What’s Hot in Neuroscience for Psychotherapy

By Richard Hill and Matthew Dahlitz

When considering the vast amount of work being done in the fields of neuroscience and its relevance to psychotherapy, it can be a little overwhelming to say the least. Where do we start? How can we define what are the “broad strokes” that will make a difference in how we see our clients and help them on the road to recovery? This question, as you can imagine, is highly subjective and dependent on what schools of thought you are coming from, and what has been your experience and attitude toward neuroscience. So the following is only the opinion of two observers, looking across a vast landscape of activity, and we do not assume our perspective to be similar to those from different vantage points, nor any more accurate.

In a personal reflection as Editor-in-Chief and publisher, I find the mind, both the individual and the collective, to be the most fascinating area of research, closely followed by quantum mechanics (which has some very interesting crossovers into mind science). Our brain is one of the most complex systems we know about and reporting about the intrepid explorers who are attempting to navigate this amazing system is very engaging and satisfying indeed. I love discovery—the bio-psycho-social-spiritual essence of who we are is a vast ocean to explore, and like the early explorers charting the new world, the sense of discovery has gripped me! Speaking as co-author and practitioner at the MindScience Institute, it is somewhat intriguing that the brain has been relegated to the rear of observing behaviour for so long. As a practitioner, the progress in understanding behaviour from the brain perspective does very little in some ways, but an enormous amount in others. Bonnie Badenoch’s wonderful book Being a Brain-Wise Therapist (2008) conveys it so well – not just to be brain-smart, but brain-wise. As the nature of the brain is learnt and then the knowledge embodied, it can sometimes feel like an imaginary fMRI is playing in the brain of the client as clients tell their story and express their feelings. It can be more than knowledge when the knowledge becomes integrated into your experience. In this context, we will highlight a number of topics that we believe are having an important impact on psychotherapy, or soon will be.

Before we look at some of these “hot topics,” we should clarify that much of what neuroscience is discovering confirms therapeutic techniques whose effectiveness in practice has already been attested. Certainly the traditional experience of a client feeling safe with a counsellor and being the recipient of a therapist’s empathy did not arise through the therapist’s having studied the neural networks and chemicals involved in down-regulating amygdala activity and the mirror-neurons involved in empathic receptivity. However, confirmation by neuroscience of what were largely intuitive practices opens an unprecedented way forward for us as therapists to refine our technique, and ourselves, for even greater success, while leaving behind those practices revealed to be ineffectual or even detrimental.

1) Memory Reconsolidation
In our opinion, at the top of the list is memory reconsolidation. It is certainly not a recent topic, having been studied since the 1960s, but is nevertheless a vital process in psychotherapy. For AEDP practitioners reading this article, we are sure you will agree that this process of implicit affect memory change is not only important, but absolutely central to all manner of therapy involving traumatic memories.

Let’s take a brief overview of what reconsolidation is about and why it is so important. We will use the explanation given by Joseph LeDoux, a leading researcher in this area, in a recent podcast (Van Nuys, 2010; for more on the work of LeDoux, see LeDoux 1996; 2002; 2010).

When we form a memory, protein synthesis is involved in the establishment of synaptic connections that are part of the network representing the memory. When a memory is retrieved—when we “remember”—protein synthesis is also involved. During this retrieval process, the memory, or rather the neural connections representing the memory, become a little unstable, and this instability is key: it is what allows us to incorporate new information. The memory in effect becomes “unlocked”, and is able to be changed. For example, you may have formed a memory, including an emotional component, of someone you met recently—let’s call him Jack—who seemed cold and aloof. Later, a friend of yours explains that Jack had just found out that he had lost his job. As your friend is talking to you, you are remembering your first encounter with Jack, and with the new information, your opinion of Jack is changing. Your memory of Jack has been altered; it is a new memory, and as a new memory, it has to be restored by protein synthesis: an update, if you like. But it is not an update that merely adds information to the existing memory; it is an update that is a new memory. The interesting thing is that if you disrupt this updating mechanism, you can threaten the survival of the memory in its original form. As LeDoux says, taken to the extreme, your memory is only as good as your last memory of that person, event, etc. One of the critical points to make here is that the modification of a recalled memory is not of the episodic part of that memory; in other words, your remembering actually meeting Jack at a certain place at a certain time is not modified, but the emotional components of this may be. These emotional first impressions are liable to change, given new information at the crucial time when the memory is “unlocked”. So we are looking at the implicit, emotional memory formed by the amygdala, rather than the hippocampal formation of cognitive memory. Traumatic memories, as a case in point, can be hugely impacted by a dampening of the emotional memory mediated by the amygdala.

