

THE PSYCHOSOCIAL GENOMICS OF RNA/DNA SIGNALING IN CONSCIOUSNESS AND COGNITION: A QUANTUM UPDATE OF PSYCHOTHERAPY AND THERAPEUTIC HYPNOSIS

ERNEST ROSSI & KATHRYN ROSSI

corresponding author: Ernest@ErnestRossi.com

*"Science goes where you imagine it."
Judah Folkman (1933-2008)*

Abstract

We review and update the current research on RNA/DNA signaling, which underpins the psychosocial and cultural genomics of consciousness, cognition and psychotherapy. We begin with an introduction to the first author's training with some of the leaders in psychotherapy and therapeutic hypnosis during the 1960s and 1970s that led to the new development of psychosocial genomic concepts of consciousness, cognition, and behavior at the quantum level in the 1980s to the present. We then illustrate how these emerging RNA/DNA informational pathways of psychosocial genomic research are currently generating new concepts, directions and protocols for the professional practice of mind-body psychotherapy, meditation, therapeutic hypnosis and rehabilitation.

Keywords: Brain plasticity, creativity, gene expression, mentorship, mirror neurons, neuroscience, observer/operator, psychosocial genomics, psychotherapy, PTSD, RNA/DNA, quantum field theory, quantum qualia, Schrödinger's equation, therapeutic hypnosis

Bernauer "Fig" Newton, My First Teacher of Therapeutic Hypnosis: The Psychosocial Genomics of Consciousness and Cognition

I well recall my first meeting with Bernauer "Fig" Newton over 50 years ago in 1962 when I began my two year United States Public Health (U.S.P.H.) Post-Doctoral Fellowship in Clinical Psychology to study psychosomatic medicine with Franz Alexander at the Mount Sinai Hospital in Los Angeles, California. "Fig" was an outside consultant in, of all things, clinical hypnosis. I had never previously expressed an interest in hypnosis, but I could not help suppressing a grin

the first time I saw him. His certainly was a brilliant man, and yes, his face really did give a humorous fig-like impression, somehow.

His "Figness" was only emphasized when his eyes crinkled as he smiled broadly because in that very first moment of our meeting *he silently knew that I knew that he was smiling because I was smiling* in astonishment about the appropriateness of his nickname "Fig." I could not have known it at the time but this smiling, silent, and simultaneous perception of each other's thoughts and evanescent emotional states was a succinct example of what would later be called, "The Neuroscience Theory of Mind," which found evidence for the activity of quantum dynamics in "Mirror Neurons" as the basis of empathy in primates and humankind. Mirror neurons are now recognized as a source of the basic talents of the psychotherapist, in general, and practitioners of therapeutic hypnosis in particular (Rossi & Rossi, 2006).

Within the first few weeks "Fig" invited me for a personal experience of therapeutic hypnosis in his private office. How did he know that I would be delighted with the prospect? Was this welcomed invitation another example of the neuroscience theory of mind, empathy, and mirror neurons again? I was still the greenest of prospects for therapeutic hypnosis. When I first stumbled into his private office I immediately felt a wave of warmth. I felt lightheaded, dizzy, and desperately looked for a soft chair I could sink into before I betrayed my fast failing condition by fainting! "Fig's" eyes seemed owl-like large as he leaned toward me perpetually smiling his figness and speaking softly for I do not recall how long. I have absolutely no memory of anything that was said during our encounter. I only recall that as I was

leaving his office I seemed to really awaken as my trance popped softly like a little bubble and my full reality orientation returned.

I paused momentarily as I looked back at his office once more and asked if it was unusually warm. Did he perhaps have the heat turned up a bit high? Was that extra warmth to facilitate hypnosis? He seemed mildly surprised that I had noticed and nodded his head "yes." His eyes crinkled even more as he chortled, "Well, that's true; I guess you really have found me out!" I smiled and believed I had stumbled upon one of the subtle secrets of therapeutic hypnosis known only to the cognoscente. Even today, almost 50 years later, I like to have the fireplace warming my home office when I receive clients. I was soon to learn more about heat and the therapeutic encounter from my next two mentors: Milton H. Erickson and David Cheek.

Milton H. Erickson, My Second Teacher of Therapeutic Hypnosis: Heat, Work and "The Burden of Responsibility in Effective Psychotherapy"

During the last eight years of his life when I tape recorded Milton Erickson's sessions with his patients (Erickson & Rossi, 1981/2014), I often noticed that some of them would begin to sweat and actually turn red during the heat and intensity of their emotional experiences and efforts during therapeutic hypnosis. At such times Milton would turn and stare directly into my eyes with his quick laser-like look of concentrated attention and give me a just barely perceptible smile as if to say, "*There, you see the patient is really working – that cannot be faked!*" Milton would smile even more broadly and chuckle solicitously when patients would wipe the sweat from their brow, flap their arms, pull at their clothing, and exclaim that they were "hot!"

Now I suddenly understood the significance of the little known and appreciated paper he had published two decades earlier on "The burden of responsibility in effective psychotherapy" (Erickson, 1964/2008). There is something very simple, reassuring, and yet profoundly paradigm shaking about the nature of therapeutic hypnosis in this brief six-page paper. Erickson maintained that *therapeutic hypnosis is not relaxation, sleep, or a "miracle of healing!"* Erickson, after all, came from a hard working family of farmers. He recognized the burden and worth of hard work when he saw it! *Therapeutic hypnosis and effective psychotherapy involved hard work – intense inner activity on the part of the patient – not necessarily the therapist!*

How different this view is from our current demonstrations of therapeutic hypnosis under the hot lights of big camera televisions where we typically see the therapist sweating and working very hard to carry the burden of responsibility in effective psychotherapy while the "good patient" sits quietly and relaxed simply imbibing it all. *Erickson, however, believed effective psychotherapy was the result of the patient's intense inner activity not the therapist's!* It was another ten years before I realized that the patient's intense creative inner activity and work was

fundamentally a manifestation of what molecular biologists called "*activity-dependent gene expression and brain plasticity*" (Rossi, 1986/1993).

David Cheek, My Third Teacher of Therapeutic Hypnosis: Psychobiological Criteria for Assessing Validity of Ideodynamic Signaling

David Cheek, one of Erickson's early students, was the clincher in convincing me that therapeutic hypnosis depended on the heat of the intense inner activity and work of the patient rather than simple relaxation and programming by the therapist. Cheek trained me to observe patients very carefully during the gentle ideodynamic finger signaling technique of therapeutic hypnosis that he originated. He taught me to notice the very first fine sheen of sweat that often appeared on a patient's finger, forehead, or nose during the emotional intensity of ideodynamic finger signaling. Cheek proposed that heat and sweating were reliable criteria of the validity and intensity of emotions during cathartic experiences of therapeutic hypnosis for resolving PTSD outlined in Box One (Rossi & Cheek, 1988).

Newton, Erickson, and Cheek's clinical experiences did not make sense in terms of the prevailing relaxation and sleep approaches to hypnotic induction. It wasn't until the 1990's that a number of German researchers investigated heart rate variability as a function of the provoked "intellectual work load by means of a hypnotic suggestion" (Hautkappe & Bongartz, 1992, p. 75; Unterweger et al., 1992). While traditional applications of therapeutic hypnosis focused on relaxation or "low phase hypnosis," research by these workers indicated that therapeutic hypnosis could engage a significant "*work function*" that operates differently in high and low hypnotic susceptibility subjects. Consistent with Cheek's recognition of heart and pulse changes as an index of responsiveness in ideodynamic signaling, Hautkappe & Bongartz (1992) found that heart rate variability was a useful physiological index for discriminating high and low hypnotic susceptibility. They found that high susceptible hypnotic subjects have less heart rate variability. "High susceptible subjects do not have to work as hard ... as do low susceptibles" (Unterweger et al., 1992, p. 87).

Milton Erickson often described good hypnotic subjects as having higher "*response attentiveness*" or focus of attention so their mind-body system does not require an indiscriminate massive arousal to do certain psychotherapeutic tasks (Erickson & Rossi, 1979/2014). Erickson actually used psychological shocks and creative moments to focus attention in what we would now call "high phase hypnosis" (Rossi, 1973). This leads to the view that high hypnotic susceptibility may be associated with a more efficient psychobiological use of information and energy. Barabasz and Barabasz (1996) have documented how this work function or heightened activity of "alert hypnosis" can facilitate neural biofeedback in children

BOX ONE

David Cheek's 3-Stage Psychobiological Criteria for Assessing Validity of Ideodynamic Finger Signaling in Post-Traumatic Stress Disorder (PTSD).

1. Emotional and Physiological Memory can be seen first through very subtle changes in *respiration, pulse rate, and emotional reactions such as facial and/or finger flushing, feeling hot, and perspiration*. These often occur rapidly in a very fine, diffident, quivering and tremulous manner that takes place *before* a designated finger lifts to show an inner re-orientation to the time and place of a frequently significant life experience that may be the source of a post-traumatic stress disorder (PTSD).

2. Ideodynamic Finger Signals indicate the accessing of memory at an unconscious (implicit) level. They usually occur a few seconds after the appearance of physiological memory. At the moment the finger lifts signaling this second, higher level memory, the patient still does not have a verbal level of awareness of the experience; there are only feelings of anticipation, vague unrest, or discomfort.

3. Verbal reporting of the experience follows these physiological and ideodynamic finger signals of the inner accessing of meaningful material with a traumatic history. *To reach this conscious horizon of cognition and verbal reporting, the entire experience may have to be reviewed repeatedly*. The patient is told that one finger will lift to signal the beginning of an experience and another finger to signal its ending. *The number of required repetitions to elevate the memory from deep unconscious zones of memory storage depends upon the gravity of the experience*.

with attention deficit hyperactivity disorder (ADHD). These considerations led me to believe that any truly complete theory must embrace both high and low activity levels of activity in the domain of therapeutic hypnosis and psychotherapy as illustrated in Figure 1.

Notice how Figure 1 embraces the entire range of hypnosis theories from Hilgard's special state perspective to the psychosocial genomic expanded view. In a sense *The Domain of Hypnotherapeutic Work* illustrates how we can integrate the apparent opposites of therapeutic hypnosis and psychosocial genomics. We can see how the *Outer Focus of High Phase Hypnosis*, associated with human performance peaks, appears to be the opposite of the well-known *Inner Absorption and Healing Facilitation of Low Phase Hypnosis*. These apparent opposites have stirred much of the controversy and debate about the nature of hypnosis, which we now believe can be investigated and resolved by the bioinformatics, psychosocial and cultural genomics of therapeutic hypnosis and psychotherapy.

The Psychosocial Genomics of Therapeutic Hypnosis and Psychotherapy

While it is now generally believed that the molecular-genomic revolution initiated by Watson & Crick, and others, fifty years ago eventually will serve as a quantum foundation for all the medical and psychological disciplines. This evolution, however, it had relatively little impact on therapeutic hypnosis

and psychotherapy at this time. We believe the reason for this can be found in the contrast in Figures 2. The upper portion of Figure 2 illustrates Watson & Crick's (1953a & 1953b) original view of what they called "the basic dogma of molecular biology: "how (1) the linear DNA code of nucleotides that makes up the *sequence* of our genes generates (2) the *structure* of the proteins of our body, which in turn generates (3) all the physiological *functions* of the body and mind."

