



THE INTERNATIONAL JOURNAL OF PSYCHOSOCIAL AND CULTURAL GENOMICS CONSCIOUSNESS & HEALTH RESEARCH

- ◆ The Psychosocial Genomics Community
- ◆ The Psychosocial Genomics Of Therapeutic Consciousness And Cognition: A New Quantum Bayesian Mathematical Notation For Expectancy Theory
- ◆ The Psychosocial Genomics Of RNA/DNA Signaling In Consciousness And Cognition: A Quantum Update Of Psychotherapy And Therapeutic Hypnosis
- ◆ Brain Structures Involved In Moral Reasoning: A Review
- ◆ The Role Of The Equations Of Motion In The Evolution Of The Integration Of Mathematics And Physics With Mind-Body Hypnotherapy In The Transformation Of Consciousness
- ◆ Trancelluloide. Hypnosis & Cinema

Editorial

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Both in Psychology and Psychotherapy, on the one hand, we have had approaches that have focused attention exclusively on the psychological dimension, leaving out the body size, while on the other hand, we had models that have considered the only body size in both the phenomenological and psycho-physiological dimension.

In fact so far, we have not had a theoretical model that would contain within it all processes and operating levels of mankind in his totality. I believe that this is essentially due to the difficulty of holding together this complexity and at the same time finding the connections between different levels of analysis.

[...]

Mauro Cozzolino



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EDITORIAL

4 The Psychosocial Genomics Community

Mauro Cozzolino

PSYCHOSOCIAL AND CULTURAL GENOMICS

5 The Psychosocial Genomics Of Therapeutic Consciousness And Cognition: A New Quantum Bayesian Mathematical Notation For Expectancy Theory

Ernest Rossi and Kathryn Rossi

19 The Psychosocial Genomics Of RNA/DNA Signaling In Consciousness And Cognition: A Quantum Update Of Psychotherapy And Therapeutic Hypnosis

Ernest Rossi and Kathryn Rossi

NEUROSCIENCE RESEARCH

38 Brain Structures Involved In Moral Reasoning: A Review

Maria Cuñat-Agut, Manuel Martí-Vilar, Ferran Suay I Lerma

PSYCHOSOCIAL GENOMICS, MATH AND PHYSICS

46 The Role Of The Equations Of Motion In The Evolution Of The Integration Of Mathematics And Physics With Mind-Body Hypnotherapy In The Transformation Of Consciousness

Bruce Gregory

BOOKS

60 Trancelluloide. Hypnosis & Cinema

Antonio De Rosa

THE PSYCHOSOCIAL GENOMICS COMMUNITY

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Both in Psychology and Psychotherapy, on the one hand, we have had approaches that have focused attention exclusively on the psychological dimension, leaving out the body size, while on the other hand, we had models that have considered the only body size in both the phenomenological and psycho-physiological dimension.

In fact so far, we have not had a theoretical model that would contain within it all processes and operating levels of mankind in his totality. I believe that this is essentially due to the difficulty of holding together this complexity and at the same time finding the connections between different levels of analysis.

The Psychosocial Genomics tries to point out and simultaneously define the highest level of functioning and even seemingly as far away from the cultural subject, moving on to the social, interpersonal, until reaching the intrapersonal one. These levels are closely connected with each other and act directly on the person at phenomenological, behavioral and psychological levels, but also to an even deeper level that reaches the our genes expression, making new proteins and brain plasticity.

We could represent these different levels as concentric circles containing one another where they influence each other. Intrapersonal level contains within it: mind, brain, body and genes. They are intimately connected each other and communicate constantly through an information transduction that makes sure the data initially created within a specific level of operation, such as mental, are transformed into signals from the brain, gene expression and synthesis of new proteins.

The process continues when the signals from the proteins become synaptogenesis and neurogenesis with inevitable effects on the brain and mind.

Unlike previous psychological and psychoterapeutic models, Psychosocial Genomics is the first epistemological, research and intervention model that has as its objective the analisis and explanation of what you think is happening apparently to a single level of our operation but in reality it is affecting every aspect of our totality trough the transduction information.

The journal and its community of reference is holding together all this different levels within a circularity that makes the two-way flow of communication and changes, and thanks to this extraordinary possibilty of construction and deconstruction plastically. In this perspective we hope to have more and more support, scientific and cultural contribution from all scholars and clinicians who care about this prospect.

Ad Maiora

THE PSYCHOSOCIAL GENOMICS OF THERAPEUTIC CONSCIOUSNESS AND COGNITION: A NEW QUANTUM BAYESIAN MATHEMATICAL NOTATION FOR EXPECTANCY THEORY

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Running Head: Quantum Bayesian Notation for Psychosocial Genomics

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Abstract

Where is innovation and research in psychosocial genomics, therapeutic consciousness and cognition going today? This paper updates the emerging science of psychosocial genomics with a new quantum Bayesian mathematical notation for exploring the dynamics of creative consciousness, cognition, creativity and expectancy in daily life as well as psychotherapy. Psychosocial genomics brings together a variety of interdisciplinary fields ranging from stress, psychosomatics, psychoneuroimmunology, and mind-body medicine to the deep psychobiology of optimal performance, sleep, dreaming, art, ritual, meditation and the qualia of spiritual life. The quantum Bayesian notation introduced here focuses on how experience-dependent gene expression and brain plasticity are interrelated in consciousness, sleep, dreams and the 4-stage creative cycle. Continued innovative research is recommended to document how the psychosocial genomic RNA/DNA quantum dynamics of therapeutic consciousness and cognition can facilitate the theory, research and practice of translational medicine and rehabilitation on all levels from mind to gene.

Key Words: Bra-Ket, expectancy, 4-stage creative cycle, sleep, dreams, expectancy, Dirac notation, psychosocial genomics, psychotherapy, quantum, RNA/DNA, therapeutic consciousness.

Introduction

We offer a new mathematical notation for conceptualizing expectancy theory in the research and practice of psychosocial genomics, meditation and therapeutic consciousness and cognition on many levels from mind to genes. Why have most cultures evolved meditation, spiritual and holistic

healing practices to facilitate health and well-being? Recent research has uncovered a surprising yet sensible answer to this question. Sleep and dreaming clear the mind by permitting 60% more cerebral spinal fluid to wash through the brain to remove the toxic byproducts of normal metabolism every day. This unexpected finding is used to explore what we know about the relationship between mind and body during therapeutic consciousness and cognition at the molecular/genomic and quantum levels. We outline a new quantum version of the RNA/DNA theory of the psychosocial genomics of consciousness, cognition and creativity in everyday life as well as psychotherapy. Controversial quantum Bayesian concepts originally formulated in mathematical physics over the last century are reviewed and applied to therapeutic consciousness and cognition.

In a clear and concise popular article in *Scientific American* the highly esteemed physicist Hans Christian von Baeyer (2013) recently outlined a new Bayesian interpretation of the nature of quantum dynamics.

A new version of quantum theory sweeps away the bizarre paradoxes of the microscopic world. The cost? Quantum information exists only in your imagination. In 2001 a team of researchers began to develop a model that either eliminates the quantum paradoxes or puts them in a less troubling form. The model, known as Quantum Bayesianism, or QBism for short, reimagines the entity that lies at the heart of quantum weirdness—the wave function.

In the conventional view of quantum theory, an object such as an electron is represented by its wave

function, a mathematical expression that describes the object's properties. If you want to predict how the electron will behave, you calculate how its wave function evolves in time. The result of the calculation gives you the probability that the electron will have a certain property (like being in one place and not another). But problems arise when physicists assume that a wave function is real.

QBism, which combines quantum theory with probability theory, maintains that the wave function has no objective reality. Instead QBism portrays the wave function as a user's manual, a mathematical tool that an observer uses to make wiser decisions about the surrounding world—the quantum world. Specifically, the observer employs the wave function to assign his or her personal belief that a quantum system will have a specific property, realizing that the individual's own choices and actions affect the system in an inherently uncertain way.

Another observer, using a wave function that describes the world as the person sees it, may come to a completely different conclusion about the same quantum system. One system—one event—can have as many different wavefunctions as there are observers. After observers have communicated with one another and modified their private wave functions to account for the newly acquired knowledge, a coherent worldview emerges. By interpreting the wave function as a subjective belief and subject to revision by the rules of Bayesian statistics, the mysterious paradoxes of quantum mechanics vanish... (p. 47-48)

We now propose how psychosocial genomics, the integration of nature and nurture, could conceptualize the quantum dynamics of memory and learning in psychotherapy (Rossi, 1988a, b, c, d; Rossi & Rossi, 1996). We begin by outlining a quantum Bayesian version of the psychosocial genomics of therapeutic consciousness, cognition, creativity and expectancy theory in everyday life as well as psychotherapy (Rossi, 2002, 2004, 2007, 2012; Rossi & Rossi, 2011, 2013, 2014a, 2016a & b).

An Evolutionary RNA/DNA Quantum Psychosocial Genomic Theory of Therapeutic Consciousness

Figure 1 is our proposal for a broad functional definition of the role of genes in the complex adaptive systems of life that we apply to therapeutic consciousness, cognition and behavior.