Bruce Ecker has for a long time now been developing a therapeutic practice (Coherence Therapy: Ecker, Ticic, & Hulley, 2012) that capitalises on this reconsolidation process. Ecker has a thorough understanding of the research literature and has demonstrated, very effectively, positive therapeutic outcomes of eliminating painful and unhelpful implicit emotional memories. Reconsolidation,
rather than setting up alternative emotional responses that compete with the unwanted implicit memory, can be used to simply modify or eliminate the unwanted implicit memory.

Among other techniques that may be tapping into the memory reconsolidation process are EFT, EMDR, and of course AEDP. All these techniques may be disrupting the reconsolidation process to dilute the traumatic impact and reverberations of the original implicit memory. A pertinent review of the neurological underpinnings of EMDR can be found in James Alexander’s *Inside EMDR* (Alexander, 2013), which explores the possible process of memory reconsolidation in that technique. A detailed explanation of memory reconsolidation in AEDP is found in *Unlocking the Emotional Brain* (Ecker, Ticic, & Hulley, 2012). We believe that this avenue of research involving memory plasticity will continue to revolutionise psychotherapy, especially in the realms of PTSD.

2) Neuroglia: The Other 80% of the Brain

Glial cells, or simply *glia* (the Greek for “glue”), greatly outnumber neurons, and are opening up a whole new realm of discovery for neuroscience. This humble class of cells was considered no more than the supportive framework for the neural system, but we are now discovering the very active role glia play in the whole communication process within the brain. Many of the functions of various glia are well known, such as immune defence, myelination, blood flow control, neuron protection, synapse development, nourishing of neurons, and regulation of neurotransmitters in the extracellular space. But there is much yet to learn. For instance, how do astrocytes (the most abundant cells in the brain that have many maintenance and supportive roles, such as nutrition to nerve cells, maintaining extracellular iron balance, and traumatic injury repair) collaborate with neural networks to modulate synaptic signalling? What role does the glial system play in the whole communication process? Some suggest there is an entire internet in the glial system.

Researcher Maurizio De Pittà of Tel Aviv University’s School of Physics & Astronomy in conjunction with Electrical Engineering, together with fellow researchers coordinated by Professor Eshel Ben Jacob, are developing computational models of brain signalling. In their research they are discovering the active role astrocytes play in information processing by the brain. Astrocytes form an additional network to neurons, operating on a slower time-frame, carrying large amounts of information across brain regions. This system works in tandem and harmony with the more familiar neural system. There is much to learn about the communication function of glial cells, and computational neuroscientists like De Pittà are on the cutting edge of this research (De Pittà et al., 2012). It has been recently shown that memory formation requires the activity of astrocytes in order to create the necessary conditions in the synapse to continue the electrical flow from one neuron to the next (Panatier et al., 2006). At the moment, CBT is a therapy that is dependent
on the process of creating strong, energetic and flowing neuronal pathways. Successful pathways have what is called Long Term Potentiation (LTP). We have not thought of astrocytes as playing any role other than to supply food and then help in the synaptic cleanup (re-uptake) after a signal had passed. We do not quite understand how a therapist might maximise astrocyte activity in order to improve the effectiveness for methods like CBT, but these discoveries show us, again, that we don’t really know how the system in our brain works. We are still stabbing in the dark (although much less nowadays) in the hope that the response to our therapeutic practice will be beneficial and will be optimal. The exciting news here is that there could be exciting news coming from ongoing research. For the moment we need to be patient.

Could it be that we have been focusing on the highways and freeways of neural transmission and have yet to explore the streets, service roads and alleys of the glial system? Stanley Keleman argues that “the glia network interacts with the neuronal system and has a regulatory function, since it both regulates metabolism and conducts information. While the neuronal system is a fast-response system of focused anticipated intentions and flash memory, the glial system is a slower-response organisation that supports voluntary muscular effort and also regulates the neuronal excitatory pattern through its layers of myelin, helping to create long term memory. These two patterns, the fast and the slow, grow the cortex and our inherited instinctual and social patterns of behaviour and experiencing” (Keleman, 2012, p. 2). How interesting to think of a “fast” and a “slow” system like this, with glia as an equally key player to neurons in shaping our brain. Yet while glia may be slow in one respect, another theory suggests they may be part of a super-fast system.