Notice that there is no place for mind, consciousness, cognition or the quantum qualia of human experience in the Watson & Crick's original dogma. The entire history of therapeutic hypnosis, since James Braid (1855/1970), however, demonstrates there is an experiential connection between mind and body and their reciprocal effects on each other. This together with current pioneering research in bioinformatics of memory and learning (Kandel, 1999; Rossi, 2002, 2004a, 2007) led us to introduce qualia (mind, cognition & emotions) into Watson & Crick's *linear outline* to illustrate the *circular process* of mind-body communication. This circular process, which we call, "psychosocial genomics," however, raises as many questions as it answers. How can we account, for example, for the differences between human consciousness and other primates when they both have about the same number of genes (~22,000), which are more than 98% alike? A DNA microarray revolution is currently exploring the special qualities of human brain evolution and

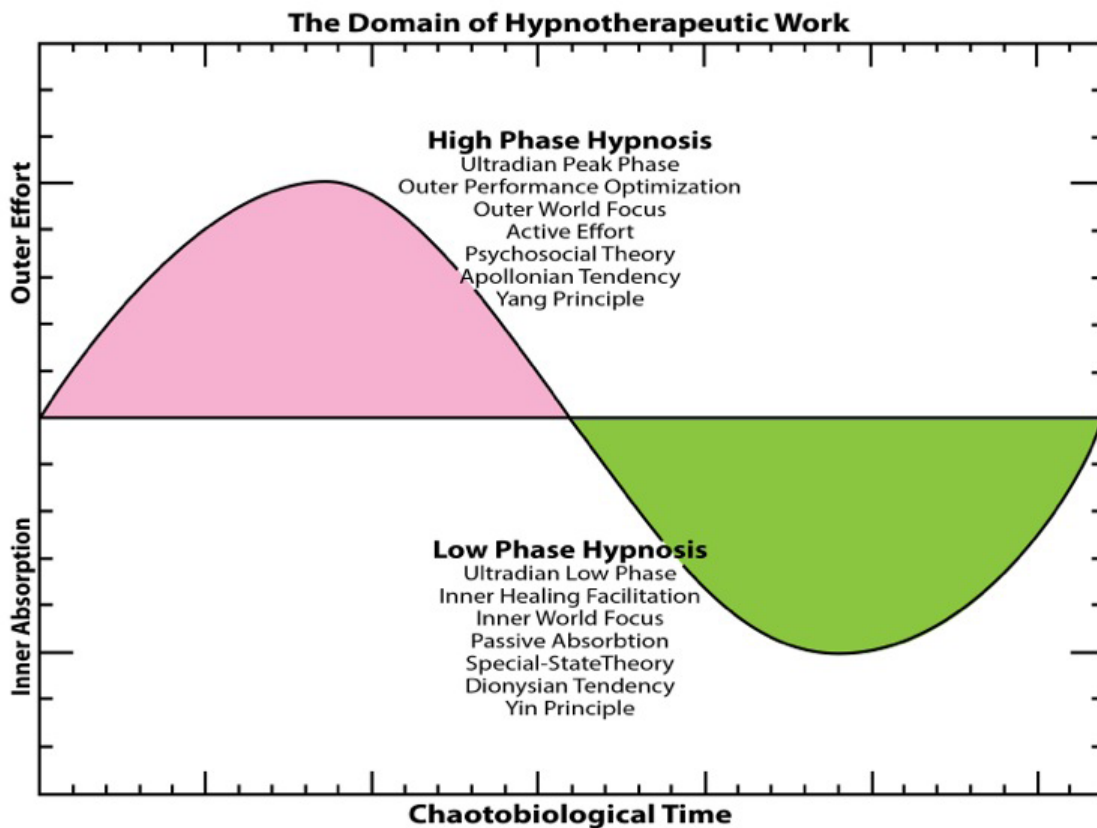


Figure 1: The domain of hypnotherapeutic work. The continuum of therapeutic hypnosis to be assessed by DNA chip technology ranges from the quasi-periodic (chaotobiological) time of (1) high phase hypnosis with its active focus on problem solving as described by psychosocial theorists to (2) the apparently passive periods of deep inner absorption and healing associated with low phase hypnosis emphasized by special state theorists. A complete unit of therapeutic hypnotic work can begin in any phase of the circadian (~24 hours) or ultradian (less than 24 hours) cycle. Some types of therapeutic work are more effective during the high phase hypnosis (sympathetic system arousal for engaging in problem solving and effective outer world performance), while other types of therapeutic work are facilitated during the relaxation of low phase hypnosis (parasympathetic periods of restoration and healing effective on the inner world often experienced as self-identity and spirit).

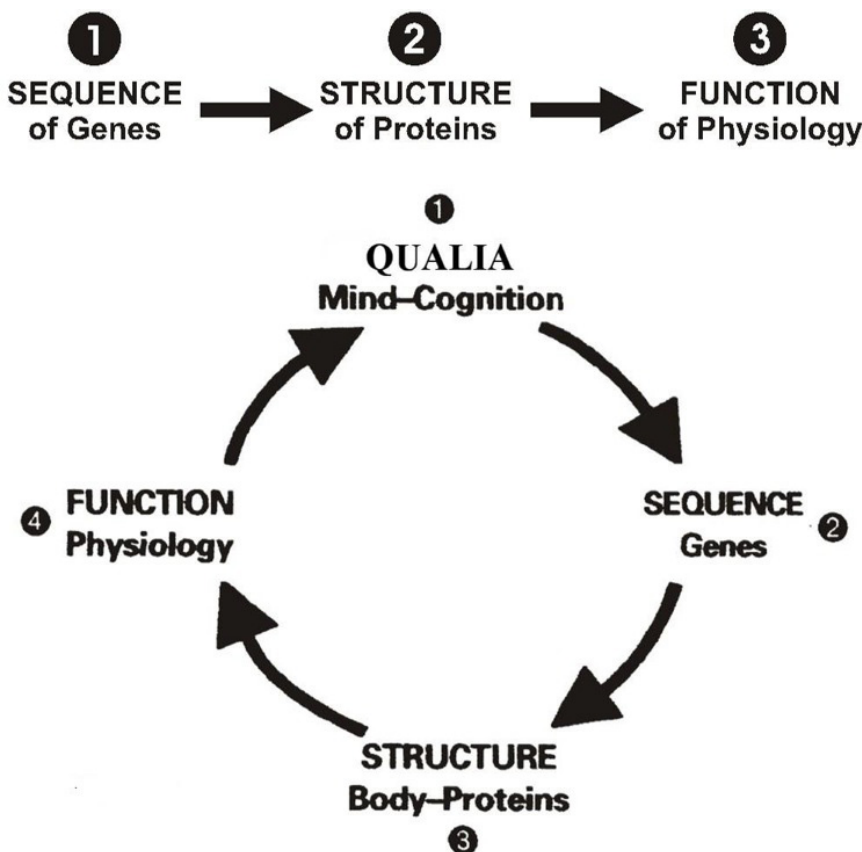


Figure 2: (Upper) The Watson & Crick's original linear dogma of molecular biology. There is no explicit role for the qualia of consciousness and psychological experience. (1953a, 1953b)

Figure 2b: (Lower) Introducing a circular paradigm of complex sensory-perceptual experiences of mind and cognition into the Watson & Crick. (1) Novelty, psychological arousal, and stress can modulate (2) gene expression and the alternative splicing of the sequence of genes (genomics), (3) protein synthesis and structure (proteomics) of the body, and (4) the physiological functions of the brain and body. Erickson's neuro-psycho-physiology emphasizes the "top down" right side of this mind-body circle of information transduction, which is balanced by the more usual "bottoms up" approach of molecular biology, behavioral genetics, evolutionary psychology, and sociobiology illustrated on the left side of the mind-body circle. (From Rossi, 2002, 2004a, 2007)

experience associated with gene expression and brain plasticity. Cáceres, et al. (2003) summarize their research as follows.

Little is known about how the human brain differs from that of our closest relatives. To investigate the genetic basis of human specializations in brain organization and cognition, we compared gene expression profiles for the cerebral cortex of humans, chimpanzees, and rhesus macaques by using several independent techniques. We identified 169 genes that exhibited expression differences between human and chimpanzee cortex, and 91 were ascribed to the human lineage by using macaques as an out-group. Surprisingly, most differences between the brains of humans and non-human primates involved up-regulation, with ~90% of the genes being more highly expressed in humans. By contrast, in the comparison of human and chimpanzee heart and liver, the numbers of up- and down-regulated genes were nearly identical. *Our results indicate that the human brain displays a distinctive pattern of gene expression relative to non-human primates, with higher expression levels for many genes belonging to a wide variety of functional classes. The increased expression of these genes could provide the basis for extensive modifications of cerebral physiology and function in humans and suggests that the human brain is characterized by elevated levels of neuronal activity.* (pg. 13,030, italics added)

These elevated levels of gene expression and neuronal activity in the human brain remind us of the heightened psychological experiences of focused attention (*monoideism*) and *fascination*, which were key concepts in early descriptions of the psychophysiology of therapeutic hypnosis by James Braid (1855/1970) outlined in his book, *The Physiology of Fascination*, as follows:

"With the view of simplifying the study of reciprocal actions and reactions of mind and matter upon each other ... the [hypnotic] condition arose from influences existing within the patient's own body, viz., the influence of concentrated attention, or dominant ideas, in modifying physical action, and these dynamic changes re-acting on the mind of the subject. I adopted the term 'hypnotism' or nervous sleep for this process ... And finally as a generic term, comprising the whole of these phenomena which result from the reciprocal actions of mind and matter upon each other, I think no term more appropriate than 'psychophysiology'" (Tinterow, 1970, pgs. 369-372).

A thought experiment about how our new science of psychosocial genomics could clarify the foundations of therapeutic hypnosis and

psychotherapy could be illuminating (Rossi, 2004b). Figure 3 is a juxtaposition of Aldrich & Bernstein's (1987) circadian profile of hypnotic susceptibility (the cognitive-behavioral level), with a typical profile of body temperature (the physiological level, which they hypothesized as underlying hypnotic susceptibility) in humans with the profile of the *Thra* gene (the genomic level) (Storch, et al., 2002). Aldrich & Bernstein (1987) summarize their result as follows:

Figure 3 shows the distribution of mean of The Harvard Group Scale of Hypnotic Susceptibility (HGSHS): A test score for each hour at which groups were hypnotized. The distribution is bimodal *with peaks at 12:00 noon and 4:00 – 6:00 p.m.* and a local minimum at 2:00 p.m. (p. 143, italics added). ... The results provide preliminary evidence that hypnotizability may be related to the circadian rhythm of body temperature." (pg. 144).