We proposed how neuroscience research on these four major dimensions of *psychosocial genomics illustrates how consciousness, expectancy, mirror neurons, and gene expression* underpins a general theory of therapeutic consciousness, cognition, creativity in psychotherapy as follows (Rossi & Rossi, 2011, 2013, 2014a & b, 2016a & b).

The Classical Mind/Gene Communication Cycle of Molecular Biology.

The top circle of figure 1 embraces the classical experimental research of historical psychology updated with the more recent bioinformatic and consciousness studies of art, beauty, creativity, music, truth, dreams and expectancy in therapeutic consciousness. Research at this top level of consciousness, dreaming, and imagination explores the *Novelty-Numinosum-Neurogenesis-Expectancy effect* as an *adaptive complex motivational system* (Rossi, 2002-2012). The experience of *novelty* evokes highly motivating experiences of the *numinosum* (*fascination, mysteriousness, tremendousness, Otto, 1923/1950*) that turn on gene expression and brain plasticity for a new cycle of consciousness, creative cognition, memory, learning and expectancy in everyday life as well as therapeutic hypnosis (Rossi, 2002a, 2004, 2007, 2012). Key research is now exploring how the complex adaptive systems of information transduction in the RNA/DNA transcription/ translation cycle operate in everyday life. The ENCODE Consortium of molecular biology documented how ~2 million eRNAs carrying signals from the physical environment and psychosocial milieu to genes bearing ~3 million docking sites the RNA/DNA transcription/ translation cycle of normal metabolism (Encode, 2012).

Current research documents the use of DNA microarrays for assessing therapeutic responses via a variety of top-down psychosocial genomic processes. These include the relaxation response (Dusek *et al.*, 2008), therapeutic hypnosis (Cozzolino, *et al.*, 2014; Rossi, *et al.*, 2008; Lichtenberg *et al.*, 2000, 2004; Rossi, 2012; Rossi & Rossi, 2013), meditation (Creswell *et al.*, 2012), the therapeutic placebo (Sliwinski and Elkins, 2013), social psychology (Cole, 2009, Cole *et al.*, 2005, 2007, 2010, 2011), and yoga (Lavretsky *et al.*, 2013) to facilitate optimal states of consciousness and cognition as well as the resolution of stress related dysfunctions (Unternaehrer *et al.*, 2012). We extended this use of DNA microarrays to explore the hypothesis that such top-down therapeutic protocols with *The Psychosocial Genomic Healing Experience (CPGHE)*. We propose that this research is foundation of a more general evidence-based theory of mind-body communication and problem solving in everyday life as well as psychotherapy. A full description of the administration, scoring and clinical application of the top-down CPGHE protocol is freely available (Rossi, 2012).

The Transition between Mind and Mirror Neurons.

The original research on mirror neurons initiated by Rizzolatti *et al.* (2008) and others (Grodzinsky and Nelken, 2014; Iacoboni, 2007, 2008) has been greatly expanded in current neuroscience. Research on bird song courtship dynamics, for example, documents how eRNAs (enhancer RNAs) turn on activity-dependent gene expression and brain plasticity.

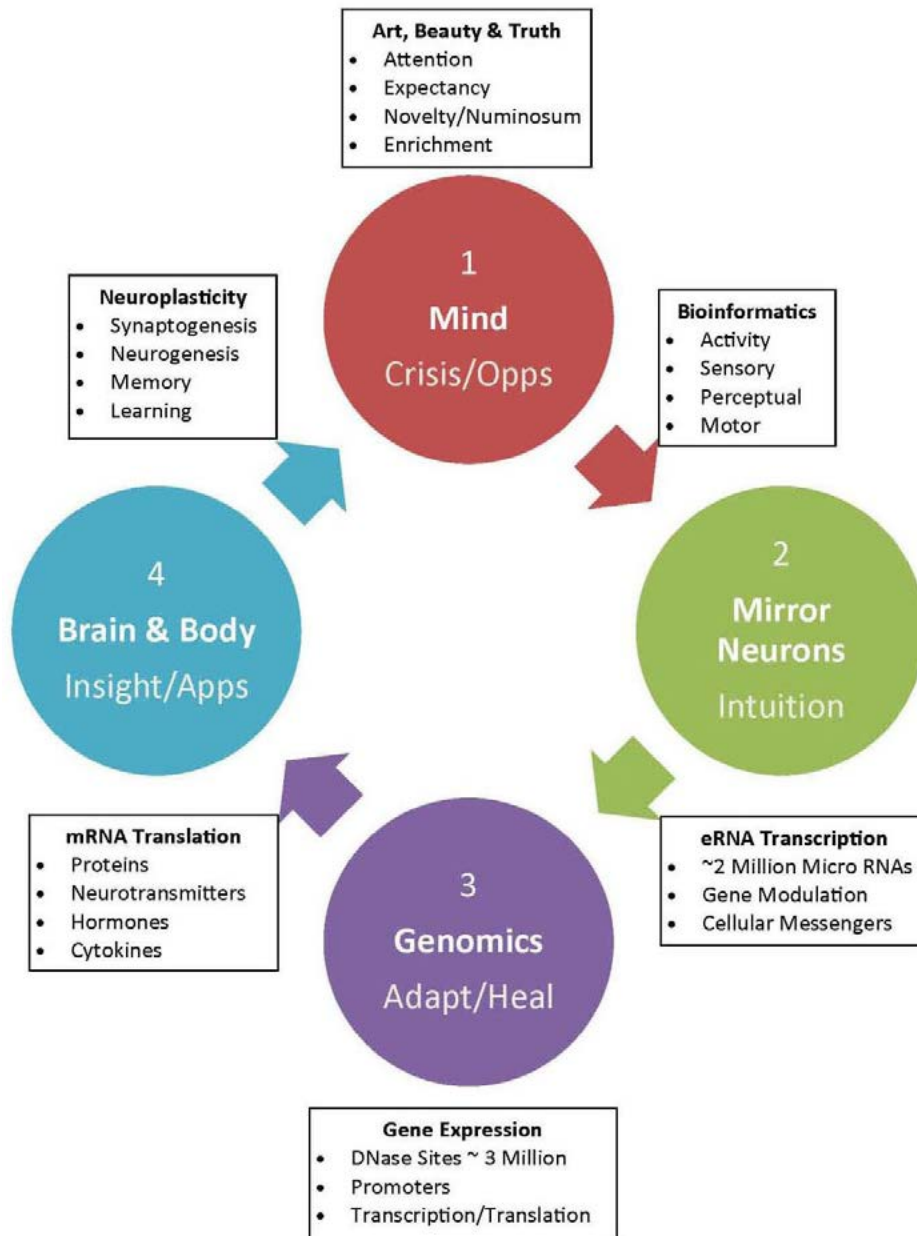


Fig. 1: The RNA/DNA Psychosocial Genomic Theory of Therapeutic Consciousness, Cognition and Behavior.

Clayton, a specialist in songbird neuro-genomics made the salient comment, “this is the first time a microRNA has been shown to respond to a particular thought process” (Saey, 2010; Warren, Clayton *et al.*, 2010; Clayton, 2013; Drnevich *et al.*, 2012; Gunaratne *et al.*, 2011). How could this be possible?

Apparently information transduction between the sound spectra of the bird song and molecular eRNAs is encoded via mirror neuron activity. It is fascinating to learn, for example, that a young male finch learns his song by trying to imitate his father. Alas, the young fellow invariably makes mistakes in trying to copy his father’s song. Yet these so-called “mistakes” become an aspect of the young male’s individual identity. His song apparently pleases a young female who then chooses to mate with him. The male’s song and the female’s choice behavior is associated with turning on the molecular-genomic RNA/DNA transcription/translation cycle leading to

the appropriate production of hormones, ovulation and sexual behavior in the lady.

More recent research on the social communication of bats confirms and extends this earlier research on bird songs. Since bats are mammals their songs provide greater detail about their appropriateness as a model of human cognition. A recent issue of *Science* (Morell, 2014) details how the FOXP2 gene, which is associated cognition and vocal learning in humans, birds and bats, may be a closer model for human speech. The trills, chirps and buzzes of bats, for example, can communicate a series of expectancies such as announcing (1) I am species *P. Nathusii*, (2) a male, (3) specifically I am the only male with this song (4) so land here next to me. (5) We share a common social identity and communication pool. (6) The soft tones of the male lure ladies while (7) harsh tone compete with other males and warn them away. Although these songs typically last only ~1.6

seconds they may contain ~20 syllables combined in specific ways with individual rhythmic patterns of communication that are appropriate for current life conditions (Knörnschild, 2014).

Such research on bird and bat song syntax and semantics illustrate how behavior encoded in the RNA/DNA transcription/translation cycle could mediate the vastly more complex cycle of information transduction that occurs in human consciousness, cognition and expectancy illustrated in Figures 1, 2 and 3 (Sczepanski & Joyce, 2014; Shelka & Piccirilli 2014). We propose this is the fundamental insight of bioinformatics that integrates the top-down path of consciousness, cognition and expectancy with the bottoms-up molecular-genomic paths of communication within and between individuals.