Stuart Hameroff has developed a quantum computation model of the brain based on quantum communication in microtubules—implicating the entire glial system in a vast “quantum computer” type of network (part of the Sir Roger Penrose and Stuart Hameroff “orchestrated objective reduction” theory of consciousness). While we are not in a position to make a judgment on this theory, it is interesting to note that there may be much more going on in the brain than neuronal transmission.

We are beginning to discover more about glia and we need to be mindful that glia are about 80% of our brain. It is not wise to underestimate such a ubiquitous set of cells in the brain. The activities of the glia will certainly affect our approaches to neuropsychopharmacology, but it may be safe to predict that glial cells are positively affected by good lifestyle practices. Time will tell what are the best applications for therapeutic practice, but in the meantime, if we got excited about the brain containing some 100 billion neurons and many thousand synaptic connections between them, then we can safely keep the excitement up – glial cells have been noticed. Let us see what they really do and what we can do to encourage their beneficial effects.
3) Plastic Neurological Underpinnings of Emotional Style

Affective neuroscience, the study of the neural basis of emotion, has been uncovering important relationships between the activity and connectivity of the prefrontal cortex and areas of the limbic system in modulating emotion, and shedding light on what Richard Davidson (2012) has so beautifully conceptualised as emotional style. The critical finding of affective neuroscience for the therapist is that the brain can expand or contract the neural territory and connectivity of regions associated with emotion, through experience, and even through thoughts and intentions. Our very thoughts can alter our physical brain and neurochemical communication patterns to modulate our emotional responsiveness. Through techniques like meditation (Davidson & McEwen, 2012) it is possible to increase specific parts of prefrontal activation while dampening an overactive amygdala, to increase prefrontal influence over the amygdala, and even to bring about structural changes such as an increase in prefrontal volume and a decrease in amygdala volume. These findings are exciting for therapists, because we are starting to see therapy as a non-invasive technique to alter brain regions, and it is this capacity for thoughts to affect the biology of the brain that is bringing incredible understanding of how and why therapy can be beneficial to mental health.

Daniel Siegel has elegantly summarised the regulating and modulating activities of the pre-frontal cortex (2012) in the context of interpersonal neurobiology. Regulating emotions, including fear, is achieved through the neural interactions between the amygdala and the GABA-ergic neuronal connections from the pre-frontal region. Bonnie Badenoch describes it as “long integrative fibers of comfort extending from the middle prefrontal cortex down to the amygdala” (Badenoch, 2008, p. 109). The neural basis of emotion is directly related to the make-up of the biochemical milieu that changes in response to stimulus from both sensorial input and mental activity.

It is the capacity of the mind to affect the biochemical milieu that enables thought to regulate and moderate emotional responses. Coping and resilience can be activated, in part, by a mindful response to the rise in cortisol and norepinephrine due to distressing stimuli (sensorial or imagined), which alters the flow and distribution of serotonin into the prefrontal cortex in order to stimulate the GABA-ergic neurons that reach down to the axons of the amygdala and basal ganglia to interrupt the bioelectrical discharge in the axon that will then stop the neuron reaching the action potential required to stimulate synaptic activity that enables the next neuron to continue the flow of energy and information. Phew! In short, something that creates stress can be calmed by various responses, including thoughts. Emotional style is the developed skill, both explicit and implicit, to produce such beneficial reactions as the one described above, by the regulation and modulation of neural activity and the consequent biochemical milieu.

There is much to be developed in this area, not only in terms of mindfulness
techniques and similar positive psychological practices, which clearly are beneficial, but also in the understanding that the brain is subject to responses that can be directed by the nature of the biochemical milieu. On a practical level, this means that when we change the way we think or the way we feel or change our perspective or change the company we are in or change the way we speak or are spoken to, our biochemistry reflects those or any changes that occur. Our biochemistry is not separate from our experience. It is an element within the interplay of our experience. Our living experience is something like an orchestra: many players doing many things and all seeking to be a contributor to the music of life. Not that everything is active all the time. Even the humble triangle, an instrument which might wait for some time before chiming in, is an integral and functional element of the orchestra. It is interesting to know the finer details of all these changes in the ebb and flow of life, but not vital. It is, however, vital to know this: we function within a finely tuned integrated system into which we add our therapeutic contribution with the specific purpose facilitating some change, that experiential change will be supported by a change in the biochemical milieu.