Aldrich & Bernstein hypothesize their results provide preliminary evidence that hypnotizability may be related to the circadian rhythm of body temperature at the physiological level. As may be seen, the circadian profile of core body temperature in Figure 3b is also bimodal and closely approximates the circadian profile of hypnotic susceptibility in Figure 3a. Figure 3c illustrates the circadian expression profile of the *Thra* gene, which is also bimodal and resembles the circadian profiles of hypnotic susceptibility and body temperature. The *Thra* gene, coding for the thyroid hormone receptor-alpha, is itself induced by the thyroid hormones T3 and T4, which are fundamental in regulating the physiological work of metabolism and *body temperature* (Storch, et al., 2002). *This turning on the thra gene could explain the warmth and heat that "Fig" Newton, Milton Erickson, and David Cheek found in their patients' experiences with their intensity of emotional crises during hypnotherapeutic work. We hypothesize this is an example of how mind, cognition, and emotions are causal in turning on gene expression to facilitate "mind-body" healing via therapeutic hypnosis and psychotherapy.*

Figure 3d illustrates the circadian expression profile of the clock gene *period* (*per1*), which is associated with many daytime activities in humans, and resembles the circadian profiles of hypnotic susceptibility and body temperature even more closely than the *thra* gene. Notice how the circadian profiles of the *per1* and *thra* gene are similar in having a peak of expression about 90-120 minutes before the peaks of core body temperature and hypnotic susceptibility around noon. This is consistent with the fact that the 90-120 minute *Ultradian Basic Rest-Activity Cycle* is typical for many genes to be expressed via gene transcription and translation into the proteins that ultimately generate their physiological and cognitive-behavioral profiles of circadian expression (Lloyd & Rossi, 1992, 2008; Rossi, 1992). *It is also consistent with the fact that Milton H. Erickson's therapeutic sessions also lasted about 90-120 minutes.*

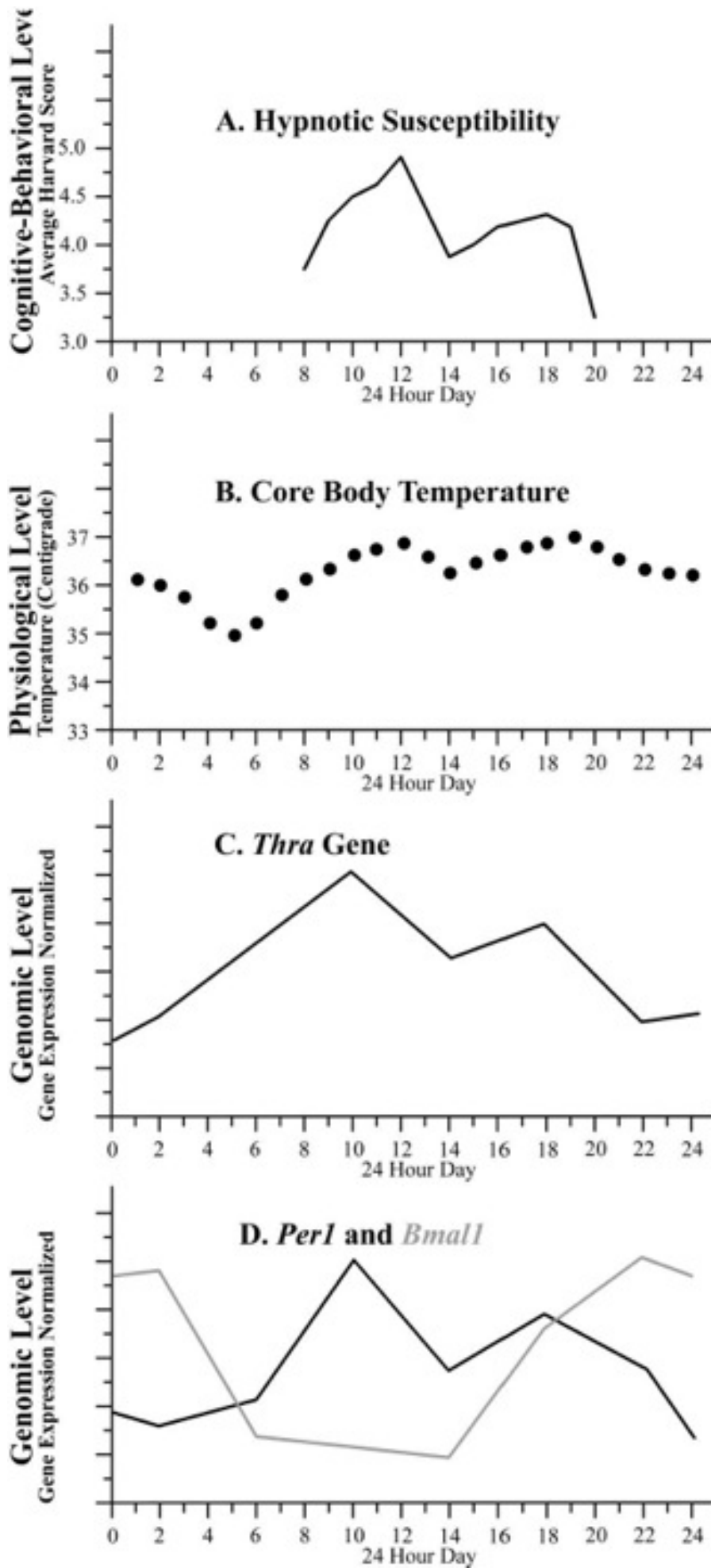


Figure 3: The bioinformatics of hypnotic susceptibility across all levels. A. The bimodal circadian profile of Hypnotic Susceptibility is similar to B. Core Body Temperature, C. *Thra* gene expression, and D. Period one (*Per 1*) gene expression (Nestler, E., 2008).

Figure 3d also illustrates the circadian profile of the *bmal1* gene associated with the sleep state (the opposite of the *per1* and *thra* gene profiles associated with being awake). Storch et al.'s (2002) research on the circadian modulation of gene expression related to body temperature, psychosocial stress (the glucocorticoids), and the immune system (tumor necrosis factor alpha) are of great interest for a psychobiologically oriented approach to therapeutic hypnosis and psychoneuroimmunology at the genomic level. The *ad hoc* assemblage of matched bi-modal circadian profiles of Figure 3 is consistent with *but certainly do not yet prove* that there are causal and reciprocal relationships in the complex interactions between the cognitive-behavioral level of hypnotic susceptibility, gene expression, and brain plasticity. Such proof would require many novel types of integrative bioinformatic research by the hypnosis community, which can be illustrated by the pioneering neuroscience of Sidarta Ribeiro in the emerging science that we now call, "psychosocial genomics."

Gene Expression, Brain Plasticity, and Memory Processing in a Psychosocial Genomic Model of Creative Psychotherapy and Therapeutic Hypnosis

Milton Erickson described therapeutic hypnosis as the *utilization of naturalistic processes of mind and body*. Today neuroscience is exploring these naturalistic processes with brain imaging and the molecular-genomic methods of DNA microarrays. This is well illustrated by Figure 4, which is Sidarta Ribeiro et al.'s (2007) neuroscience model of how the human cortex and hippocampus engage in a daily dialogue to update new memory and learning in the brain. *Please note how profound this is for understanding the deep psychobiology of therapeutic hypnosis and psychotherapy!* Many people still believe that genes are active only during biological reproduction and physiological activities. We now know, however, that special classes of genes called, "activity-dependent" (or "experience dependent") are activated or "turned on" by many normal, creative and stressful life experiences (e.g. PTSD), associated psychiatric conditions such as major depression, bipolar disorder, and schizophrenia (Cousin, 2008). *The psychological level can turn on the biological activity of gene expression and activity-dependent brain plasticity in our physical brain and body. This is the essence of psychosocial genomics and top-down mind-body therapy!* This is how modern neuroscience has validated the essence of James Braid's (1855/1970) prescient statement about "the reciprocal actions of mind and matter upon each other" quoted above.

The process illustrated by Riberio begins while we are awake when we experience the three types of behavior that turn on "activity-dependent" gene expression and brain plasticity: *novelty, enrichment, and exercise, mental as well as physical* (Rossi, 2002, 2004a, 2007). The hippocampus activates gene expression and brain plasticity to make a temporary

neural network recording of novel and highly salient interactions with the environment. *Think of this as the typical patient having a novel and numinous emotional experience narrating her personal story tremulously for the first time and getting some new insights about her life with the psychotherapist.* Later during sleep the hippocampus repeatedly replays this novel experience to the cortex during slow wave sleep (SWS), which stimulates the cortex to turn on "activity-dependent gene expression and brain plasticity" to update the brain/mind in an evolutionary adaptive manner during rapid eye movement (REM dream) sleep. Ribeiro et al. (2007) found that two brain plasticity-related immediate-early genes, *arc* and *zif-268*, are central to this process of consolidating new memory and learning. *Think of this as the post-hypnotic process of how the brain/mind utilizes the therapist's permissive suggestions (which we now call "implicit processing heuristics") to facilitate mind-body healing.*

The dynamics of activity-dependent gene expression and brain plasticity, which underpin the creative psychosocial genomic process of therapeutic hypnosis and psychotherapy as well as the arts and sciences throughout human history are illustrated in Figures 5, 6a & 6b, and 7

It will certainly require decades of research to document the many genes associated with psychosocial genomic dynamics of therapeutic hypnosis, meditation and psychotherapy but a beginning has already been made (Lichtenberg, 2000, 2004; Raz, 2008; Rossi, 1986/1993, 2002, 2004a, 2004b, 2007). We are currently conducting studies with a research team in Italy exploring gene expression and brain plasticity during therapeutic hypnosis and psychotherapy (Cozzolino, et al., 2014a, b, Rossi, et al. 2008,). We have found many significant up- and down-regulated genes in our Psychosocial Genomic studies. If we find the *arc*, *comt*, *DRD4*, *MAOA*, *zif-268* and many more genes expressed during these studies, it will be another link to further support the emerging neuroscience of psychosocial genomics and a deeper appreciation of therapeutic hypnosis, psychotherapy, and creative human experience on all levels of mind and body. Figures 8a-d illustrate our current psychosocial genomic vision and open questions about how the four stages of the creative process became manifest in "A Sensitive Fail-Safe Approach to Hypnosis" (video recorded demonstration of therapeutic hypnosis at an Ericksonian congress, available from the MHE foundation code IC-92-D-V8). Additionally, chapters seven and eight of *The Psychobiology of Gene Expression* (Rossi, 2002) contain the entire verbatim transcription and detailed analysis of this video.