Free public data bases are being updated daily by the National Institute of General Medical Sciences, which offers information on these advances of *The New Genetics* (<http://publications.nigms.nih.gov/thenewgenetics/>). Francis Collins, Director of the National Institutes of Health (NIH) is now funding research on their new Extracellular RNA (ExRNA) Communications Program. The NIH Common Fund provides research grants to catalogue all types of ExRNA that flow between mind and body "in blood, tears, saliva & every other body fluid" to provide a baseline that can be compared with ExRNA profiles associated with Alzheimer's, ageing, autism, development, diabetes, obesity, psychiatry, Parkinson's, stress, trauma, etc. (Leslie, 2013). These research developments illustrated in figure 2 lead us to propose how the psychosocial genomics of ExRNAs signaling between nature and nurture are the molecular/genomic underpinning of the complex adaptive dynamics of therapeutic consciousness, translational medicine and psychotherapy.

Figure 2 illustrates how DNA codes for messenger RNA (mRNA), which in turn codes for protein. We propose that thoughts dialogue with genes via the psychosocial genomic loop mediating between nature and nurture. Cognitions are converted into eRNAs (enhancer RNAs) to turn on DNA (experience-dependent gene expression). We propose how this codes for mRNAs (messenger RNAs) that generate the proteins (hormones, neurotransmitters, cytokines, etc.) throughout the complex adaptive mirror neuron system to facilitate mind/body communication and problem resolution in everyday life as well as psychotherapy (Rossi, 2002a, 2004, 2007, 2012; Vedral, 2012).

Genomics Research via the ENCODE project that includes activity and experience-dependent gene expression is currently manifesting a profound breakout on the epigenomic level in figure 3. Key research is now exploring complex adaptive systems of the RNA/DNA transcription/translation. Pollard (2006, 2012), for example, has recently pioneered research into the Human Accelerator Regions (HARs) that are now recognized as being groups of genes that are undergoing very rapid adaptation distinctively different from our nearest primate relatives. Notice how we give precise psychosocial meaning to the commonly used but vague psychological terms of the 4-stage creative process such as Crisis/Opportunity (stage 1), Incubation/Intuition (stage 2), Aha Insights (stage 3) and real life Applications (stage 4). Key psychosocial genomic research now explores how proteins, often called "mother molecules," are cleaved into the neurotransmitters, hormones, and cytokines of the complex adaptive systems of psychoneuroimmunology (Irwin & Vedhara, 2005) and the dynamics of memory, learning, behavior via synaptogenesis and neuroplasticity. (Rossi & Rossi, 2013).

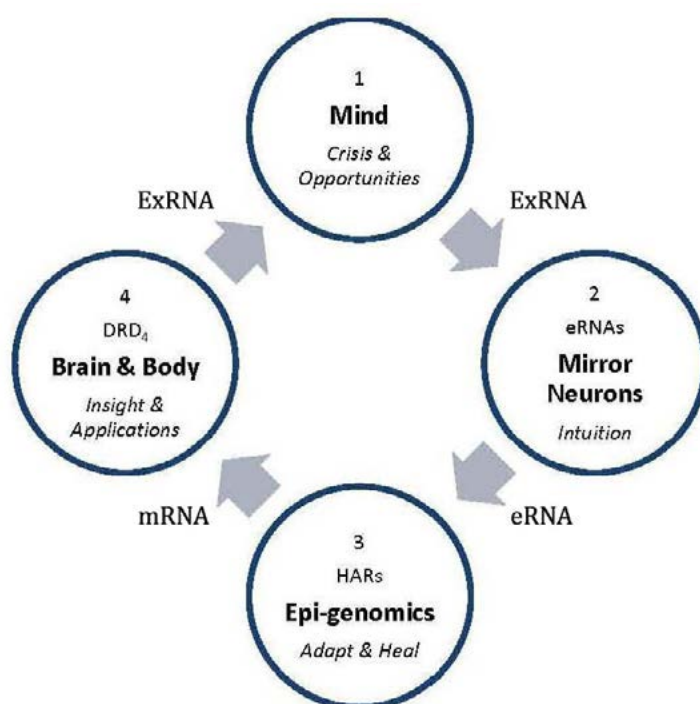


Fig. 2. A psychosocial epi-genomic cycle update of the Watson/Crick central dogma of molecular biology.

The Classical/Quantum Transitions Between Conscious & Unconscious States

Figure 3 implies the question of how the psychosocial genomic transitions between classical-to-quantum dynamics (conscious-to-unconscious) of stage 2 and quantum-to-classical dynamics (unconscious-to-conscious) of stage 4 are actually experienced psychologically.

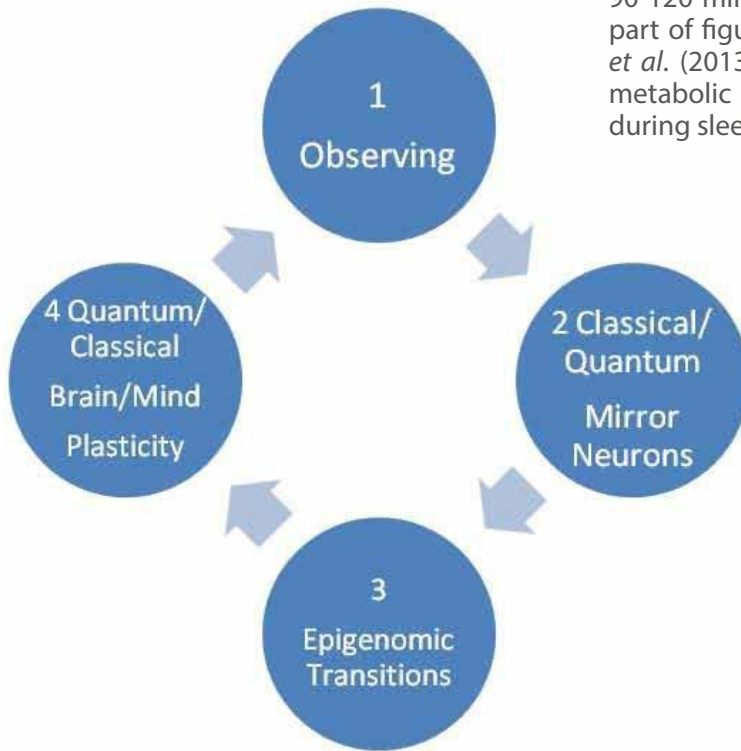


Fig. 3. Transitions in the Classical/Quantum Dynamics that Construct New Experiences of Therapeutic Consciousness & Cognition.

We attempt to answer this question by visualizing the dynamics of therapeutic consciousness, cognition and expectancy in the next three figures. Figure four illustrates the wave nature of psychosocial genomics outlined as a profile of the 4-Stage creative cycle mapped onto the normal 90-120 minute 4-Stage Basic Rest-Activity Cycle (BRAC) is illustrated in yellow in the upper curve. The proteomics (protein) pink profile in middle curve depicts the energy landscape for protein folding within neurons of the brain into the correct structures needed for adaptive brain plasticity.

This proteomic profile arises from the functional concordance of co-expressed genes illustrated by the green genomics profile below it (Levsky *et al.*, 2002). This psychosocial genomic 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 Cycle of 90-120 minutes. The lower diagram illustrates how the qualia of consciousness cognition and behavior are typically experienced within the normal circadian cycle of waking as well as during REM dreams while sleeping (Rossi, 2002, 2004; Rossi & Nimmons, 1991).

Recent research (Jamieson, 2007; Jamieson & Burgess, 2014) also has documented how the overall domain of therapeutic consciousness, cognition could be conceptualized as a combination of the high and low phases of hypnosis (Rossi, 2002a) that are illustrated in Figure 5.

Hot phases of high performance activities are illustrated in red in the top part of figure 6. These red high performance peaks alternate with low phases of healing and recovery shown in green during the 90-120-minute basic rest-activity cycle. The bottom part of figure 6 illustrates the recent research of Xie *et al.* (2013) documenting the cleaning up of toxic metabolic waste products of daily conscious work during sleep (green) and dreaming (rainbow).

The small rainbows support our hypothesis of how the presence of many such alternating phases of RNA/DNA activity during REM dreaming as well as waking consciousness, which clean up toxic waste products of brain/mind metabolism could be the actual molecular/genomics basis of many holistic psychotherapeutic rituals that emphasize rest and relaxation (therapeutic hypnosis, prayer, meditation, yoga etc.) developed independently over the ages by many different cultures.

All together the alternating phases of consciousness, cognition and expectancy look very similar to manifestations the basic quantum wave nature of many natural epigenomic therapeutic processes that could enhance counseling, psychotherapy and translational medicine.

We now need to calculate to what degree such wave patterns are consistent with a more general quantum RNA/DNA epigenomic theory of therapeutic consciousness, cognition and expectancy. To do this we will explore some fundamentals about quantum Bayesianism as a new notation for a mathematical model therapeutic consciousness, cognition, creativity and expectancy.

