for action, the capacity to retain attention, and experiment, and the ability to create an action plan: this is often referred to as executive ability and it is linked to the baby's sense of itself in time.

This 2nd pathway is practical cooperation [and] collaboration. It is interpersonal, involv[ing] a minimum of two people, and involves coordinating [activities together] to complete a task. It is fascinating to see how infants vary in building this capacity to collaborate. It does not necessarily include or exclude emotional exchange .... Collaboration is accomplished independently of emotional competence. It can be done well by infants with an avoidant attachment style (with their physiological indicators sky high). ...

If the child does not receive support to build up collaborative ability, it will have serious consequences. At age 4, 5 & 6 the child will have trouble with [their] peers. He will be at risk for lots of trouble in school [over] tasks involving cooperation. If you look at what builds up in dyads [in] the 2<sup>nd</sup> year, you see that it is important for learning [how] to deal with anger, conflict, etc. One of the causes of these difficulties may be [a] lack of [neurological & experiential] channels of collaboration.<sup>19</sup>

This area of research is obviously not only crucial for treatment of the client, who may be having severe relationship or employment difficulties, but also for the nature and dynamic of the therapeutic relationship. Exploration of what is missing in the early dyad will begin to remedy both the individual's skills as well as exploring this in the context of the dyadic therapeutic relationship.

This work leads us directly into the next main area of neuroscience and research that can impact significantly on the field of body psychotherapy.

## Affect Regulation

The work of Allan Schore, and his 3 volumes on affect, affect regulation and dysfunctions, and human development, are massive and seminal (Schore, 1999; 2003a; 2003b). He is a clinician and eminent theoretical researcher and, as such, has ventured into, and impacted a number of fields: developmental psychology, psychopathology, psychiatry, neuroscience, psychoanalysis – and also body psychotherapy as he presented at the 2004 International Biosynthesis conference in Lisbon; it

<sup>18</sup> EABP Conference 2007, Askov, Denmark; EABP & ISC Conference 2009, Paris.

<sup>19</sup> Taken from notes by Jacqueline Carleton, on the George Downing's plenary presentation: *The Development of the Infant*, at the 2008 EABP Paris Conference: *Body Awareness – Where Body Psychotherapy, Neuroscience and Traditional Healing Meet*, reported in EABP 2009 Summer Newsletter: accessible <http://www.eabp.org/pdf/summer2009.pdf> : accessed 22/07/09.

is a pity there is nothing published coming out of that conference, as the 3 volumes and numerous published papers are somewhat overwhelming.

The second and third volumes definitively show the breadth of his theoretical models and the practical import of his findings. If we take these at face value, we should all be involved in *“early prevention programmes that address infant care in the prenatal and postnatal periods – the periods in which the human brain exhibits the greatest degree of plasticity.”*<sup>20</sup> However, there is still a lot to learn from his work when working with adults. Perhaps more than anyone yet mentioned, Schore emphasizes the psycho-neuro-biological perspective: a technical way of saying the emotional mind-body perspective. What is of particular interest to body psychotherapists is that he states:

The current intense interest on affect in psychoanalysis and the related sciences emphasizes the critical role of somatic, bodily-based activities in adaptive self-functions during all stages of development. In an important article, Lieberman wrote that current models of development are almost exclusively focusing on cognition. She stated, “The baby’s body, with its pleasures and struggles, has largely been missing from this picture.”<sup>21</sup> Once again, information about the development and dynamic operations of the right hemisphere is critical to a deeper understanding of the evolution of the organismic substrate of the corporal/social/emotional self.

This hemisphere is pre-eminently concerned with the analysis of direct information received from the body. Somatosensory processing and the representation of visceral and somatic states, body sense, and painful sensation are all under primary control of the “non-dominant” hemisphere. Neuroimaging research reveals that two other bodily-based drives of intense interest to Freud, sex and aggression, are also under right hemispheric control. Other studies on conversion seizures and conversion hysteria (hysterical paralysis), an area of great interest to Freud, implicate right hemisphere structures in what are now termed somatization disorders. Right hemispheric operations are thus centrally involved in allowing the individual to emotionally react to and understand bodily stimuli, to identify a corporeal image of self and its relation to the environment, and to distinguish self from nonself.