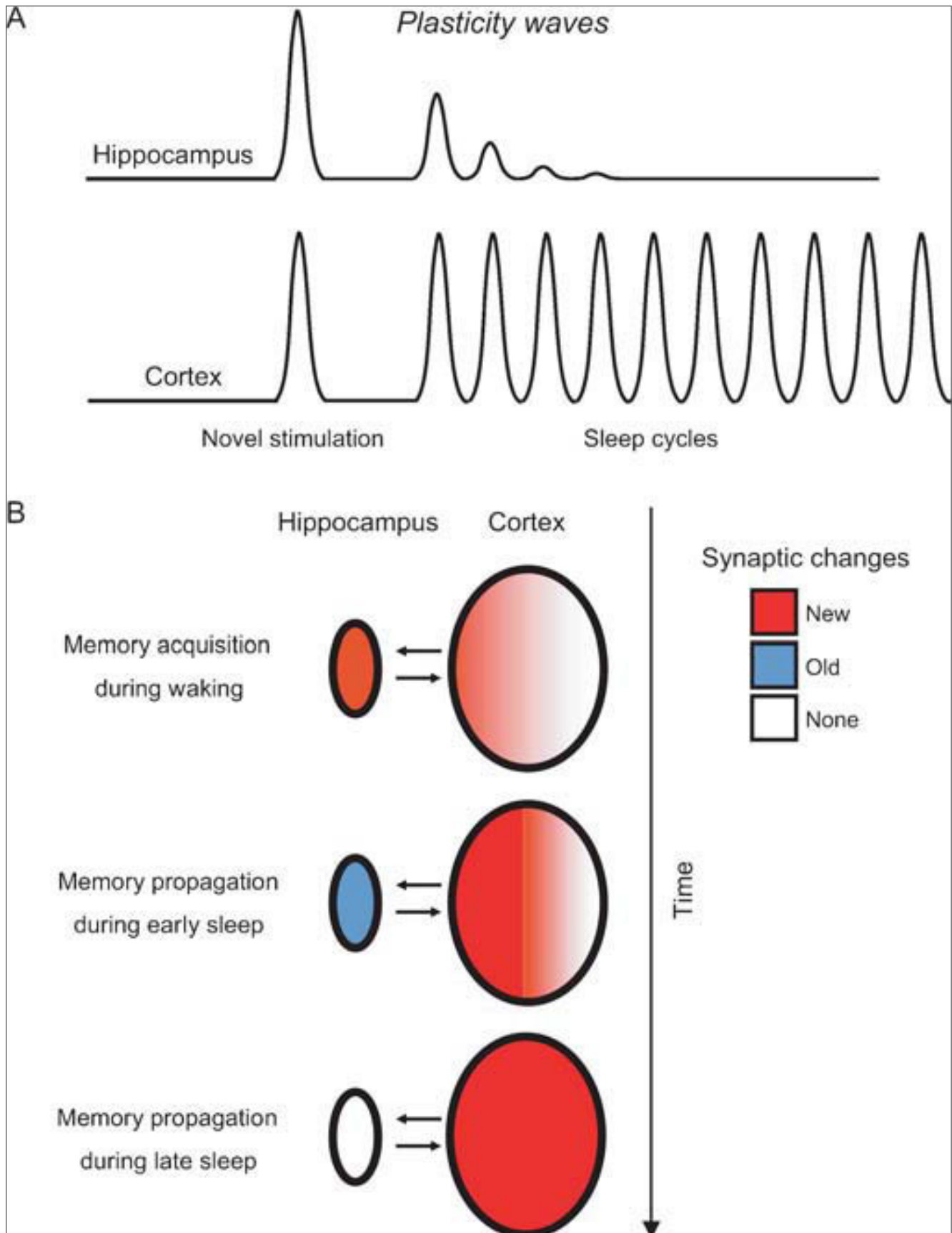


Figure 4. Ribeiro's modeling of the hippocampus-cortical dynamics of new memory and learning. A. The hippocampus initially undergoes a few waves of brain plasticity before fading out. These waves of brain plasticity can maintain memories in the hippocampus for weeks or months. In contrast, the cerebral cortex undergoes plasticity waves for a much longer period of time, leading to many more cycles of memory reinforcement that can last for years. B. A dialogue transfers memory from hippocampus to cortex during slow wave sleep. Episodic and spatial memories acquired during waking by new synaptic changes (shading) are distributed between the hippocampus-cortical networks of neurons (top). The recurrence of cortical plasticity during subsequent sleep stabilizes the propagation of new synaptic changes in the cortex (middle). The relatively fast decay of sleep-dependent plasticity in the hippocampus generates a net outflow of information to associated cortical networks. This clears the hippocampus for the next day's recording of novel and salient waking experiences (bottom). (Ribeiro, 2007)

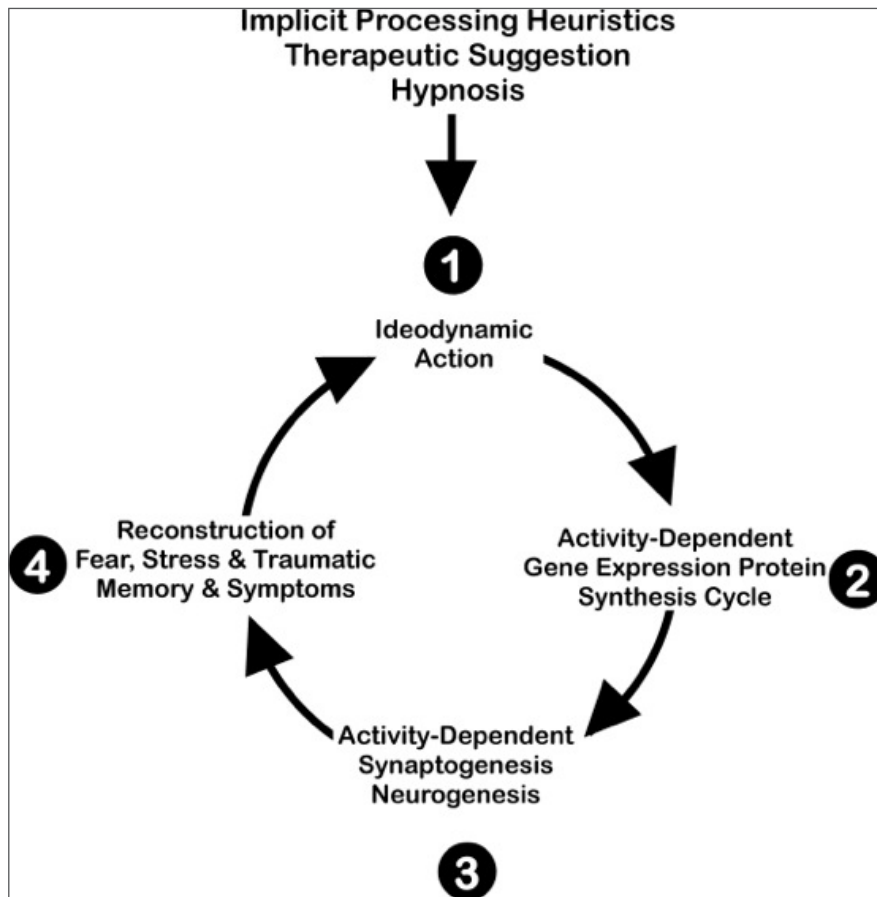


Figure 5: The psychosocial genomics model of therapeutic hypnosis and psychotherapy. Consistent with Ribeiro's neuroscience model of the consolidation of new memory and learning we hypothesize 1. Permissive therapeutic suggestions (implicit processing heuristics) evoke ideodynamic action, which in turn evokes 2. Activity-dependent gene expression, 3. Brain plasticity (synaptogenesis & neurogenesis, and the 4. Reconstruction of fear, stress, and traumatic memory and symptoms.

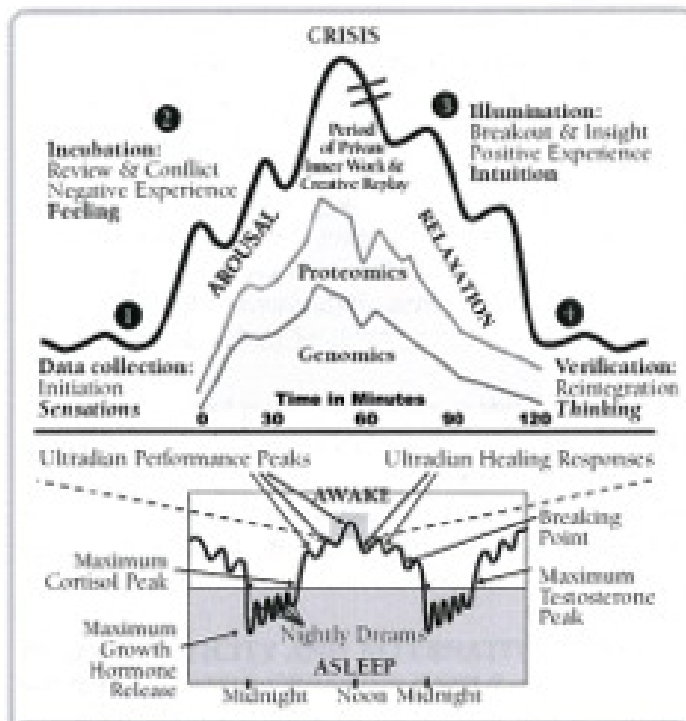


Figure 6a: The Quantum wave form profile of psycho-neuro-physiology during the 4-Stage creative process. The ultradian profile (90-120 minutes) of the 4-Stage creative process shows the psychological level (top most portion of the upper curve). The proteomics (protein) profile in middle curve depicts the energy landscape for protein folding within neurons of the brain into the correct structures needed for brain plasticity (Balch, et al., 2008; Cheung et al. 2004). This proteomic profile arises from the functional concordance of co-expressed genes illustrated by the genomics profile below it. This genomics curve represents the actual gene expression profiles of the immediate-early gene *c-fos* and 10 other genes (alleles) over the typical Basic Rest-Activity (BRAC) period of 90-120 minutes (Levsky, et al., 2002). The lower diagram illustrates how these psychobiological dynamics are typically experienced as Kleitman's 90-120 minute Basic Rest-Activity Cycle within the normal circadian cycle of waking and sleeping (Rossi, 2002, 2004a, 2007).

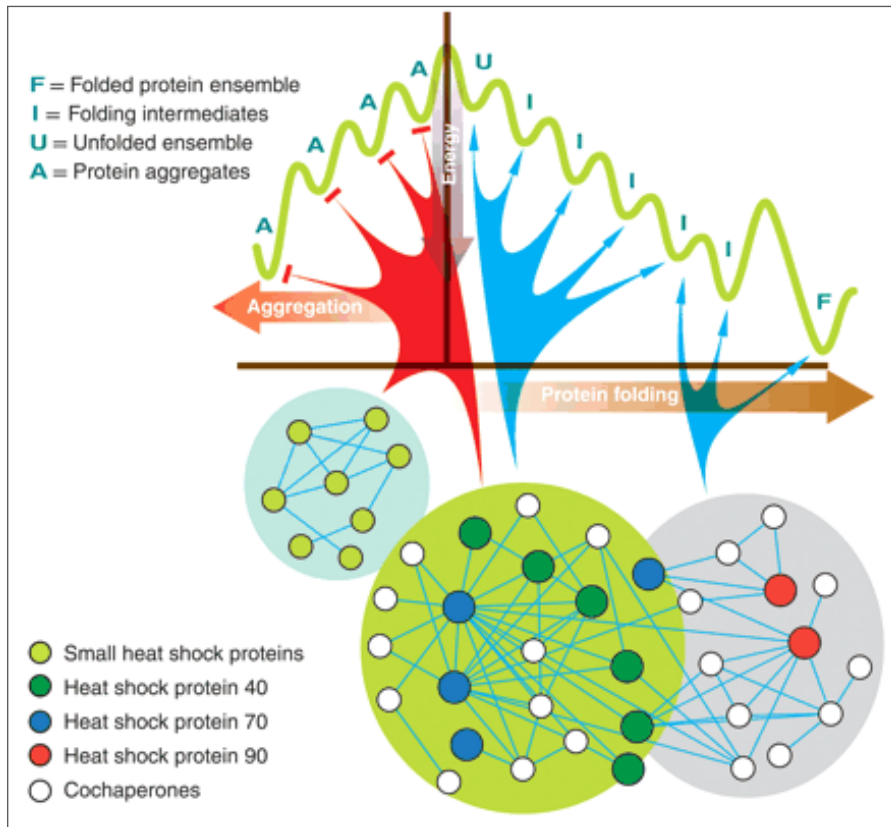


Figure 6b: The Quantum wave form profile of protein dynamics. Protein aggregation and folding are required within cells for physiological processing in development, aging, and disease intervention (Top: wave form profile). Three circular networks of proteins interact with their chaperones (Bottom circles; Balch et al., 2008). Note the essential fractal self-similarity of the pyramidal wave form of arousal and relaxation of Figures 3a and 3d. While the mechanisms of psychobiological clocks may be different, the fractal self-similarity of their psychobiological time domains models how their interactions on all levels from mind to molecule (e.g. from the experiential dynamics nature of therapeutic hypnosis in 6a to genes and proteins in 6b) may be related (Lloyd and Rossi, 2008; Nestler, 2008).