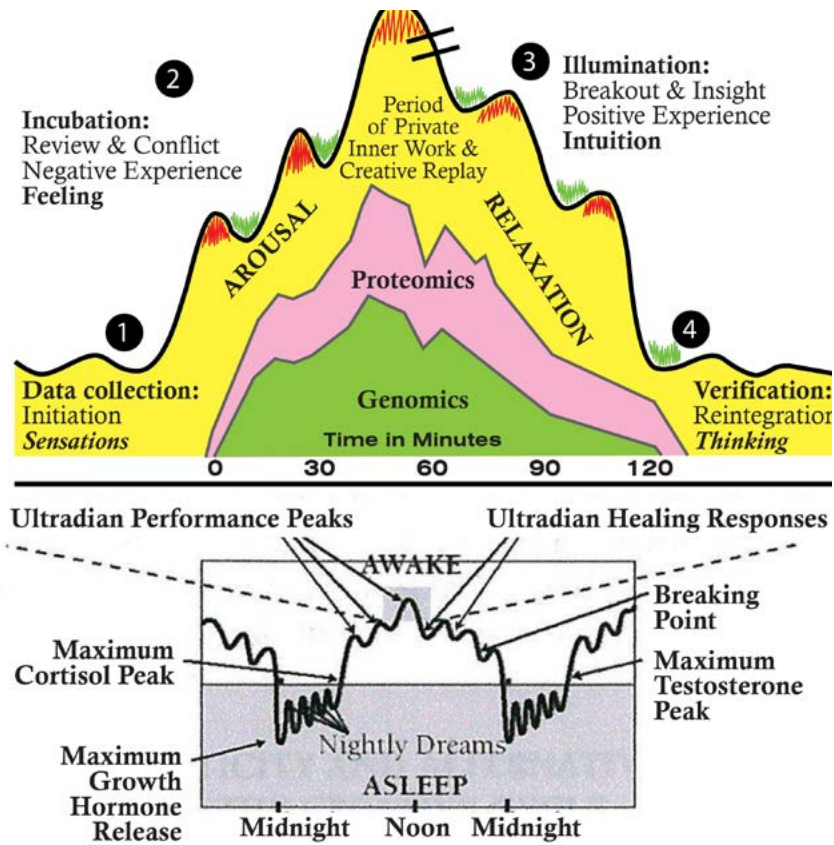


Figure 4. The wave nature of psychosocial genomics outlined as a profile of the 4-Stage creative cycle in daily life as well as therapeutic consciousness, cognition and psychotherapy.

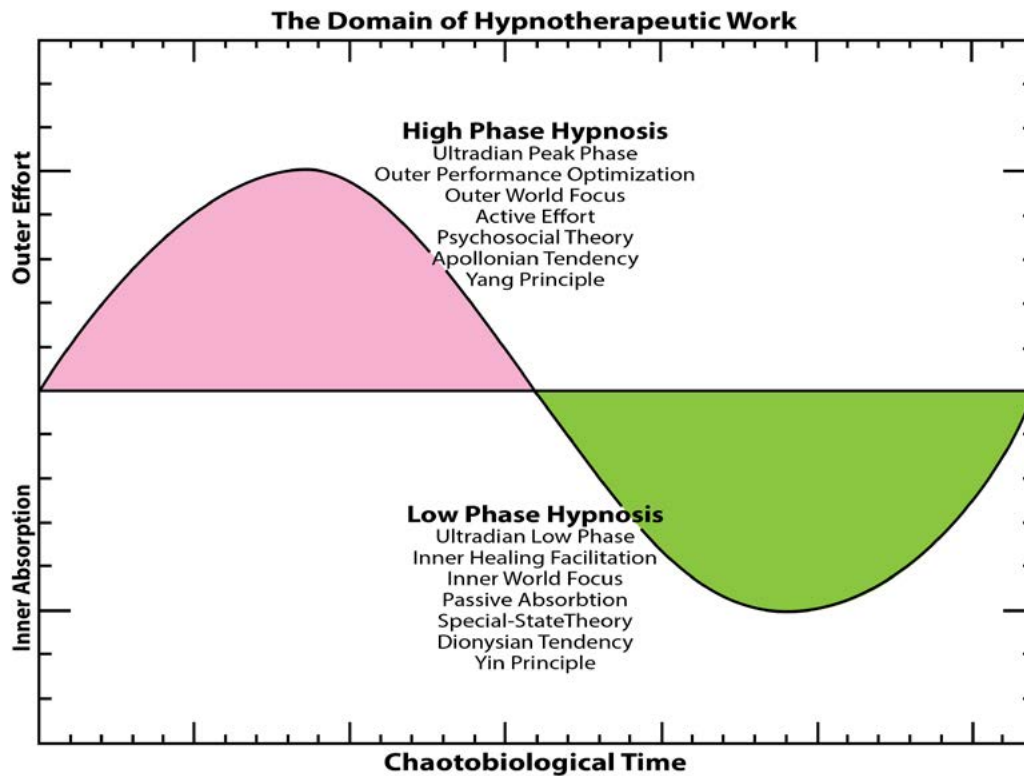


Fig 5. The wave nature of the qualia of subjective experiencing during the high and low phases of therapeutic hypnosis (can be conceptualized as manifestations of the 4-Stage Creative Cycle mapped onto the 90-120-minute Basic Rest-Activity Cycle (BRAC) and many other psychobiological rhythms about 12 times a day in normal everyday life (Lloyd & Rossi, 1992, 2008; Rossi, 2002a).

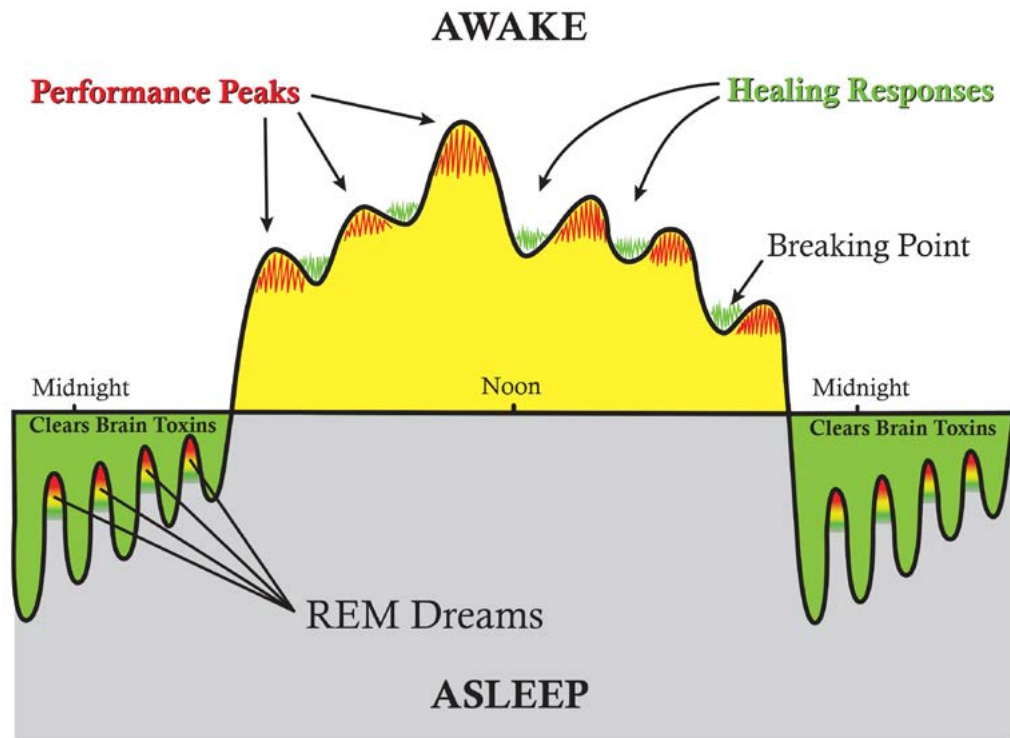


Fig. 6. Top: The wave nature of the 4-stage creative process as a basic paradigm of the evolutionary RNA/DNA epigenomic quantum field theory of mind/body healing of stress and PTSD during the 90-120-minute basic rest-activity cycle in everyday life, sleep, dreams and therapeutic consciousness and cognition.

Quantum Bayesian Notation 101 for Therapeutic Consciousness, Cognition and Expectancy

In quantum physics probability replaces the determinism of classical Newtonian physics. We now know its' propose is also true for conceptualizing the quantum Bayesian dynamics of therapeutic consciousness, cognition, creativity as well as therapeutic hypnosis (Jamieson & Burgess, 2014). What could quantum Bayesian dynamics actually mean for therapeutic consciousness? The first fundamental insight for both physics and psychology is that *the qualia of subjective experience are probabilistic* in normal consciousness and behavior as well as therapeutic consciousness and cognition (Caves, Fuchs & Schack, 2001; Fuchs, 2001, 2010, 2011, 2012; Fuchs, Mermin & Schack, 2013; Fuchs & Schack, 2013).