...

These neurobiological data on affective structure-function relationships have implications for clinical psychoanalysis. In treatment models, affects, including unconscious affects, are both the centre of empathic communication” and the “primary data” and “the regulation of conscious and unconscious feelings is placed in the centre of the clinical stage”. In this work, as Sander stated, “It is not the past we seek but the logic of the patient’s own state regulating strategies. ... Current psychobiological studies indicate that affects are not merely by-products of cognition – they have unique temporal and physiological characteristics that, more than thoughts, define our internal experience of self. ... Furthermore, neurobiological studies demonstrate the involvement of the right hemisphere in “implicit learning”<sup>26</sup> and “nonverbal processes”. ... According to Emde, the therapeutic context mobilizes in the patient a biologically prepared positive developmental thrust. The findings that the prefrontal limbic cortex, more than any part of the cerebral cortex, retains the plastic capacities of early development<sup>26</sup> and that the right hemisphere cycles into growth phases throughout the lifespan allows for the possibility of changes in “mind and brain” in psychotherapy. Updated, psychobiologically oriented psychoanalytic treatment models may potentiate what Kandel, in a clarion call for a paradigm shift in psychiatry, describes as “biology and the possibility of a renaissance of psychoanalytic thought.” (Schore, 2003b, p. 259 & 262-5)

I apologize slightly for the length of this quote, however it is of extreme importance. In essence, what Schore is saying is that, since most affect happens in the right hemisphere, purely cognitive (left hemisphere) models and strategies are relatively ineffective, and therefore psychoanalysis (in particular) needs to consider much more bodily-based models and treatment. Maybe we, body psychotherapists, could also learn something as well, and indeed some of our colleagues in the San Francisco Bay area have formed a Schore study-group .

## Gene Research

On the other side of the Atlantic, Joachim Bauer is a physician and psychotherapist at the University of Freiburg, Germany. He is the author of the book, *The Memory of the Body*,<sup>22</sup> about the traces of interpersonal experiences in the body

<sup>20</sup> From the cover of ‘Affect Dysregulation’ (Schore, 2003a)

<sup>21</sup> The numerous references in this extract have been omitted.

<sup>22</sup> In German: “Das Gedächtnis des Körpers”.



and its genes. He has also written two further books (also in German) about recent developments in neurobiology. In an interview,<sup>23</sup> he states:

... information that is laid down in the coding regions of our genes has an impact on many structural and metabolic aspects of our body. However, this is just half the truth. Genes consist not only of their so-called coding regions - the latter is that part of the DNA whose text is transcribed into RNA. [But] ... Every gene is under the command of a "gene switch." That is a regulatory sequence that in most cases is situated "upstream" of the coding region of the gene. The regulatory sequence determines to which extent the gene that is under its command is activated. "Gene switches," they are also designated as "promoter regions," consist also of DNA, however, they are not transcribed into RNA. Instead, they are the target for signal factors coming "from outside." Signals that act on "gene switches" are at the end of signal cascades that may start from different sources, both inside or outside the body. One of the most important sources of signals that regulate gene activity is the interpersonal experiences that we undergo in our personal environment. ...

In fact, interpersonal experiences that, to many people, seem to be immaterial, have been proven to exert pronounced biological effects, first on our brain, and then on our whole body. The continuous inflow of psychological experiences becomes converted into bio-electrical neuronal impulses and into the release of neurotransmitters. From there, cascades of signals are initiated that end in different parts of the body where they affect biological responses including the regulation of gene activity. ...

The "fine tuning," however, is not predetermined by such an endogenous program. When it comes to the "fine tuning," there is no contradiction between genes and environments, nor between "nature" and "nurture". "Genes" only make sense with respect to the way in which they respond to their environments, thus helping the organism to adapt. "Environments" only make sense with respect to the effects they have on our body, and that includes their effects on gene regulation. Therefore, the question, "to what extent" environmental factors determine biological parameters cannot be answered because the question is wrong.