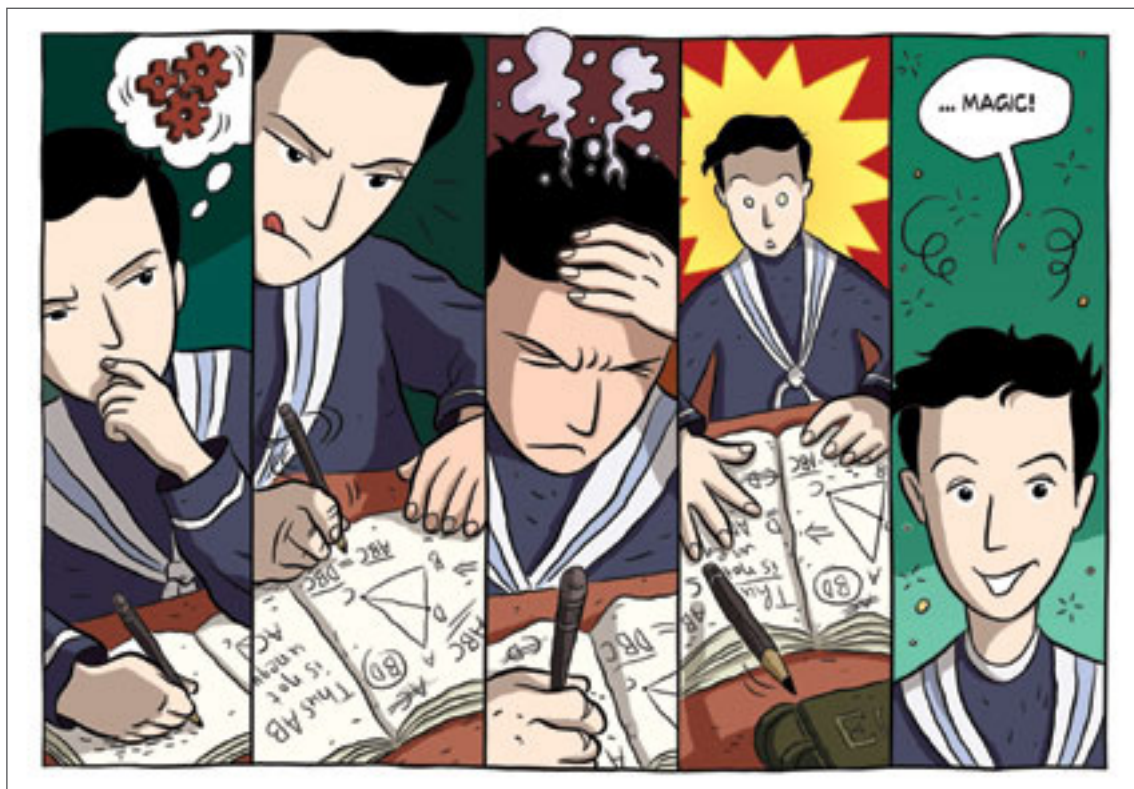


Figure 7: A cartoon of the 4-Stage creative process. Stage One is getting a new idea and starting to work on a problem (first two panels on the left). Stage Two is the typically difficult experience of incubation, struggle, and emotional conflict trying to solve a problem. Stage Three is the creative moment of getting a flash of insight. Stage Four is the happy verification of the problem solution in the real world. (With permission, Tomlin, 2005).



Figure 8a. Stage One: The therapist models a delicately balanced and symmetrical hand position a few inches above the lap to initiate a hand levitation approach to the induction of therapeutic hypnosis. The therapist wonders what stage of the basic rest-activity cycle (BRAC) the patient may be experiencing, whether CYP17 — the social gene — is becoming engaged as a natural manifestation of the psychotherapeutic transference, and to what extent immediate-early genes (IEGs) such as c-fos and c-jun associated with a creative state of psychobiological arousal, problem solving, and healing — are becoming engaged.



Figure 8b. Stage Two: The patient experiences psychobiological arousal (associated with behavioral state-related gene expression (BSGE)). She expresses surprise and confusion about her unusual sensations and involuntary movements that were not suggested by the therapist. The therapist wonders how to facilitate the psychosocial genomics of arousal via the therapeutic hypnosis associated with the comt gene expression (Lichtenberg, et al., 2000, 2004) to turn on immunological variables such as interleukin-1, 2, and 1β associated with Cox2 that may be implicated in rheumatoid arthritis which is the patient's presenting symptom.



Figure 8c. Stage Three: The patient experiences the playful activity-dependent exercise of shadow boxing as a creative breakout of her typically restrained hand and finger movements associated with her rheumatoid arthritis. Future research will be needed to determine if activity-dependent gene expression (ADGE) — such as the CREB genes associated with new memory and learning — as well as the ODC and BDNF genes associated with physical growth and brain plasticity are actually being engaged during such creative moments.

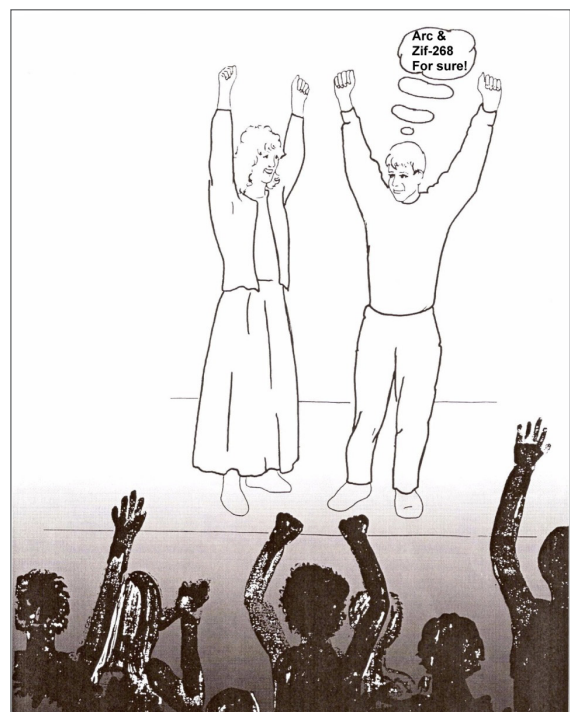


Figure 8d. Stage Four: The patient receives a standing ovation from the audience. The therapist speculates that the arc and zif-268 genes will be expressed in her REM dream states tonight to encode her new therapeutic experiences with brain plasticity supported by this unusually strong show of psychosocial support from the audience.

A Fundamental Quantum Field Theory of Physics, Biology and Psychology

While thousands of books and papers have been published over the past century exploring the possibility of an integrative and holistic understanding of the human condition on the quantum level there still remains much confusion and controversy about applying an integrating quantum science for professionals in the humanities and sciences as well as the general public. Wonderfully accessible yet authoritative and profound introductions to the quantum dynamics of life have been published recently however (Cox & Forshaw, 2011). Lowenstein, 1999, 2013; McFadden, 2000; McFadden & Al-Khalili, 2014; Wilczek, 2015) that present evidence that helps most people understand the significance of quantum science in consciousness, cognition and behavior. The molecular biologist, McFadden (2000), for example, originally proposed the scientific integration of quantum physics, biology and psychology in his highly innovative volume on quantum evolution as follows.

The classical view of the dynamics inside living cells (still the view held by most biologists) was of classical particles perusing independent trajectories through intercellular spaces. This vision allowed biochemists and geneticists to wholeheartedly adopt the reductionist program of dissecting the cell into smaller and smaller pieces, with the expectation of gaining a greater and greater level of understanding. However, now that biology has reached the level of fundamental particles, we must confront the quantum cell, which has revealed itself as a dynamic mosaic of quantum and classical states. Particles can no longer be considered as independent entities but as the products of internal quantum measurement. Quantum mechanics directs us to look up from the fundamental particles and examine the environment measuring them.

Why does this matter? ... Measurement of quantum particles is not ever innocuous; it always affects dynamics. Physicists are normally employed to make quantum measurements, and the choices they make ... affect the dynamics of the systems they study. But now, we have the living cell as an independent quantum-measuring device that measures its own state, so that the choices it makes about what it wishes to measure will influence its internal dynamics.

The environment of the cell arms its quantum-measuring devices and thereby determines the properties that the cell can measure. This will in turn influence the internal dynamics of the cell. This represents a kind of choice, since it is an influence denied to inanimate objects unable to

measure the quantum states of the particles within them. But – at least in simple living systems – the ability to make these choices is not associated with any *conscious* decision. Nevertheless, I do believe that *this ability to make quantum choices is the basis for our sense of volition as conscious beings.* (pgs. 252–253, italics added here)

These carefully considered hypotheses about quantum dynamics as an essential characteristic of all living systems now find further important scientific support from their fundamental role in the RNA/DNA of transcription and translation during the psychosocial genomics of mind-body oriented meditation, psychotherapy and rehabilitation as well as creative work in everyday life.

The Emerging Quantum RNA/DNA Pathways of Psychosocial Genomics

The most dramatic indication of a currently emerging paradigm of the quantum RNA/DNA pathways of psychosocial genomics is celebrated on the June 6th 2016 cover of *Science*, which is reproduced here in Figure 9.

Artist's interpretation of RNA activity (the train represents a ribosome). RNA serves many biological purposes: It carries genetic information, regulates gene expression, and functions as a structural component of cells' molecular building machinery. RNA is replete with signals that control its activity, and its pivotal role in the cell has made it an attractive candidate for development as a therapeutic agent. (pg. 1365)

The Greek symbol for "psychology" and "quantum" is the same: Ψ from the ancient Greek this quantum symbol (ψ) also implies the modern meanings of mind or soul, from which the terms psyche and psychology arose.

The role of the Ψ (ψ) symbol in the *Science* cover illustrates how "Nascent RNA transcripts in eukaryotic cells are chemically modified (red dot) by m^6A , Ψ , and m^5C "writer" enzymes in the nucleus (Gilbert, Bell, & Schaening, 2016). Notice how Figure 9 places an artist's impression of the central role of the Ψ (ψ) symbol of Schrödinger's quantum equation into RNA/DNA signaling. Some significant mathematical relationships of dynamics of Schrödinger's quantum equation with this Ψ (ψ) symbol are illustrated in red in Figure 10.

While Figure 10 identifies Schrödinger's quantum equation with this Ψ (ψ) symbol in the fundamental mathematics of physics (Nave, 2016), the advent of quantum biology documents how these quantum level processes operate on the information signaling of RNA/DNA in the transformational molecular dynamics of enzymes in all life processes (Loewenstein, 2013; McFadden, 2000). As carefully noted regarding the skepticism about Schrödinger's (1953) original claim that all life involves quantum level on the biological level McFadden & Al-Khalili explains:



Figure 9. The Science June 17th 2016 cover with an artist's impression of the quantum Ψ (Psi) symbol in the core dynamics of RNA/DNA informational signaling.