Ernest Rossi describes this as “state-dependent” memory learning and behaviour (Rossi, 2007, pp. 53-54). Ongoing research into the interplay between neuronal structures, the biochemical milieu this creates, and how this milieu can be modulated and regulated by mental activity and mind states will help in deepening our understanding of how to resist being buffeted by the emotions and feelings that can sometimes seem to take over our brains, disturbing our capacity to manage the stresses and traumas that befall us. Coping and resilience are an expression of a system operating in harmony. This allows us to generate healing processes and move toward healing behaviors. There is a natural preference for wellbeing which can be seen in the current research showing the benefits of positive and caring therapeutic practice in reducing inflammatory gene expression and increasing antioxidant genes (Atkinson et al., 2010). That is just one example of many others that look at the benefits of mindfulness, meditation, positive intention, positive interactions and other interventions that result in positive affect and positive experiences (see Fosha, 2009) used to help people resolve and recover from their trauma.

4) Activity-Dependent Gene Expression in Psychotherapy

Activity-dependent plasticity is the brain’s capacity to change and remodel itself through activity as a result of gene expression. This ability to adapt, to “rewire,” is essential for learning, memory, and recovery from neurological disorders, and may reveal more ways we can protect ourselves from some of the adverse effects of stress (Li et al., 2008). The idea of brain plasticity has been strongly and successfully argued over the past decade, and now we are looking deeper into our biology and the possibility of gene plasticity. The building of new tissue is made possible by the expression of genes, and many genes only express themselves in response to stimuli from the current environment. Even more
intriguing is that this environment comprises both the outside world and the inner world, which in turn includes not only the myriad of biochemical activities, but also abstractions of thought, imagination, and shared thoughts and imagination.

Ernest Rossi presciently described, with David Cheek in 1988, the “molecular-genetic basis of memory learning and behaviour that is now called ‘activity dependent neuromodulation’” (Rossi & Cheek, 1988, p. 59) as they followed the earlier suggestion from Eric Kandel (1983) that “normal learning, the learning of anxiety and unlearning it through psychotherapeutic intervention, might involve long-term functional and structural changes in the brain that result from alterations in gene expression” (p. 1291). Rossi brought this thinking into the scope of psychotherapeutic practice in his book, The Psychobiology of Gene Expression (2002), which introduced the term psychosocial genomics. Recent publications have established a definition—“the study of how psychological and social experience modulates gene expression in health and illness” (Hill, 2012, p. 47)—and proposed frameworks for future research.

These ideas have had to wait for our ability to read the genome and test for gene expression, but enormous strides have been taken over the past decade. Technologies are continuing to develop and are now much quicker and cheaper, but there is some way to go. Still, in recent years, research into the effect of experience on gene expression, either directly, through stimulation of the gene, or through epigenetic processes, has produced some fascinating results. The effects of insecure attachments (McGowan & Szyf, 2010) and trauma (McGowan et al., 2009) have been revealed in the glucocorticoid receptors of the hippocampus, helping our understanding of anxiety and depression in later life; some fascinating research post 9/11 has revealed information about the genetic signature of post-traumatic stress (Yehuda et al., 2009); and early work has begun on examining gene expression in response to psychotherapy (Rossi et al., 2008).

Rossi’s experiments in gene expression following non-invasive talk therapy (the creative psychosocial genomic healing experience, or CPGHE) have shown evidence, in a pilot study, of an ongoing cascade of expressed genes over a 24-hour period that are beneficial for anti-inflammatory processes and reducing oxidative stress. Atkinson et al. (2010) have also noted an up-regulation of genes (early growth response: EGR1,2,3,4) which are associated with adaptive brain plasticity, evoked by experiences of novelty, memory, learning, and dreaming. In essence, just about every experience triggers gene expression somewhere in the body. It is intriguing to discover that brain plasticity is so closely related to activities like learning and dreaming. The fundamental drive to seek meaning and purpose is being shown to be directly related to stimulating beneficial biological activity in the body and brain. Our ‘biological’ reaction to difficulty and disturbance is the stimulation of inflammatory processes: the body responds to upset and trauma in a similar fashion.
to an invading bacteria or virus. This is the information that helps us believe that there is a biological preference for coping, resilience, purpose and meaning in life. Other studies have examined gene expression cascades following the use of a relaxation response (Dusek et al., 2008) and Chinese qigong (Li et al., 2005). Although this work is in its very early days, there are a growing number of experiments looking into gene expression stimulated by the simple activity of interpersonal experience. Psychotherapy is primarily an interpersonal experience. Feinstein and Church (2010) are among those who looking at the change in gene expression in response to non-invasive therapies, positive affirmations of love to counter self-hatred schemas and the stimulation of acupressure points.