This is pretty revolutionary stuff. In the interview with Elizabeth Marshall, a body psychotherapist, Bauer, firstly briefly dismisses the concept of Richard Dawkin's "selfish gene" as ideological science fiction, and then goes on to explain, much more interestingly, how motivation has a genetic origin and yet can be influenced by emotional exchanges:

The "Motivation systems" are networks of specialized nerve cells that have the capacity to synthesize and to release certain transmitters such as dopamine, endogenous opioid, and oxytocin. These transmitters, if acting in common, may create a psychological state that we call motivation, vitality or creativity. Dopamine gives us the feeling of energy; the opioids provide that we feel fine while doing something and oxytocin motivates us to do something for or together with people we like.

Obviously, people sometimes lack any motivation. In the case of depression, the system appears to be completely shut off. Therefore, after the importance of the motivation system for vitality was recognized, the question arose what signals were necessary to activate these neurobiological systems. Recent research could show that social acceptance and sympathy we receive from others is the main stimulus of the motivation systems. (Marshall, 2010)

This is how he feels that psychology can transform biology, and vice versa: it is an interactive process. The interview is concluded by an interesting discussion about mirror neurons.

## Mirror Neurons

Another interpersonally interactive component of biology that has recently been discovered is the existence of mirror neurons. Rizzolatti & Craighero (2004) published an article about mirror neurons, which mirror the activity, body position or stance of another animal or human. Mirror neurons are adjacent to motor neurons and they activate or fire. The pattern of firing in the observer mimics the exact pattern that the observer would use if he were doing that action. V.S. Ramachandran<sup>24</sup> believes they might be very important in imitation and language acquisition. Other scientists theorize that these are involved in the development of empathy. MRI studies led to suggestions that human language evolved from a gesture performance/understanding system implemented in mirror neurons.

Some researchers also speculate that mirror systems may simulate observed actions, and thus contribute to theory of mind skills. They may also be involved in developing a theory of mind, which refers to our ability to infer another person's

<sup>23</sup> Scheduled for publication in the Journal of Body, Movement & Dance in Psychotherapy: Vol. 6, No. 1, Spring 2011.

<sup>24</sup> Retrieved on 22/07/09 from: [http://www.edge.org/3rd\\_culture/ramachandran/ramachandran\\_p1.html](http://www.edge.org/3rd_culture/ramachandran/ramachandran_p1.html).

mental state from their behavior and thus something of their experiences. In studies, apparently females exhibit stronger motor resonances than males.

## Proxemics

Michael Heller is a scientist, body psychotherapist and colleague. At the 2004 European Association for Body Psychotherapy conference in Marathon, he presented a very interesting talk on proxemics (Heller, 2004). He uses tools forged in the analysis of non-verbal communication to illuminate some dimensions of Beatrice Beebe's case description in order to show how an awareness of postural dynamics can sharpen one's perception of long-term individual development.

Proxemics and postural dynamics extend the concept of body language, to the positioning of the client's and therapist's chair in the room, and the flexibility of the dynamics between client and therapist, that can allow the client (and therapist) to move, walk around, change position, or engage in whatever form of emotional expression is needed.

Other scientists have studied these as well (amongst them: Trout & Rosenfeld, 1980; Heller, 1991; Blatner, 2009a & 2009b). This field bridges the gap between traditional psychotherapy (two people sitting facing each other in a room) and dance-movement (psycho)therapy, about which there is much modern research, and it also follows on from the whole concept of experiential, bodily-oriented learning that is so central to our philosophy in body psychotherapy. As I have mentioned previously, Dance Movement Psychotherapy, in one aspect, transcends the somewhat static (or even supine) position of body psychotherapy, but usually doesn't go deep enough into the person's physiology.