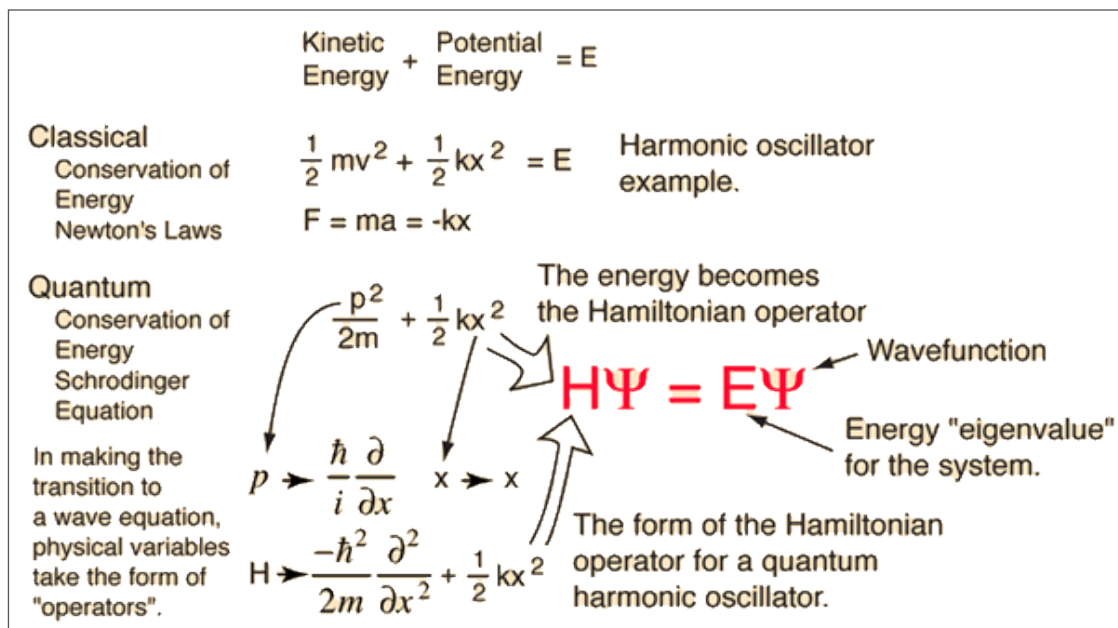


Figure 10. The dynamics of Schrödinger's equation with the Ψ (psi) symbol that is now well recognized in an integrated Quantum Field Theory of the fundamental mathematics of physics (Nave, 2016), which we generalize to quantum biology and psychology.

Much of the skepticism of Schrödinger's quantum equation attracted at the time was rooted in the general belief that the delicate quantum states couldn't possibly survive in the warm, wet and busy molecular environments inside living organisms ... But, as both Jordan and Schrödinger argued ... life is different from inanimate objects because relatively small numbers of highly ordered particles, such as those inside a gene or the avian compass [in a bird's brain], can make a difference to an entire organism. *This is what Jordan termed amplification and Schrödinger called order from disorder. The color of your eyes, the shape of your nose, aspects of your character, your level of intelligence and even your propensity to disease have in fact all been determined by precisely forty-six highly ordered supermolecules: the DNA chromosomes you inherited from your parents. No inanimate*

macroscopic object in the known universe has this sensitivity to the detailed structure of matter at its most fundamental level – a level where quantum mechanical rather than classical laws reign. Schrödinger argued that this is what makes life so special. In 2014, seventy years since Schrödinger (1967) first published his book, we are finally coming to appreciate the startling implications of the extraordinary answer he provided to the question: What is life? (McFadden & Al-Khalili, 2014, pgs. 56-58, italics added here).

Gilbert, Bell and Schaening (2016) Illustrate the quantum locations of some of these "writer" enzymes within the DNA of the nucleus of cell of life in Figure 11.

RNA contains more than 100 distinct modifications that promote the functions of stable noncoding RNAs in translation and splicing. Recent technical advances have revealed widespread and sparse

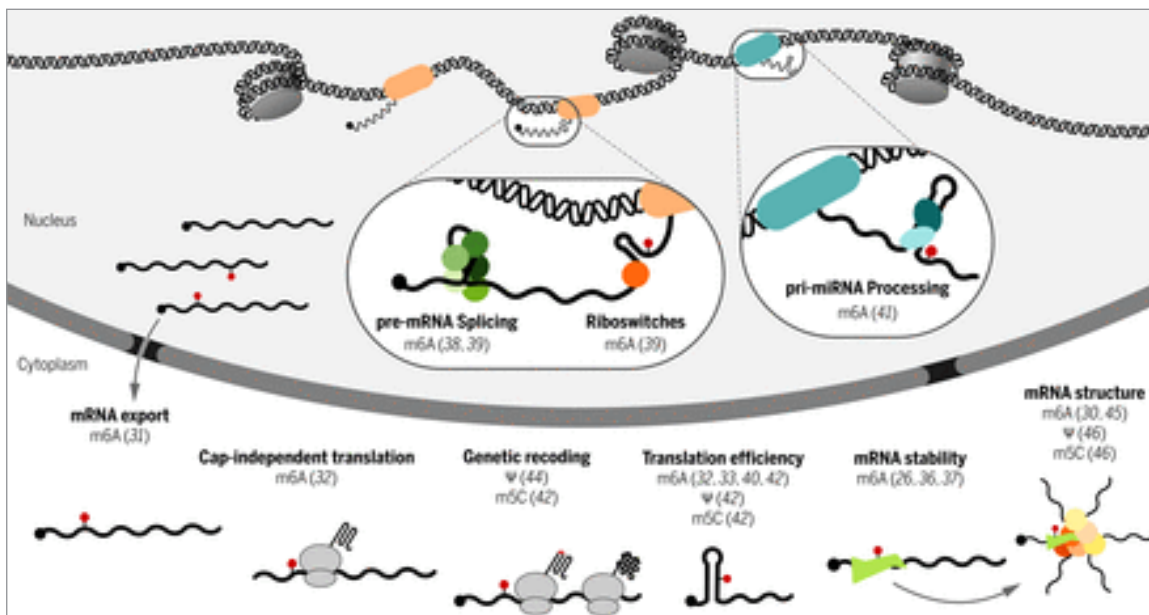


Figure 11. An illustration of some of the quantum level "writer" enzymes within the DNA during Genetic Recording, Translational Efficiency and mRNA Structure (Gilbert, Bell and Schaening, 2016).

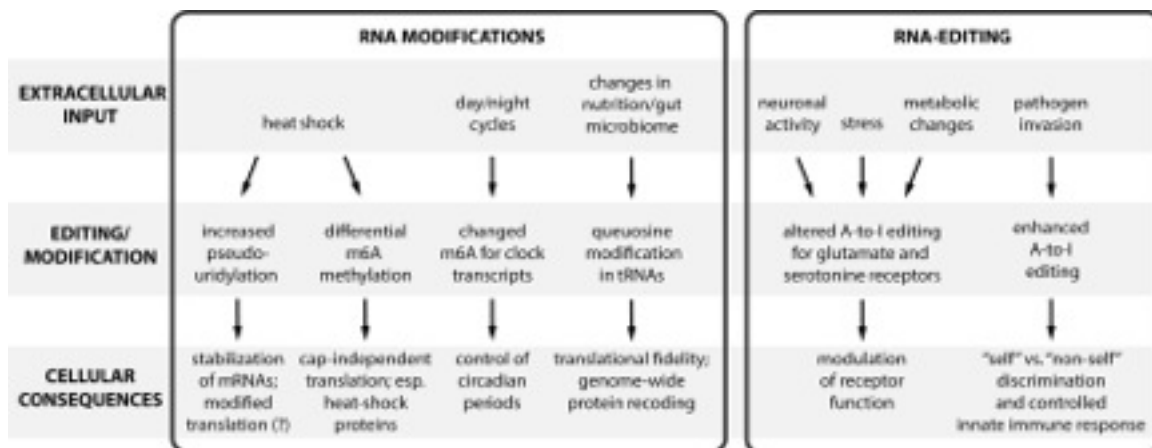


Figure 12. A summary of psychosocial genomic factors related to stress, neuronal activity, nutrition, "Self" and "Non-Self" of the immune system and the daily circadian cycle at the quantum level (adapted from Licht & Janish, 2016).

modification of messenger RNAs with N6-methyladenosine (m6A), 5-methylcytosine (m5C), and pseudouridine (Ψ). Here we discuss the rapidly evolving understanding of the location, regulation, and function of these dynamic mRNA marks, collectively termed the epi-transcriptome. We highlight differences among modifications and between species that could instruct ongoing efforts to understand how specific mRNA target sites are selected and how their modification is regulated. Diverse molecular consequences of individual m6A modifications are beginning to be revealed, but the effects of m5C and Ψ remain largely unknown. Future work linking molecular effects to organismal phenotypes will broaden our understanding of mRNA modifications as cell and developmental regulators (p.1408).

Further details of these largely unknown functions of Ψ and other “writer” enzymes within the DNA of the nucleus of cell, particularly how they are related to neuronal activity, stress, the daily circadian cycle in Figure 12 by Licht & Janish (2016).

Advances in next-generation sequencing and mass spectrometry have revealed widespread messenger RNA modifications and RNA editing, with dramatic effects on mammalian transcriptomes. Factors introducing, deleting, or interpreting specific modifications have been identified, and analogous with epigenetic terminology, have been designated “writers,” “erasers,” and “readers.” Such modifications in the transcriptome are referred to as epi-transcriptomic changes and represent a fascinating new layer of gene expression regulation that has only recently been appreciated. Here, we outline how RNA editing and RNA modification can rapidly affect gene expression, making both processes as well suited to respond to cellular stress and to regulate the transcriptome during development or circadian periods.

Integrating the Fundamental Quantum Field Theory (QFT) of Physics, Biology and Psychology with the Observer/Operator Effect in the Psychosocial Genomics of Psychotherapy

We now propose that this deeper perspective integrating the quantum world view of physics, biology and psychology is currently emerging with new insights into uncertainty, expectancy, and what we call the observer/operator effect in psychotherapy. It was a difficult paradigm breaking problem for Newtonian classical physics to realize that the inner mind–brain observer could interfere with the observed in the outside world. *In other words, the so-called objective scientific measurements of the outside world by physics and biology are dependent on the*

perceptions of the inner subjective world of psychology. We now propose that the physicist’s problem of quantum observations, the so-called weird or paradoxical measurements of the atoms (and even subatomic particles such as photons of light and the electrons of atoms and molecules of life) may be transformed into an opportunity for integrating the fundamentals of physics, biology, psychology and psychotherapy. We propose to call this integration the *observer/operator effect*, which we illustrate in Figure 13.