The second fundamental insight for both physics and psychology is that *the qualia of subjective experience are discrete; this means they are quantized into separate units of sensation and/or perception*. The qualia of the redness of red and the blueness of blue, for example, can be experienced as continuous blends in the rainbow, but also we can distinguish about 7 separate or discrete color sensations/perceptions/cognitions depending on how we choose to interpret them. Mathematicians have formulated an *axiom of choice* in logical systems and physicists have had a century of struggle formulating the mathematical notation of light itself having a *dual nature as either discrete particles or smooth continuous*

waves depending on how experimental situations are arranged to observe photons. We now note that letters, words, emotions and states of consciousness as well as cognition, mathematics, music, the 4-stage creative cycle also have a dual nature depending on how we choose to arrange our observations of them. The observer/operator qualia of human subjective experience manifest an infinite axiom of choice in organizing its own world. This vast possibilities of human choice can be confusing and stressful in the transitions between stage two (conflict/incubation) and stage three (insight) of the 4-stage creative cycle (Rossi, 2002a, 2004, 2007; Rossi & Rossi, 2012, 2013). Early morning thoughts can be an effective self-care method for optimizing people's creative consciousness and cognition.

The third fundamental insight for physics, biology and psychology is that quantum Bayesian dynamics are manifest (observable) on all levels from mind to genes in living systems. Although quantum physics was initiated by the need to resolve the paradoxes that emerged from research on atomic and subatomic levels (such as photons of light and electrons of electricity), early theorists like Bohr, Dirac, Heisenberg, and Schrodinger realized that the quantum level underpinned the entire universe at large as well as the molecular chemistry of life and consciousness (Baggott, 2011; Jeong, Lim, & Kim, 2014; Susskind & Friedman, 2014; Wilber, 1993).

The fourth fundamental insight integrating physics, biology, psychology and therapeutic consciousness is the central role of adaptive expectancy in an uncertain

world. The late mathematical physicist, Steven Holzner (2013), for example, introduced a probabilistic dice model to illustrate the basic concepts of quantum physics and the wave function in table one, which we now generalize to the psychosocial genomics of expectancy in therapeutic consciousness (Chiarucci, Madeo, Loffredo *et al.* 2014; Kirsch, 2001; Mazzoni *et al.*, 2013 Pekala *et al.* 2010).

model of the meaning of expectancy in therapeutic consciousness and cognition from a quantum Bayesian perspective.

The Expectation Value of $\langle \Psi | \mathbf{E} | \Psi \rangle$ illustrates another convenient and very flexible feature of Dirac Bra-Ket notation: the single letter **E** represents a mathematical operator in quantum theory. In psychology the operator could be any *activity A*,

Dice Sum	Relative Probability	Probability Amplitude	Quantum Notation $\langle \Psi $	Expectation Value $\langle \Psi \mathbf{E} \Psi \rangle$
2	1	$\sqrt{1}$	1/6	7
3	2	$\sqrt{2}$	$\sqrt{2}/6$	7
4	3	$\sqrt{3}$	$\sqrt{3}/6$	7
5	4	$\sqrt{4}$	2/6	7
6	5	$\sqrt{5}$	$\sqrt{5}/6$	7
7	6	$\sqrt{6}$	$\sqrt{6}/6$	7
8	5	$\sqrt{5}$	$\sqrt{5}/6$	7
9	4	$\sqrt{4}$	2/6	7
10	3	$\sqrt{3}$	$\sqrt{3}/6$	7
11	2	$\sqrt{2}$	$\sqrt{2}/6$	7
12	1	$\sqrt{1}$	1/6	7

Table 1. The dice roll model of probability, quantum notation and expectancy applied to therapeutic therapeutic consciousness and cognition (Adapted from Holzner, 2013).

In table 1 the initial Dice Sum column lists all the possibilities of the roll of a pair of dice. The next column lists the Relative Probability of each possibility – the number of ways of rolling a particular sum on the dice. Quantum physics does not deal directly with such probabilities, however, but rather with the Probability Amplitudes, which are the square roots of the probabilities in the middle column. These probability amplitudes represent the height of the wave state from the lowest to the highest as illustrated. Dirac’s quantum Bra-Ket mathematical notation is introduced in the next column as a compact way of expressing the sum of all the possible ways rolling the dice with a single Greek letter $\langle \Psi |$ (psi) denoting the wave nature of consciousness, cognition and creativity as probability amplitudes. The final Expectation Value column is expressed in Dirac’s quantum bra-ket math notation $\langle \Psi | \mathbf{E} | \Psi \rangle$ that denotes our emerging mathematical

behavior **B**, cognition **C** or function such as **R** for “Rolling the dice,” which is an operator **R** that acts simultaneously on the Bra $\langle \Psi |$ on the left and a Ket $|\Psi \rangle$ on the right. Since the quantum perspective always deals with a range of possibilities (probability amplitudes) rather than a single value, the expectation value of $\langle \Psi | \mathbf{R} | \Psi \rangle$ actually is a very compact notation for the complex matrix math formulated in Dirac’s bracket notation. Doing the matrix math (easy with software) yields the final answer of our dice roll example that is entered into a computer looks like this.

Doing the matrix math provides the answer as is shown in table one: $\langle \Psi | \mathbf{R} | \Psi \rangle = 7$

So the expectation value of a roll of the dice is 7. It’s always 7 even though you “hope” your dice roll may be different when gambling at a casino. The casino management, however, arranges the “rules” of the game so they will always win in the end (the result of many dice rolls). But sometimes you

$$\langle \psi | R | \psi \rangle = \begin{bmatrix} \frac{1}{6} & \frac{\sqrt{2}}{6} & \frac{\sqrt{3}}{6} & \frac{2}{6} & \frac{\sqrt{5}}{6} & \frac{\sqrt{6}}{6} & \frac{\sqrt{5}}{6} & \frac{2}{6} & \frac{\sqrt{3}}{6} & \frac{\sqrt{2}}{6} & \frac{1}{6} \end{bmatrix} \begin{bmatrix} 2 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 3 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 4 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 5 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 6 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 7 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 8 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 9 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 10 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 11 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 12 \end{bmatrix} \begin{bmatrix} \frac{1}{6} \\ \frac{\sqrt{2}}{6} \\ \frac{\sqrt{3}}{6} \\ \frac{2}{6} \\ \frac{\sqrt{5}}{6} \\ \frac{\sqrt{6}}{6} \\ \frac{\sqrt{5}}{6} \\ \frac{2}{6} \\ \frac{\sqrt{3}}{6} \\ \frac{\sqrt{2}}{6} \\ \frac{1}{6} \end{bmatrix}$$

may be temporarily “lucky” due to chance. Now we can understand and appreciate where the terms *bra* and *ket* come from — they “bracket” a psychosocial genomic quantum novelty-numinosum-neurogenesis-expectancy operator.

The expectation value of an operator turns out to be the average value one would expect to find by performing the same measurement many times. The matrix math notation in our above example the long diagonal from the top left to the bottom right above can be recognized as a list representing the wave state of probabilities amplitudes engendered by the R dice operator. But what are all the zeros in the large square matrix supposed to mean? Well, they could be a field of other numbers, math functions, qualia of human subjective experience, cognitions, behaviors, symptoms, scores on hypnotic susceptibility scales or whatever one could imagine interacting together as a *complex adaptive system of psychosocial genomics* illustrated in all the figures of this paper. The possibilities are limited only by the constraints of imagination one chooses to impose. We could use the Dirac bra-ket notation to explore, for example, some interesting ways of understanding the qualia and dynamics of what we tentatively choose to call the “*observer/*

operator effect” in the psychosocial genomics dreams, therapeutic consciousness and cognition.

Illustrations of the Observer/Operator in Sleep, Dreaming and Therapeutic Consciousness

In classical psychology *episodic memory*, originally discovered and defined by Endel Turving (2002, 2005) can now be assessed by neuroscience imaging of the mind/brain (Kellogg, 2013). Memory and its transformations during REM dreaming (Rossi & Rossi, 1972/1986/2000; Rossi & Rossi 1996) now can be easily queried, studied and evaluated with our new quantum Bayesian notation of consciousness, cognition, creativity and therapeutic therapeutic consciousness and cognition. This is illustrated with the dream of a 78-year old male patient still recovering from a childhood post traumatic syndrome disorder (PTSD) perpetuated by his abusive father.

“My father is a young man as he was when he used to beat me so badly that I would scream so loudly that our neighbors would knock on our windows yelling, ‘Stop beating that child!’ Anyway, in my dream he is now a nice guy who is building a new home and I am a little boy helping him! The house is now

almost finished but there is still fresh dirt piled up roughly around in piles. This dirt is clean but it needs nutrients. So we scatter organic fertilizer on it so that green grass and flowers and trees will grow real pretty in our new yard.

I can hardly believe I'm now having such a nice dream about my long ago terrible father who abused me sexually! All my life I have hated him and struggled to get away from my family vowing never to forgive any of them! I left home as a young man and never went back! But somehow I now seem to actually like my father and we are doing nice things together in my dream. Can this really be happening to me, doctor? Is this what you call, 'brain plasticity'?

Brain plasticity, indeed! We summarize the therapeutic reframing of this life story with the positive observer/operator (O) in psychological bra-ket notation.