The discovery of gene expression and epigenetic activity in response to non-invasive therapeutic practices has a number of implications. The influence of the “mind” on our biology is one of the most startling revelations of these experiments. The assurance that therapeutic practices like psychotherapy have a direct and distinct benefit for the whole body, especially the immune system, provides concrete evidence of the value and benefit of psychotherapy. Saying that something is “in the mind” is now tantamount to saying it is also “activating genes.” It may not be necessary for every psychotherapist to have a detailed understanding of our genes, just as it may not be necessary to have a detailed understanding of the brain, but it is important to know that there is a lot going on inside our clients, and ourselves, when we practice. There is no limit to what benefits might come from the developing understanding of psychosocial genomics and activity-dependent biological expression that is stimulated by psychotherapy.

5) Mindfulness

Much has been said about being “mindful,” mindfulness meditation, and how we all should be taking time out to develop this in our lives. Being mindful is certainly not new. Mindfulness techniques are ancient, but their neurological confirmation is another part in the exciting, breakthrough convergence of areas of the life sciences and talking therapies. In the Western world, where scientific validation has become paramount, it is significant to see such ancient wisdom now being taken seriously because we are starting to measure it and model the process.

To be mindful means to be able to direct one’s attention where one wishes, when one wishes, and more specifically to have a nonjudgmental awareness of the present moment. Attention operates in working memory, and is modulated by dopamine release and basal ganglia control to either maintain a certain focus or open up to new information/stimulation (the process is actually a complex of top-down and bottom-up modulators; see Dehaene, Sergent, & Changeux, 2003; Buschman & Miller, 2007). The ability to focus attention, filter out distractions, and mentally stand aloof from certain emotions has a neural basis that can be developed. To be able to
disengage from automatic cognitive and emotional patterns is an important skill for those suffering from detrimental thoughts and emotions (Kang, Gruber, & Gray, 2013). What is being discovered is that a more influential prefrontal cortical control over amygdala activation can be developed through mindfulness, giving an individual greater emotional control. Davidson (2013) showcases mindfulness as a powerful tool to develop more cortical control over our "emotional" brain.

A recent study found that mindfulness-based stress reduction training reduced the feelings of loneliness in a sample of lonely older adults, and also reduced related pro-inflammatory gene expression (upregulated pro-inflammatory NF-κB-related gene expression has been implicated with loneliness in older adults), indicating that mindfulness not only improves a subjective feeling like loneliness, but can also have a positive effect on gene expression (Creswell et al., 2012).

Short Takes

The five fascinating topics we have described so far are in no particular order of importance and do not by any means exhaust the list. U.S. President Barack Obama has announced a new $100 million initiative to unlock the “enormous mystery” of the human brain in the hope of boosting the understanding and treatment of brain disorders. The BRAIN Initiative—short for Brain Research through Advancing Innovative Neurotechnologies—will dramatically increase research in brain mapping and the development of neurotechnologies, but the deeper purpose is to increase our understanding of what is still a largely mysterious biological structure (Whitehouse, 2013). Here we take a brief look at some of the remaining fascinating topics from the field of neuroscience that are important for the mental health practitioner.

- Neural–Somatic Interplay

Although the Cartesian concept of dualism has long been refuted, it has become an attitude that is hard to shift. Moving beyond just the brain and mind toward whole-body therapy is an important paradigm shift that is now finding support and grounding in neuroscience (Fosha, et al., 2009). How is the mind modulating the body, and the body the mind? Strong clues are to be found in a variety of therapeutic approaches led by people such as Pat Ogden and Peter Levine (1997) in psychotherapy, and in body to brain and mind effects as discussed by the likes of cognitive psychologist Art Glenberg (2006). AEDP’s (Fosha, 2001; Russell & Fosha, 2008) attention to somatically based emotional experience and the integration of Schore’s (2000) right brain to right brain interpersonal relating, especially in therapy, is a well developed practical application of the neural-somatic interplay. Continuing research and the ongoing integration of academic disciplines involving the mind, brain and body will push open this door, long restrained by dualism, revealing the nature of the interplay occurring throughout our biology.