Notice how observer/operator (conscious/unconscious) transitions on the quantum level are illustrated in Figure 13. Making novel, numinous and highly salient *observations at Stage 2* of the classical/quantum (consciousness/unconsciousness) interface automatically *operates* on the molecular epigenomic level of brain plasticity. Stage 4 of the quantum/classical interface updates the new expectancy, consciousness, cognition, and behavior. Summary outlines of these cyclic classical-to-quantum and quantum-to-classical transitions

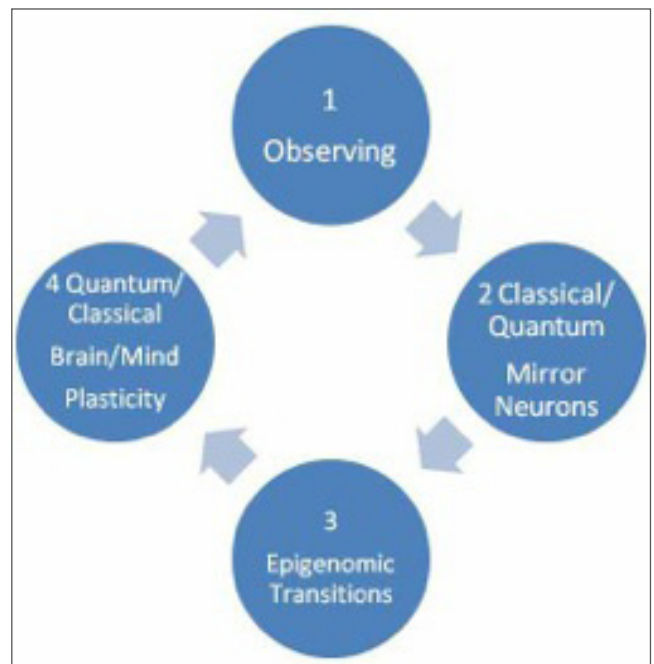


Figure 13. On the fundamental quantum level, the observer/operator effect is the basic insight and central dynamic for an integrative science of physics, biology and psychology.

of consciousness, cognition and behavior are characteristic of the 4-Stage creative cycle and the 90-120-minute Basic Rest-Activity Cycle (BRAC) of everyday life have been previously published from many perspectives in great detail (Rossi, 2002; Rossi & Rossi, 2016a, 2016b)

The upshot for an integrated science of physics, biology and psychology as well as a psychotherapy of consciousness/unconsciousness (classical/quantum) is evident in Figure 13. These quantum < Conscious | Ψ | Unconscious > transitions experienced in everyday

life as well as counseling, meditation, coaching, mindfulness, translational medicine and so forth are profound. Any novel and numinous (fascinating, mysterious, tremendous, spiritual, (Otto, 1923/1958) *conscious observations* that are experienced by the therapist and/or the patient automatically *operate unconsciously* to transform both of them on the quantum level of activity-dependent gene expression and brain plasticity (Rossi, 2002; Rossi & Rossi, 2014a, 2014b, 2016a). This *observer/operator effect* begins as a very *delicate small quantum qualia* of sensation, perception, and meaning in subjective experience and/or transference. *We propose that amplifications of these very sensitive small subjective*

In quantum mechanics, quantities such as energy and mass are not continuous; instead they come in discrete lumps, or quanta. Paradoxically these quanta have dual wave-particle identity, described mathematically by a quantum mechanical wave-function equation that is supposed to represent something existing in outside reality. A recent school of thought called quantum Bayesian (Caves, Fuchs, & Schack, 2001; Fuchs, 2001, 2010, 2011, 2012), however, reinterprets the wave function as a subjective psychological belief system governed by the rules of Bayesian statistics, so that the so-called mysterious and weird physical paradoxes of quantum mechanics vanish. *We now propose that the physicist's problem*

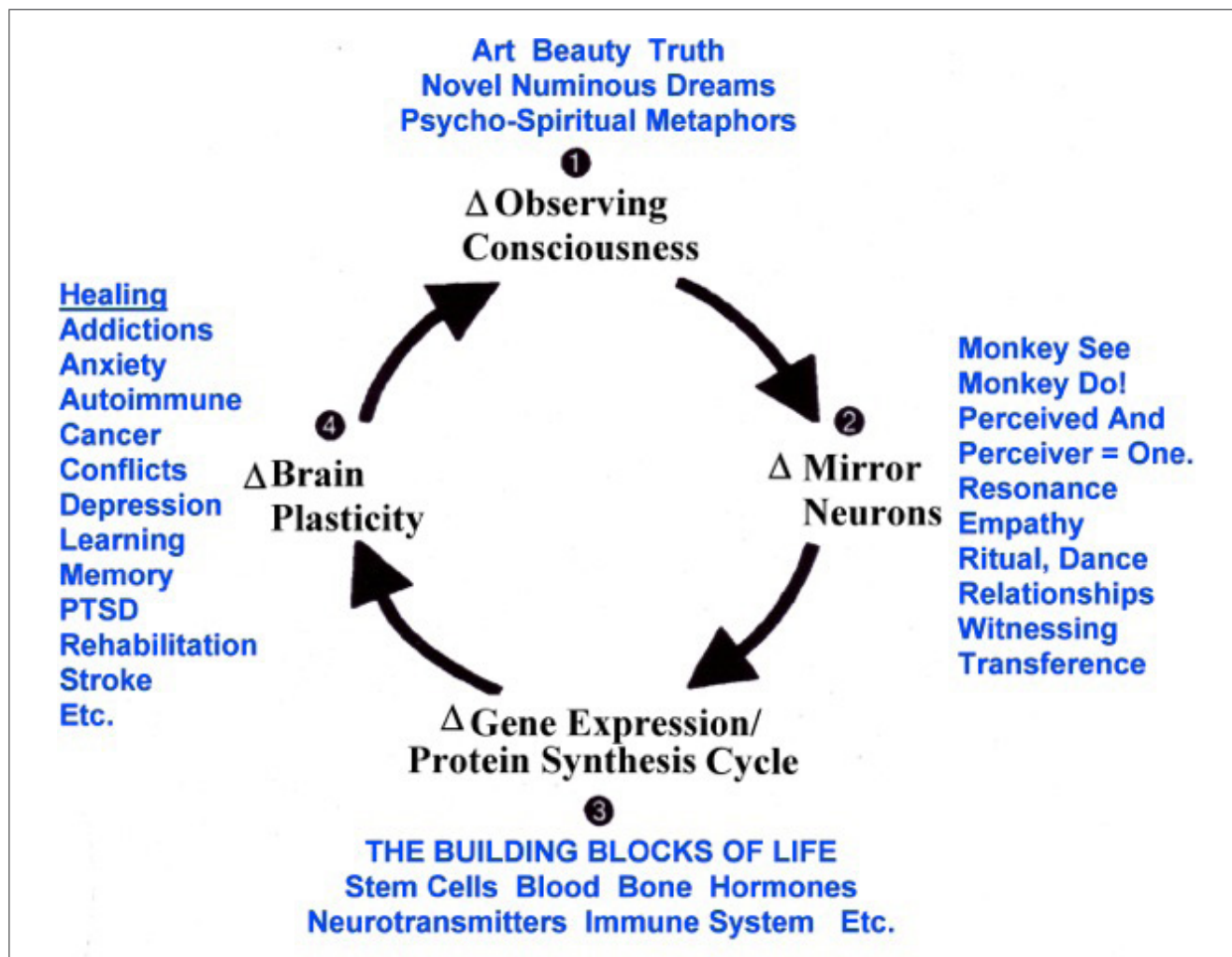


Figure 14. The 4-Stage cycle of health, stress, illness and rehabilitation within individuals, cultures and societies as an integration of art, beauty and truth in the quantum field theory of all schools of mind-body psychotherapy.

quantum qualia of psychological transformation can be causal in mediating objectively measured RNA/DNA cascades of epigenetic activity-dependent gene expression and brain plasticity that underpin new states of consciousness, cognition, behavior and rehabilitation (Doidge, 2015; Rossi, 2002, 2004, 2007, 2012).

Over the past century, quantum field theory has become the most accurate science on atomic as well as cosmic scales of observation and measurement.

of paradoxical quantum observations (measurements) may be transformed into an opportunity for psychology, mind-body psychotherapy, meditation is called the observer/operator effect. The upshot for psychotherapy and society in general is that any novel and numinous observation that is made by people in *positive empathic relationships* automatically operates to transform activity-dependent epigenetic gene expression and brain plasticity, which underpins

new therapeutic states of creative consciousness and cognition associated with rewarding emotional experience, and social relationships (Rossi, 2002, 2012; Rossi & Rossi, 2016a, 2016b).

But let us beware: If we persist in *negative competitive relationships* (typical of people stuck in Stage 2 of the psychosocial genomic 4-Stage creative cycles of the Basic Rest-Activity 90-120 minute cycles of everyday life) we fall into dismal, depressive, destructive and dissociative states of lying, cheating and eventually war! How simple these psychological insights seem! Even children understand them when they get tired, cranky and need to take a nap. In Figure 14 we summarize these scientific observations as a 4-Stage cycle of health, stress, illness and rehabilitation within individuals, cultures and societies.

Notice how anything that aids our *capacity of observation* from electron microscopes to gigantic telescopes increases our *potential power of operating* for good or ill. We still have to learn, however, how to *observe with quantum delicacy* and make choices to *operate with appropriate wisdom*.

Summary

We certainly have come a long way from the early approaches of historical hypnosis and our teachers such as Bernauer Newton, Milton Erickson, and David Cheek. These are a few of the emerging principles of the psychosocial genomics of therapeutic hypnosis, psychotherapy, and creativity now require further confirmation.

1. Normal, novel, creative, and stressful psychosocial activities in everyday life turn on patterns of activity-dependent gene expression and brain plasticity on the quantum level that can now be measured in real time with DNA microarrays and brain imaging. This is becoming recognized as a foundation of personalized medicine, therapeutic hypnosis and psychotherapy.

2. Novel and salient activities when we are awake are replayed in dialogues between our brain cortex and hippocampus during slow wave sleep and REM dreaming to update memory and learning in an evolutionary adaptive manner.
3. *These quantum level state-dependent neural "dialogues" are a new model for the so-called creative unconscious of the psychosocial genomic foundations of modern mind-body psychotherapy as well as the cultural, historical and traditional holistic practices and rituals of meditation and medicine.*
4. Mindfulness, psychotherapy and virtually all the therapeutic arts can facilitate our natural circadian/ultradian cycles of waking, sleep, and dreaming to evoke creative psychosocial genomic patterns of optimal performance, rest and healing on many levels from mind to gene.
5. The tragic effects habitual stress, trauma and disruption that leaves many people stuck in Stage two of the natural creative cycle is the source of conflict, psychopathology, psychosomatic illness and war.
6. A gentle and empathic education can help us recognize how the normal 90-120 minute basic-activity cycles of everyday life could optimize the novel and numinous quantum qualia of the 4-Stage creative cycles of work in the arts, humanities and sciences.
7. Extending our culture of teaching, training, mentorship, and research in psychology, human relationships and psychotherapy is a positive and compassionate exercise in facilitating the delicate observer/operator effect of insight and learning via the gentle and sensitive quantum dynamics of psychosocial genomics in everyday life as well as the arts, humanities and sciences.