< Ψ FUTURE | O₊ | Ψ PAST >

Consciousness is Janus-faced positive operator in the hypnotherapeutic focus of the dream work; to *observe is to operate* simultaneously on the past as well as the future! But the patient still has an urgent question. He needs the therapist to convert the *quantum probability amplitude* of a therapeutic reframing of his life story with his father into creating a *new psychological reality in Hilbert space* (infinite possibilities). The patient urgently needs the therapist to answer "yes, this is clearly the result of brain plasticity successfully operating in your dream to therapeutically reconstruct your still stressful emotions about your father." Suppose the therapist had responded with the common but cynical, destructive and false public opinion: "Too bad it was only a dream."

A young woman dreams:

"I am an apprentice to a baker making a sandwich several yards long! An inspector comes by and asks the baker if he is responsible for making the sandwich. But with a cynical attitude the baker ignores the inspector. I am puzzled in the dream about why the baker is ignoring the nice inspector.

In Bra-Ket notation:

< Ψ PUZZLED | O-BAKER | Ψ CYNICAL >

This notation illustrates how the dream observer/operator (O-) was a negative projection onto the baker. So she remains stuck in stage 2 of the 4-stage creative cycle at the end of her dream.

Upon awakening, however, the young woman's first sleepy early morning thoughts spontaneously replays her dream: she would rather have told the nice inspector the truth about how the baker was indeed responsible

for making the huge sandwich. She intuits the inspector needed this information so the baker could be rewarded for his excellent work."

In Bra-Ket notation:

< Ψ REWARD | O₊ INSPECTOR | Ψ PUZZLED >

Fortunately, this young woman has the wit to utilize the *axiom of choice* in her early morning thoughts. During her nighttime of sleep her brain was cleared of metabolic toxins (she had been stressfully overworked lately) so she could more objectively reconsider the cynical but still dominant side of her personality that requires some therapeutic reframing to empower her to tell the world (the inspector in the dream) the truth about her growing abilities (symbolized by making fantastic sandwiches in the dream) so she can be appropriately recognized and rewarded. Notice how this two-step process in her early morning thoughts enabled her to shift from the unsatisfactory stage 2 in her dream to a more satisfactory stage 2 in the therapeutic reframing of herself. Such positive therapeutic reframing is evidence of a well-adjusted mind.

A depressed middle age man reports a spontaneous daydream during therapeutic therapeutic consciousness and cognition induced with *The Creative Psychosocial Genomic Healing Experience* protocol.

"I am down deep in a bomb shelter with a small group of cowering fearful people. A strong muscular fellow is guarding the exit door so we cannot run out in panic when the bombs start to fall. This guard has a long pole with a soft cushion on the end so he can safely push people back in if they foolishly try to exit when the bombs begin exploding above.

In psychological level bra-ket notation:

< Ψ INCUBATION | O₊ GUARD | Ψ WAR >

Together the depressed man and therapist work out a helpful and hopeful therapeutic interpretation of this dream. The man's depressing dream is actually an appropriate stage 2 (incubation) expression of the 4-stage creative cycle wherein he needs to recognize the realities of his currently dangerous but temporary life situation. The guard is a manifestation of the constructive observer/operator in his dream. It protects him and others so they can safely incubate for a while about their condition until appropriate *quantum probability amplitudes* of adaptive psychosocial genomic RNA/DNA transition/translation dynamics develop to construct new therapeutic possibilities (Rossi & Rossi, 2016a & b in press). Conceivably this hopeful *expectancy* will optimize his ability to recognize the fruits of a good night's sleep in clearing his brain enough to optimize gene expression and brain plasticity for creating new consciousness.

Summary

Current approaches to psychotherapy are updated to support an adaptive evolutionary RNA/DNA psychosocial genomic theory of the quantum transformations of consciousness, creative cognition and expectancy. Alternating classical-to-quantum and quantum-to-classical transitions on all levels from mind to gene are explored for an understanding of how the 4-stage creative cycle operates in the practice of psychosocial genomics in daily life as well as psychotherapy.

We have uncovered surprising tendencies toward cognitive dissonance (Festinger, 1957), emotional negativity (Bilalić & McLeod, 2014) and psychological regression during stage 2 (incubation/conflict) of the 4-stage creative cycle that is particularly evident in dreams and therapeutic therapeutic consciousness and cognition when parsed with our new psychological bra-ket quantum Bayesian math notation. *The Creative Psychosocial Genomic*

Healing Experience protocol provides opportunities for resolving cognitive dissonance, symptoms, and psychopathology of all sorts with malfunctioning observer/operators in people (Oakley & Halligan, 2009; Rossi, 1997b; Rossi & Rossi, 1996). We propose such dysfunctions of stage two of the creative cycle are the evolutionary RNA/DNA psychosocial genomic source of the dynamics of war, bullying, discord, inappropriate competition, hate crimes, genocide and other psychosocial pathologies.

Controversial concepts of the observer/operator originally discovered in the early paradoxes of mathematical physics have profound applications in counseling, psychotherapy and therapeutic consciousness. Key research in psychosocial genomics is recommended to document and extend these observations for facilitating innovative evidence-based practices of therapeutic consciousness with the psychological bra-ket quantum observer-operator.

References

- BAGGOTT J (2011). *The quantum story: A history in 40 moments*. NY: Oxford University Press.
- BILALIĆ M & McLEOD P (2014). *Why Good Thoughts Block Better Ones*. *Scientific American*, 310 (3), 74-79.
- CAVES, C, FUCHS C & SCHACK R (2001). *Quantum Probabilities as Bayesian Probabilities*. ArXiv:quant-ph/0106133v2.pdf.
- CHIARUCCI R, MADEO D, LOFFREDO M, ET AL. (2014). *Cross evidence for hypnotic susceptibility through nonlinear measures on EEGs of non-hypnotized subjects*. *Scientific Reports*, Nature Publishing Group. *Scientific Reports*, 4, 5610, doi: 10.1038/srep05610.
- CLAYTON D (2013). *Genomics of memory and learning in songbirds*. *Annual Review of Genomics and Human Genetics*, Vol. 14: 45-65.
- COLE S (2009). *Social regulation of human gene expression*. *Current Directions in Psychological Science*, 18, 132-137.
- COLE S, AREVALO J, TAKAHASHI R, SLOAN EK, LUTGENDORF S, SOOD A, SHERIDAN J & SEEMAN T (2010). *Computational identification of gene-social environment interaction at the human IL6 locus*. *Proc. Natl. Acad. Sci.* 107, 5681-5686.
- COLE S, HAWKLEY L, AREVALO J, SUNG C, ROSE R & CACIOPPO J (2007). *Social regulation of gene expression in human leukocytes*. *Genome Biology*, 8, R189-R189.13.
- COLE S HAWKLEY L, AREVALO J & CACIOPPO J (2011). *Transcript origin analysis identifies antigen-presenting cells as primary targets of socially regulated gene expression in leukocytes*. *Proc. Natl. Acad. Sci.* 108, 3080-3085.
- COLE S YAN W, GALIC Z, AREVALO J & ZACK J (2005). *Expression-based monitoring of transcription factor activity: the TELiS database*. *Bioinformatics*, 21, 803-810.
- COZZOLINO M, TAGLIAFERRI R, CASTIGLIONE S, FORTINO V, CICATELLI A, DE LUCA P, GUARINO F, NAPOLITANO F, CELIA G, IANNOTTI S, RAICONI G, ROSSI K & ROSSI E (2014). *The creative psychosocial and cultural genomic healing experience: A new top-down epigenomic psychotherapeutic protocol*. *The International Journal of Psychosocial Genomics: Consciousness and Health Research*. Vol. 1(1), 18-25.
- CRESWELL J, IRWIN M, BURKLUND L, LIEBERMAN M, AREVALO J, MA J, BREEN E, & COLE S (2012). *Mindfulness-Based Stress Reduction training reduces loneliness and pro-inflammatory gene expression in older adults: A small randomized controlled trial*. *Brain, Behavior, and Immunity*, DOI: 10.1016/j.bbi.2012.07.006.
- DIRAC P (1930). *The Principles of Quantum Mechanics*. Oxford: Clarendon Press.
- DRNEVIC J, REPLOGLE KL, LOVELL P, HAHN TP JOHNSON F, MAST TG ... & CLAYTON DF. (2012). *The impact of experience-dependent and independent factors on gene expression in songbird brain*. *Proceedings of the National Academy of Sciences (USA)* 109:17245-17252.
- DUSEK J, OTU, H, WOHLHUETER A, BHASIN M, ZERBINI L, JOSEPH M, BENSON H & LIBERMANN T (2008). *Genomic Counter-Stress Changes Induced by the Relaxation Response*. *PLoS ONE* 3(7): e2576. doi:10.1371/journal.pone.0002576.
- ENCODE PROJECT CONSORTIUM, (2012). *An integrated encyclopedia of DNA elements in the human genome*. *Nature*, 489, 57-74.
- FESTINGER L (1957). *A theory of cognitive dissonance*. NY: Basic Books.
- 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, UK: Cambridge University Press.
- FUCHS C (2012). *Interview with a Quantum Bayesian*. arXiv:1207.2141v1.pdf.
- FUCHS C, MERMIN N & SCHACK R (2013). *An Introduction to QBism with an Application to the Locality of Quantum Mechanics*. arXiv:1311.525v1 [quant-ph].pdf.
- FUCHS C & SCHACK R (2013). *Quantum-Bayesian Coherence: The No-Nonsense Version*. arXiv:1301.3274v1 [quant-ph].pdf
- GRODZINSKY Y & NELKEN I (2014). *The neural code that makes us human*. *Science*, 343, 978-979.
- GUNARATNE P, LIN Y, BEMHAM A, DRENVICH J, COARFA C, TENNAKON J ... & CLAYTON D (2011). *Song exposure alters the profile of microRNAs in the zebra finch auditory forebrain*. *BMC Genomics* 12:277.
- HOLZNER S (2013). *Differential Equations Workbook for Dummies*. NY: Wiley.
- IACOBONI M (2007). *Face to face: The Neural Basis of Social Mirroring and Empathy*. *Psychiatric Annals*, 37(4), 236-241.
- IACOBONI M (2008). *Mirroring People: The new science of how we connect with people*. NY: Farrar, Straus and Giroux.
- IRWIN M & VEDHARA K (2005). *Human Psychoneuroimmunology*. NY: Oxford University Press.
- JAMIESON G (2007). *Hypnosis and Conscious States.: The Cognitive Neuroscience Perspective*. NY: Oxford University Press.
- JAMIESON G & BURGESS A (2014). *Hypnotic induction is followed by state-like changes in the organization of EEG functional connectivity in the theta and beta frequency bands in high-hypnotically susceptible individuals*. *Frontiers Human Neuroscience*, 8: 528. doi: 10.3389/fnhum.2014.00528.
- JEONG H, LIM Y, & KIM M (2014). *Coarsening Measurement References and the Quantum-to-Classical Transition."* *Physical Review Letters*, DOI: 10.1103/PhysRevLett.112.010402. arXiv:1307.3746.
- KELLOGG R (2013). *The Making of the Mind: The Neuroscience of Human Nature*. NY: Prometheus Books.
- KIRSCH I (2001). *The Response Set Theory of Hypnosis: Expectancy and Physiology*. *American Journal of Clinical Hypnosis*, 44:1, 69-73.
- KNÖRNSCHILD M (2014). *Vocal production learning in bats*. *Current Opinion in Neurobiology*, 28: 80-85.