## Memory & Language

Much work in neuroscience has been done on memory; and perhaps this is more of interest to those more cognitively-oriented amongst body psychotherapists. Kandel (2007), a Nobel prize winner, explores (very personally) some of his work in understanding learning and memory. LeDoux (2003) also explores this area of science, and in addition, one of the seminal books in this field is Gazzinga's *Cognitive Neuroscience* (Gazzinga et al., 1998), which takes a highly interdisciplinary approach to the topic and the neuroscience and neuropsychological evidence.

Other interesting works on memory include Baddeley's classic work on working memory (Baddeley, 1995; Baddeley et al., 2009); a good overview in an internet article, *The Cognitive Neuroscience of Memory*<sup>25</sup> from the prestigious University of Cambridge Inference group; Craver's work (2002) on the multi-level mechanisms of memory; and a wikibook article on Cognitive Neuroscience and Memory, explaining the different types of memory.<sup>26</sup>

Of similar interest may be Harley's (2007) *The Psychology of Language*, which is an especially good textbook on psycholinguistics and language development.

## Other research findings

Greenfield (2000) presents the basics of contemporary thought on consciousness as they relate to her own theory, which involves a continuum of experience between sensual, emotional grounding in the surrounding world and rational, cognitive withdrawal into mental life. Arguing from a wide range of animal and human research, and drawing on the work of philosophers John Searle and Daniel Dennett, she makes her case compellingly but gently, granting that other theories might also hold in this still-uncharted territory. Looking in depth at depression, drug use, and fear, Greenfield shows how each is explained by her continuum theory and how each relates to the life of the human organism as a whole.<sup>27</sup>

There is more and more of this sort of compilation.

Hass-Cohen & Carr (2009) give an account of the latest developments in neuroscience and its impact on art therapy. They explore the complex relationship between art and creativity and neurological functions such as stress response, immune functioning, child developmental phases, gender difference, the processing of imagery, attachment, and trauma. Maybe we can learn from some of this.

There is also much more work around, if you look: for example, Deborah Harkin is applying neuroscience findings to clinical work with adolescents (Harkin, 2009, 2010), and Janet Treasure (and others) are applying neuroscience to treating people with eating disorders (Treasure et al., 2005); Ernest Rossi's (1989) classic book, *The Psychobiology of Mind-Body Healing*, has some very interesting perspectives on the ANS, the endocrine system and the immune system, and also on the plasticity of the brain; Rossi has also produced a book on *The New Neuroscience Of Psychotherapy, Therapeutic Hypnosis & Rehabilitation: A Creative Dialogue With Our Genes* (Rossi & Rossi, 2008) that goes into several of the points of areas

<sup>25</sup> Downloaded 17/09/10: <http://www.inference.phy.cam.ac.uk/jmb86/memory.pdf>.

<sup>26</sup> Downloaded 15/9/10: [http://en.wikibooks.org/wiki/Cognitive\\_Psychology\\_and\\_Cognitive\\_Neuroscience/Memory](http://en.wikibooks.org/wiki/Cognitive_Psychology_and_Cognitive_Neuroscience/Memory)

<sup>27</sup> Extract from Rob Lightner, Amazon.com review:

[http://www.amazon.com/Private-Life-Brain-Emotions-Consciousness/dp/0471399752/ref=sr\\_1\\_1?ie=UTF8&s=books&qid=1295389987&sr=8-1](http://www.amazon.com/Private-Life-Brain-Emotions-Consciousness/dp/0471399752/ref=sr_1_1?ie=UTF8&s=books&qid=1295389987&sr=8-1): downloaded 15/9/10.