References

- ALDRICH, K., & BERNSTEIN, D. (1987). *The effect of time of day on hypnotizability*. *International Journal of Clinical & Experimental Hypnosis*, 35, 141-145.
- BARABASZ, A, BARABASZ, M (1996) "Neurotherapy and Alert Hypnosis in the Treatment of Attention Deficit Hyperactivity Disorder" Casebook of Clinical Hypnosis, Kirsch, J., and Rhue, S eds., American Psychological Association, pgs. 271-291.
- BALCH, W., MORIMOTO, R., DILLIN, A., KELLY, J. (2008). *Adapting proteostasis for disease intervention*. *Science*, 319, 916-919.
- BRAID, J. (1955/1970). *The Physiology of Fascination: The Critics Criticized*. In TINTEROW, M. (ed.). *Foundations of Hypnosis: From Mesmer to Freud*. Springfield, IL: Thomas.
- CÁCERES, M., LACHUER, J., ZAPALA, M., REDMOND, J., KUDO, L., GESCHWIND, D., LOCKHART, D., PREUSS, T. AND BARLOW, C. (2003). *Elevated gene expression levels distinguish human from non-human primate brains*. *Proceedings of the National Academy of Scientists*, 100, 13030-13035.
- CAVES, C., FUCHS, C. & SCHACK, R. (2001). *Quantum Probabilities as Bayesian Probabilities*. ArXiv:quant-ph/0106133v2, 1-6.
- CHEUNG, M., CHAVEZ, L., & ONUCHIC, J. (2004). *The energy landscape for protein folding and possible connections to function*. *Polymer*, 45, 547-555.
- COUZIN, J. (2008). *Gene tests for psychiatric risk polarizes researchers*. *Science*, 319, 274-277.
- COX, B. & FORSHAW, J. (2011). *The Quantum Universe: And Why Anything that can Happen, Does*. NY: DeCaprio Press.
- COZZOLINO M, IANNOTTI S, CASTIGLIONE S, CICATELLI A, ROSSI K & ROSSI E. (2014a). *A bioinformatic analysis of the molecular-genomic signature of therapeutic hypnosis*. *The International Journal of Psychosocial Genomics: Consciousness and Health Research*. Vol. 1, (1), 6-11.
- COZZOLINO M, TAGLIAFERRI R, CASTIGLIONE S, FORTINO V, CICATELLI A, GUARINO F, NAPOLITANO F, RAICONI G, CELIA G, DE LUCA P, FUSCO F, ROSSI K, ROSSI E & IANNOTTI S (2014b). *The Creative Psychosocial and Cultural Genomic Healing Experience: A new top-down epigenomic psychotherapeutic protocol*. *International Journal of Psychosocial Genomics: Consciousness and Health Research*. Vol. 1, (1), 18-26.
- DOIDGE, N. (2015). *Hypnosis, neuroplasticity, and the plastic paradox*. *American Journal of Clinical Hypnosis*, 57, 3, 349-354.
- ERICKSON, M. (1964/2008). *The burden of responsibility in effective psychotherapy*. *The American Journal of Clinical Hypnosis*, 6, 269-271. Reprinted in *The Collected Works of Milton H. Erickson*. Phoenix, AZ: The Milton H. Erickson Foundation Press.
- ERICKSON, M. & ROSSI, E. (1979/2014). *Hypnotherapy: An Exploratory Casebook*. Vol 11. *The Collected Works of Milton H. Erickson*. Phoenix, AZ: The Milton H. Erickson Foundation Press.
- ERICKSON, M. & ROSSI, E. (edited by: Rossi, E., Erickson-Klein, R. & Rossi, K.), (1981/2014). *Experiencing Hypnosis: Therapeutic Approaches to Altered States*. Vol 12 *The Collected Works of Milton H. Erickson*. Phoenix, AZ: The Milton H. Erickson Foundation Press.
- FUCHS, C. (2001). *Quantum Foundations in the Light of Quantum Information*. arXiv: [quant-ph/ 0106166v1.pdf.
- FUCHS, C. (2010). *QBism, the Perimeter of Quantum Bayesianism*. arXiv:1003.5209v1.pdf.
- FUCHS, C. (2011). *Coming of Age with Quantum Information: Notes on a Paulian Idea*. Cambridge University Press.
- FUCHS, C. (2012). *Interview with a Quantum Bayesian*. arXiv:1207.2141v1.pdf
- GILBERT, W. TRISTAN A. BELL, T. SCHAENING, C. (2016). *Messenger RNA modifications: Form, distribution, and function*. *Science*, 352 (6292),1408-1412.
- HAUTKAPPE, H. & BONGARTZ, W. (1992). *Heart-Rate Variability as in Indicator for Post-Hypnotic Amnesia in Real and Simulating Subjects*. In BONGARTZ, E. (Ed.), (1992). *Hypnosis: 175 Years after Mesmer: Recent Developments in Theory and Application*. Konstanz: Universitätsverlag.
- KANDEL, E. (1998). *A new intellectual framework for psychiatry?* *American J. Psychiatry*, 1998, 155, p 460.
- LEVSKY, J., SHENOY, S., PEZO, C., & SINGER, R. (2002). *Single-Cell Gene Expression Profiling*. *Science*, 297, 836-840.
- LICHT, K. AND JANTSCH, M. (2016). *Rapid and dynamic transcriptome regulation by RNA editing and RNA modifications*. *Journal of Cell Biology*, 213(1), 15-22.
- LICHTENBERG, P., BACHNER-MELMAN, R., GRITSENKO, I., EBSTEIN, R. (2000). *Exploratory association study between catechol-O-methyltransferase (COMT) high/low enzyme activity polymorphism and hypnotizability*. *American J. Medical Genetics*, 96, 771-774.
- LICHTENBERG, P., BACHNER-MELMAN, R., EBSTEIN R., CRAWFORD., H. (2004). *Hypnotic susceptibility: multidimensional relationships with Cloninger's Tridimensional Personality Questionnaire, COMT polymorphisms, absorption, and attentional characteristics*. *International Journal Clinical of Experimental Hypnosis*. 52, 47-72.
- LLOYD, D. & ROSSI, E. (Eds.) (1992). *Ultradian Rhythms in Life Processes: An Inquiry into Fundamental Principles of Chronobiology and Psychobiology*. New York: Springer-Verlag.
- LLOYD, D. & ROSSI, E. (2008). *Ultradian Rhythms from Molecules to Mind: A New Vision of Life*. NY: Springer.
- LOEWENSTEIN, W. R. (1999). *The touchstone of life: Molecular information, cell communication, and the foundations of life*. New York, NY: Oxford University Press.
- LOEWENSTEIN, W. R. (2013). *Physics in mind: A quantum view of the brain*. New York, NY: Basic Books.

- McFADDEN, J. (2000). *Quantum evolution: How physics' weirdest theory explains life's biggest mystery*. New York, NY: Norton.
- McFADDEN, J. & AL-KHALILI, J. (2014). *Life on the edge: The coming of age of quantum biology*. New York, NY: Crown.
- NAVE, R. (2016). <http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html> [Website]. Department of Physics and Astronomy, Georgia State University, Atlanta.
- NESTLER, E. (2008). *Answers across all levels*. Nature, 451, 1033.
- OTTO, R. (1923/1958). *The Idea of the Holy*. NY: Oxford University Press.
- RAZ, A. (2008). *Genetics and neuroimaging of attention and hypnotizability may elucidate placebo*. International Journal of Clinical and Experimental Hypnosis. 56 (1): 99-116.
- RIBEIRO, S., SHI, X., ENGELHARD, M., ZHOU, Y., ZHANG, H., GERVASONI, D., LIN, S., WADA, K., LEMOS, N., AND NICOLELIS, M. (2007). *Novel experience induces persistent sleep-dependent plasticity in the cortex but not in the hippocampus*. Frontiers in Neuroscience, 1(1), 43-55.
- ROSSI, E. (1973). *Psychological Shocks and Creative Moments in Psychotherapy*. The American Journal of Clinical Hypnosis, 16, 9-22.
- ROSSI, E. (1986/1993). *The Psychobiology of Mind-Body Healing: New Concepts of Therapeutic Hypnosis* (2nd Edition). New York: W. W. Norton.
- ROSSI, E. (1992). *Periodicity in self-hypnosis and the ultradian healing response: A pilot study*. Hypnos, 19, 4-13.
- ROSSI, E. (2002). *The Psychobiology of Gene Expression: Neuroscience and Neurogenesis in Therapeutic Hypnosis and the Healing Arts*. N.Y.: W. W. Norton Professional Books. ISBN: 0 – 393 – 70343 – 6.
- ROSSI, E. (2004a). (Translator & Editor, Salvador Iannotti: Saiannot@tin.it) *Discorso Tra Geni* [Italian]. *A Discourse with Our Genes: The Psychosocial and Cultural Genomics of Therapeutic Hypnosis and Psychotherapy*. Benevento, Italy: Editris SAS Press. [Available in Italian and English editions] ISBN 88 – 89396 – 01 – 6. New York: Zeig, Tucker, Theisen.
- ROSSI, E. (2004b). *A Bioinformatics Approach to the Psychosocial Genomics of Therapeutic Hypnosis*. Hypnos, 31:1, 15-21.
- ROSSI, E. (2007). *The Breakout Heuristic: The New Neuroscience of Mirror Neurons, Consciousness and Creativity in Human Relationships: Selected Papers of Ernest Lawrence Rossi*. Phoenix, Arizona: The Milton H. Erickson Foundation Press.
- ROSSI, E., & CHEEK, D. (1988). *Mind-Body Therapy: Methods of Ideodynamic Healing in Hypnosis*. New York: W. W. Norton.
- ROSSI, E., IANNOTTI, S., CASTIGLIONE, S., COZZOLINO, M., & ROSSI, K. (2008). *A Pilot Study of Positive Expectations and Focused Attention via a New Protocol for Therapeutic Hypnosis Assessed with DNA Microarrays: The Creative Psychosocial Genomic Healing Experience*. The Journal of Sleep and Hypnosis. 162. 168.
- ROSSI, E. & ROSSI, K. (2006). *The Neuroscience of Observing Consciousness & Mirror Neurons in Therapeutic Hypnosis*. American Journal of Clinical Hypnosis. 48: 283-278.
- ROSSI, E. & ROSSI, K. (2014a). *An Evolutionary RNA/DNA Psychosocial Genomic Theory of the Transformations of Consciousness: The Quest for Therapeutic Mind/Gene Search Algorithms*. The International Journal for Transformations of Consciousness. Vol. 1, 1-20. <http://www.globetranscons.com>.
- ROSSI, E. & ROSSI, K. (2014b). *Quantum Perspectives of Consciousness, Cognition and Creativity: The Dirac Equation in a New Contour Integral Model of Brain Plasticity*. Journal of Applied & Computational Mathematics. Vol. 3 (6): 183. <http://dx.doi.org/10.4172/2168-9679.1000183>
- ROSSI, E. & ROSSI, K. (2016a). *A Quantum Field Theory of Life and Consciousness: The Quantum Heat Engine of Psychosocial Genomics*. International Journal of Psychosocial and Cultural Genomics: Consciousness and Health Research, 2, 1, 11-34.
- ROSSI, E. & ROSSI, K. (2016b). *How Quantum Field Theory Optimizes Neuropsychotherapy*. The Neuropsychotherapist, 4, 4, 14-25.
- ROSSI, E., ROSSI, K., YOUNT, G., COZZOLINO, M. & IANNOTTI, S. (2006). *The Bioinformatics of Integrative Medical Insights: Proposals for an International PsychoSocial and Cultural Bioinformatics Project*. Integrative Medicine Insights. 2, 7-26. Open Access on line: <http://www.la-press.com/integmed.htm>.
- SCHRÖDINGER, E. (1967). *What is Life? Mind and Matter*. (Combined reprint). NY: Cambridge University Press.
- STORCH, K., LIPAN, O., LEYKIN, I., VISWANATHAN, N., DAVIS, F., WONG, W. & WEITZ, C. (2002). *Extensive and divergent circadian gene expression in liver and heart*. Nature, 417, 78 – 83.
- TINTEROW, M. (1970). *Foundations of Hypnosis: From Mesmer to Freud*. Springfield, IL: Thomas.
- TOMLIN, S. (2005). *Dramatizing Maths: What's the Plot?* Nature, 436, 622-623.
- UNTERWEGNER, E., LAMAS, J., AND BONGARTZ, W. (1992). *Heart-Rate Variability of High and Low Susceptible Subjects During Administration of the Stanford Scale, Form C*. In BONGARTZ, E. (Ed.), (1992). *Hypnosis: 175 Years after Mesmer: Recent Developments in Theory and Application*. Konstanz: Universitätsverlag.
- WATSON, J. & CRICK, F. (1953a). *A structure for deoxyribose nucleic acid*. Nature, 171, 737-738.
- WATSON, J. & CRICK, F. (1953b). *Genetical implications of the structure of deoxyribonucleic acid*. Nature, 171, 964-967.
- WILCZEK, F. (2015). *A Beautiful Question: Finding Nature's Deep Design*. NY: Penguin Press.