- LESLIE M (2013). *NIH Effort Gambles on Mysterious Extracellular RNAs*. *Science*, 341, 947.
- 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.
- LOYD D & ROSSI E (Eds.), (1992). *Ultradian Rhythms in Life Processes: An Inquiry into Fundamental Principles of Chronobiology and Psychobiology*. NY: Springer-Verlag.
- LOYD D & ROSSI E (Eds.), (2008). *Ultradian Rhythms from Molecules to Mind: A New Vision of Life*. NY: Springer.
- MAZZONI G, VENERI A, MCGEOWN W, KIRSCH I (2013). *Neuroimaging resolution of the altered state hypothesis*. *Cortex*, 49(2), 400-10.
- MORELL V (2014). *When the bat sings*. *Science*, 344(6190),1334-1337
- OAKLEY D, HALLIGAN P (2009). *Hypnotic suggestion and cognitive neuroscience*. *Trends Cognitive Science* 13(6):264-70.
- OTTO R (1923/1950). *The Idea of the Holy: An Inquiry into the non-rational factor in the idea of the divine and its relation to the rational*. NY: Oxford University Press.
- PEKALA R, KUMAR V, MAURER R, ELLIOTT-CARTER N, MOON E & MULLEN K. (2010). *Suggestibility, expectancy, trance state effects, and hypnotic depth: I. Implications for understanding hypnotism*. *American Journal of Clinical Hypnosis*, 52(4):275-90.
- POLLARD K., SALAMA S, LAMBERT N, ET AL. (2006). *An RNA gene expressed during cortical development evolved rapidly in humans*. *Nature*, 443 (7108): 167–172.
- POLLARD K (2012). *The genetics of humanness. What makes us human? Answers from evolutionary anthropology*. In CALCAGNO, J. AND FUENTES, F. (Eds.) *Evolutionary Anthropology* 21: 184.
- RIZZOLATTI G & SINIGAGLIA C (2008). *Mirrors in the Brain: How our Minds Share Actions and Emotions*. NY: Oxford University Press.
- ROBINSON G, FERNALD R & CLAYTON D (2008). *Genes and Social Behavior*. *Science*. 322:869-900.
- ROSSI E (1972/1985/2000). *Dreams, Consciousness & Spirit: The Quantum Experience of Self-Reflection and Co-Creation*. (3rd Edition of *Dreams & the Growth of Personality*). NY: Zeig, Tucker, Theisen.
- ROSSI E (1982). *Hypnosis and Ultradian Cycles: A New State(s) Theory of Hypnosis?* *The American Journal of Clinical Hypnosis*, 25, 21-32.
- ROSSI E (1986, 1993, 2nd. Ed.). *The Psychobiology of Mind-Body Healing: New Concepts of Therapeutic Hypnosis*. NY: WW Norton.
- ROSSI E (1988a). *Non-locality in Physics and Psychology: An Interview with John Stewart Bell*. *Psychological Perspectives*, 19(2), 294-319.
- ROSSI E (1988b). *Beyond relativity and quantum theory: An interview with David Bohm*. *Psychological Perspectives*, 19, 25-43.
- ROSSI E (1988c). *Perspectives: Consciousness and the New Quantum Psychologies*. *Psychological Perspectives*, 19(1), 4-13.
- ROSSI E (1988d). *Perspectives: A Mind-Gene Connection*. *Psychological Perspectives*, 19(2), 212-221.
- ROSSI E (1997a). *The Feigenbaum Scenario in a Unified Science of Life and Mind*. *World Futures*: 50, 633-645.
- ROSSI E (1997b). *The symptom path to enlightenment: The psychobiology of Jung's Constructive Method*. *Psychological Perspectives*, 36, 68-84.
- ROSSI E (1998). *The Feigenbaum Scenario as a Model of Conscious Information Processing*. *Biosystems*, 40, 1-10.
- ROSSI E (1999). *The co-creative dynamics of dreams, consciousness and choice*. *Psychological Perspectives*, 38, 116-127.
- ROSSI E (2002a). *The Psychobiology of Gene Expression: Neuroscience and Neurogenesis in Hypnosis and the Healing arts*. NY: WW Norton.
- ROSSI E (2002b). *A conceptual review of the psychosocial genomics of expectancy and surprise: Neuroscience perspectives about the deep psychobiology of therapeutic hypnosis*. *American Journal of Clinical Hypnosis*. 45:2, 103-118.
- ROSSI E (2002c). *Psychosocial genomics: gene expression, neurogenesis, and human experience in mind-body medicine*. *Advances in Mind Body Med.* 18(2):22-30.
- ROSSI E (2004). *A Discourse with Our Genes: The psychosocial and cultural genomics of therapeutic hypnosis and psychotherapy*. Available in English and Italian. (ISBN –89396-01-6) San Lorenzo Maggiore, Italy: Editris s.a.s. Phoenix, AZ: Zeig, Tucker and Theisen.
- ROSSI E (2005). *Einstein's eternal mystery of epistemology explained: The four stage creative process in art, science, myth, and psychotherapy*. *Annals of the American Psychotherapy Association*, 8, 4-11. Reprinted in: Rossi, E. (2007). *The Breakout Heuristic: The New Neuroscience of Mirror Neurons, Consciousness and Creativity in Human Relationships: Vol. 1, The Selected Papers of Ernest Lawrence Rossi*. Phoenix, AZ: The Milton H. Erickson Foundation Press.