mentioned in this article; there is a whole (new) field of psycho-neuro-immunology (PNI) that studies the interaction between psychological processes and the nervous and immune systems of the body (interestingly, this is an interdisciplinary approach that incorporates psychology, neuroscience, immunology, physiology, pharmacology, molecular biology, psychiatry, behavioral medicine, infectious diseases, endocrinology, and rheumatology); there are some very interesting overlaps between brain activity with the field of social psychology and social neuroscience, summarized by Harmon-Jones & Winkielman (2007); Roz Carroll writes on neuroscience and psychotherapy with reference to the impact of the human face and aspects of love (Carroll, 2005); Colwyn Trevarthen is doing lots of research on communication between mothers and babies, as well as infant intersubjectivity (Trevarthen & Aitkin, 2001); there is a useful “Somatics Therapy Research Guide” on the CIIS website<sup>28</sup>, that gives pointers to find out more; other body-oriented therapies (like craniosacral therapy<sup>29</sup>) are also investigating relevant neuroscience findings; and the forthcoming, massive English-American edition of the *Handbook of Body Psychotherapy*<sup>30</sup> has several chapters that relate many neuroscience findings that are significant to body psychotherapy. I could go on and on: enough already.

## Conclusion

We are fortunate in that many of these distinguished neuroscientists have come and presented their work at various Body Psychotherapy conferences. These people include Damasio, and Allan Schore, Steven Porges, Ed Tronick, Jan Panksepp, George Downing, Kerstin Unvas-Moberg, Bessel van der Kolk, and several others. Many of these people are not body psychotherapists, instead they are respected scientists and researchers in their own fields, but their work impacts on, informs, and can be central to our understanding of body psychotherapy and to what is happening within the psycho-neuro-biological dynamics of our patients and clients – and what has happened to them (the social dynamics) – and thus to our work, as clinicians, as they can try to help us and we try to help them with their resulting difficulties.

There are, of course, many, many other studies in neuroscience, and many of these may also have great importance for body psychotherapy. I have just indicated a small sample of studies that have been of interest to some of my body psychotherapist colleagues, or from those who have presented at body psychotherapy conferences, or who have caught my interest, as I have trolled my very individual way through this increasingly complex field. So, please believe that this is not a comprehensive survey of the field of neuroscience; it is a snap-shot, a soupçon, a taster of this new and impressive field. I am going to leave it up to you to delve further and to relate what you discover as being relevant to our work as body psychotherapists: hopefully the subject of many of your future articles.

However, useful – essential – as all this neuroscience stuff is, I further contend that we – within body psychotherapy – must also start to do some of the basic scientific research that directly pertains to our clinical work. I wrote about this need in the previous section of these series (Young, 2010 a), so I don’t want to become too polemic and strident and repeat myself endlessly. However, I will continue to try to persuade the various professional body psychotherapy associations to organize properly structured effectiveness studies (see Seligman, 1998), as well as making contact with universities to try to collaborate on some duly considered efficacy studies for single conditions. I hope that you too will assist the science of body psychotherapy in this direction.

So, we must all find ways to apply – to use – these precious diamonds – all this new and wonderful research coming from neuroscience, and we must also find ways to demonstrate the findings of the neuroscientists in our own clinical work. It is a both ... and situation. As we begin to do our own research, we may even be able to inform neuroscience about aspects that they are not aware of, as they are not clinicians, in contact with the deeper aspects of the clients’ psyche and soma. As clinicians, we need to be dictating what we need to have researched, rather than just picking up the crumbs of other people’s research.

So, having made what I hope has been a useful survey of this topic, and the research in this field,<sup>31</sup> in this series of four articles on “The Science of Body Psychotherapy Today”, I now leave it up to you.

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<sup>28</sup> Retrieved 15/9/10: [http://library.ciis.edu/resources/subject/somatic\\_psychology.asp](http://library.ciis.edu/resources/subject/somatic_psychology.asp)

<sup>29</sup> Retrieved 15/9/10: <http://www.hummingbird-one.co.uk/craniosacral/links01.html>

<sup>30</sup> German edition: Marlock, G. & Weiss, H. (2006) *Handbuch der Körperpsychotherapie*. Stuttgart: Schattauer.

<sup>31</sup> I am deeply indebted to Jacqueline A. Carleton for the use of her personal ‘Library List’ in the field of Neuroscience. She supplied the references to a substantive portion of this article and is thus also (indirectly) somewhat responsible for its extended length.

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