- Neural Connectivity Mapping – the Connectome
The idea of looking at the ways in which neurons connect and create the associative processes of the brain is to open our understanding to how functional brain states emerge from the underlying structures of the brain. The *connectome* was described simultaneously and independently by Dr. Olaf Sporns at Indiana University (Sporns et al., 2005) and Dr. Patric Hagmann (2005) at Lausanne University Hospital in 2005. Hagman speaks of the connectome in a similar light to the genome. Just as the genome is much more than just the sum of its components, the brain is more than just the neurons; it is the expression of a complex system capable of exceeding the apparent limitations of its parts. Exactly what the implications of this will be for our understanding of mental health and therapeutic practice is a wondrous mystery yet to be revealed.

- **Neuropsychopharmacology**

What is really going on inside the brain when the brain is working well, or when it becomes “chemically imbalanced” (Schildkraut, 1965; Tost et al., 2010)? Although we have a rudimentary knowledge of some of the systems, and processes within those systems, a number of drugs for mental illness are very poorly understood. Second-generation antipsychotics are only beginning to be understood, and while the relief they provide from psychotic states is beneficial to many, they can still be very dangerous—enough to “kill you in 10 different ways” in some cases, according to Professor Tim Lambert of Sydney University Medical School. The BRAIN Initiative in the U.S. is expected to reveal much more about the details of the complex activities of energy and information flow both through and around neurons in the brain.

**Conclusion**

There are undoubtedly many more exciting developments than those we have had the space to cover here, but there comes a point where we must not so much stop, as pause in the discussion of what is happening in neuroscience today. It is exciting, and it is adventurous—both excellent elements for inducing neural plasticity and synaptogenesis! The very act of studying the brain could well be the stimulus required for the brain to develop in new and unexpected ways. There may be no limit to the how the billions of neurons, trillions of glia, and many quadrillions of possible connections in the skull-based brain alone might interact. Add to that the peripheral nervous system, which through the conceptual framework of interpersonal neurobiology we understand to be an essential part of the brain, and finally the trillions of body cells and how they interact in an extraordinary interplay of biological processes—and we have a remarkable identity indeed. If we can get our heads around the enormity of all those possibilities, it only remains to add in the 302 billion base pairs of the DNA, the individualised regulation of the DNA by epigenetic markers, and the host of individualising gene-based activities of the RNA.

We are a biology of almost unimaginable possibility and potential. Our current knowledge represents no more than a small fraction of what remains to be known.
As neuroscience continues to forge a way forward with great promise for new and refined techniques in therapy, the future of research and discovery in the uncharted areas of our humble biology has much to reveal. What an exciting time it is to be a human interested in what it means to be human.

References


**Richard Hill**

Richard Hill, MA, MEd has had an eclectic and fascinating journey to become an internationally recognized speaker and educator on the mind, the brain, psychosocial genomics and the human condition. Richard began training to be a psychotherapist as an actor/singer/songwriter with numerous ‘role plays’ in stage, television and film. The calling to academia came in his mid-40’s and he is now a practicing psychotherapist, author, developer of the Curiosity Oriented Approach and host of the online interview program, MindScience TV. Richard is a board member of the Global Association for Interpersonal Neurobiology Studies (GAINS); a select member of the International Social Genomics Research Team under Ernest Rossi; an esteemed member of the International Council of Psychotherapy Professionals (ICPT); and an invited member of the Creative Skills Training Council (CSTC).

**Matthew Dahlitz**

Matthew Dahlitz describes himself as an autodidactic eclectic, with a broad base of academic and practical experience in music, business, medicine, and the arts. He has studied masters level classical composition, scored for film, produced albums, worked a decade as an advanced care paramedic, managed multimillion dollar businesses with his entrepreneurial father and started businesses of his own. Now Matthew is going back to his roots in psychology, completing a Masters in Counselling with a foundation in
neuropsychotherapy, and developing *The Neuropsychotherapist*, a web based platform that aims to equip psychotherapists with the latest knowledge in neuroscience and the new paradigm shift we find ourselves in.