- ROSSI E (2007). *The Breakout Heuristic: The New Neuroscience of Mirror Neurons, Consciousness and Creativity in Human Relationships*. The Selected Papers of Ernest Lawrence Rossi, Vol. 1. Phoenix: AZ: The Milton H. Erickson Foundation Press.
- ROSSI E (2012). *Creating Consciousness: How Therapists Can Facilitate Wonder, Wisdom, Truth and Beauty*. The Selected Papers of Ernest Lawrence Rossi, Vol. 2. Phoenix: AZ: The Milton H. Erickson Foundation Press.
- ROSSI E, IANNOTTI S, COZZOLINO M, CASTIGLIONE S, CICATELLI A & 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*. *Sleep and Hypnosis: An International Journal of Sleep, Dream, and Hypnosis*, 10:2, 39-44.
- ROSSI E & ROSSI K [With Otto Rössler] (1996). *The Symptom Path to Enlightenment: The New Dynamics of Hypnotherapeutic Work: An Advanced Manual for Beginners*. Los Osos, CA: Palisades Gateway Press.
- ROSSI E & ROSSI K (2011). *Decoding the Chalmers Hard Problem of Consciousness: Qualia of the Molecular Biology of Creativity and Thought*. *Journal of Cosmology*, Vol 14. On Line @ <http://journalofcosmology.com/Consciousness126.html>. Re-Printed in: PENROSE, R., HAMEROFF, S. AND KAK, S. (Eds.) (2011). *Consciousness and the Universe: Quantum Physics, Evolution, Brain, and Mind*, pp. 210-227.
- ROSSI E & ROSSI K (2013). *Creating New Consciousness in Everyday Life: The Psychosocial Genomics of Self-Creation*. A Video eBook available @ Amazon.com. Los Osos, CA: The Psychosocial Genomic Research Institute of the California Central Coast.
- ROSSI E & ROSSI K (2014a). *An Evolutionary RNA/DNA Psychogenomic 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). *How Quantum Field Theory Optimizes Neuropsychotherapy*. *The Neuropsychotherapist*, 4(4), 14-25.
- ROSSI E & ROSSI K (2016b, In press). *A Quantum Field Theory of Neuropsychotherapy: Semantic Mind Brain Maps and the Quantum Qualia of Consciousness*. *The International Journal of Neuropsychotherapy*.
- SAEY T (2010). *First songbird genome arrives*. *Science News*, 177(9), 16.
- SCZEPANSKI J & JOYCE G (2014). *A cross-chiral RNA polymerase ribozyme*. *Nature*, 515, 440-442.
- SHELKA S & PICCIRILLI J (2014). *RNA made in its own Mirror image*. *Nature*, 515, 347-348.
- SLIWINSKI, J AND ELKINS, G (2013). *Enhancing placebo effects: insights from social psychology*. *American Journal of Clinical Hypnosis*. 55: 236-248.
- SUSSKIND L & FRIEDMAN A (2014). *Quantum Mechanics: The Theoretical Minimum*. NY: Basic Books.
- TURVING E (2002). *Episodic Memory: From Mind to the Brain*. *Annual Review of Psychology*. 53, 1-26.
- TURVING E (2005). *Episodic Memory and Autoeogenesis: Uniquely Human?* In TERRANCE & METACALF (Eds.) *The Missing link in Cognition*. Oxford: Oxford University Press, 3-56.
- UNTERNAEHRER E, LUERS P, MILL J, DEMPSTER E MEYER A, STAEBLI S, ET AL. (2012). *Dynamic changes in DNA methylation of stress-associated genes (OXTR, BDNF) after acute psychosocial stress*. *Translational Psychiatry*, 2, e150, doi:10.1038/tp.2012.77.
- VEDRAL V (2012). *Decoding Reality: The Universe as Quantum Information*. NY: Oxford University.
- VON BAEYER H (2013). *Quantum weirdness? It's all in your mind*. *Scientific American*, 308, 46-51.
- WAGSTAFF G (2010). *Hypnosis and the relationship between trance, suggestion, expectancy and depth: some semantic and conceptual issues*. *American Journal of Clinical Hypnosis*.53(1):47-59.
- WARREN W, CLAYTON D, ET AL. (2010). *The genome of a songbird*. *Nature*, 464, 757-762.
- WILBER K ((1993). *The Spectrum of Consciousness*. Wheaton: Quest Books.
- XIE, ET AL. (2013). *Sleep drives metabolite clearance from the adult brain*. *Science*, 342, 373-377.

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

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*"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

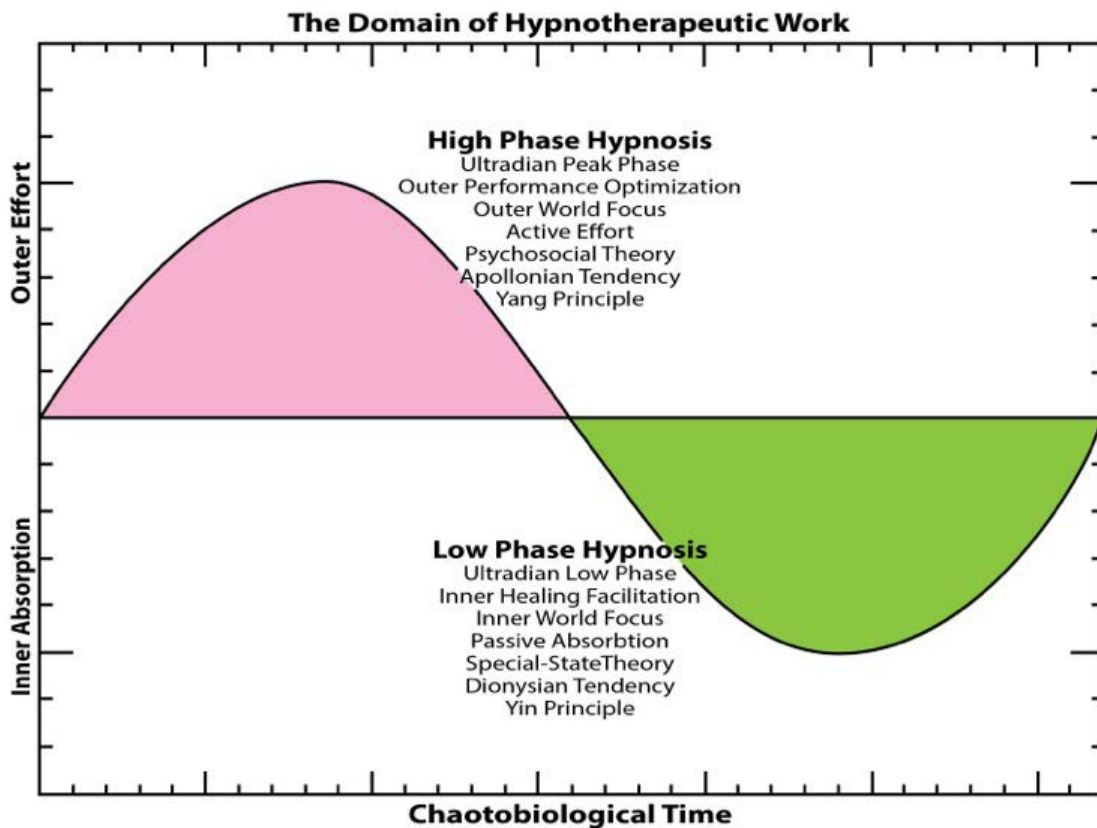


Figure 1: The domain of hypnotherapeutic work. The continuum of therapeutic hypnosis to be assessed by DNA chip technology ranges from the quasi-periodic (chaotobiological) time of (1) high phase hypnosis with its active focus on problem solving as described by psychosocial theorists to (2) the apparently 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).

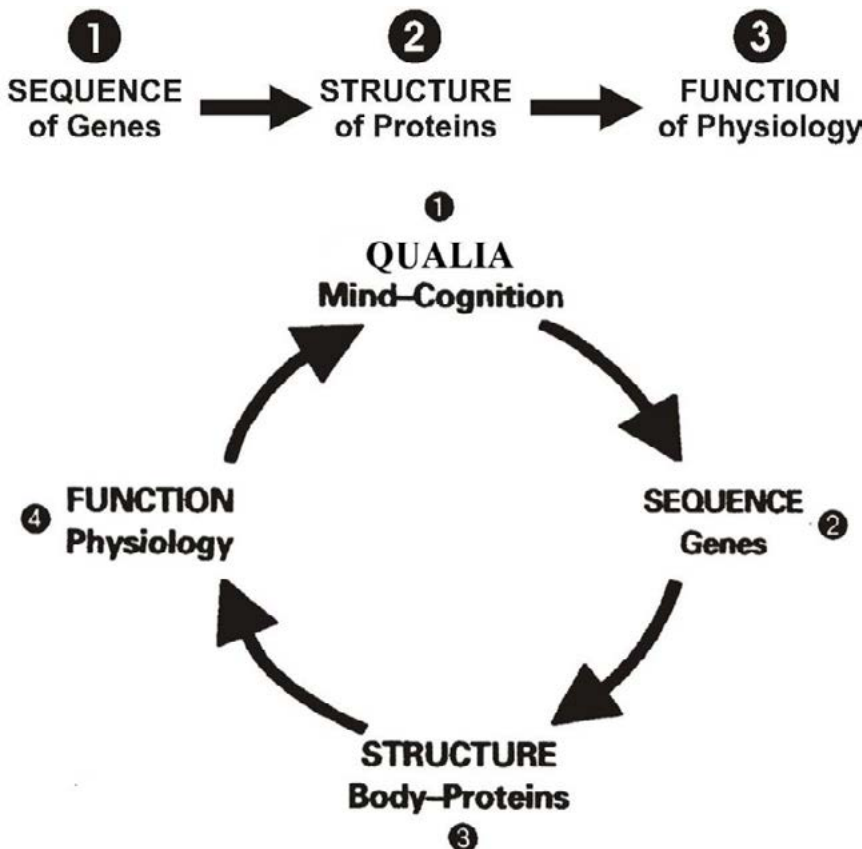


Figure 2: (Upper) The Watson & Crick's original linear dogma of molecular biology. There is no explicit role for the qualia of consciousness and psychological experience. (1953a, 1953b)

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.*

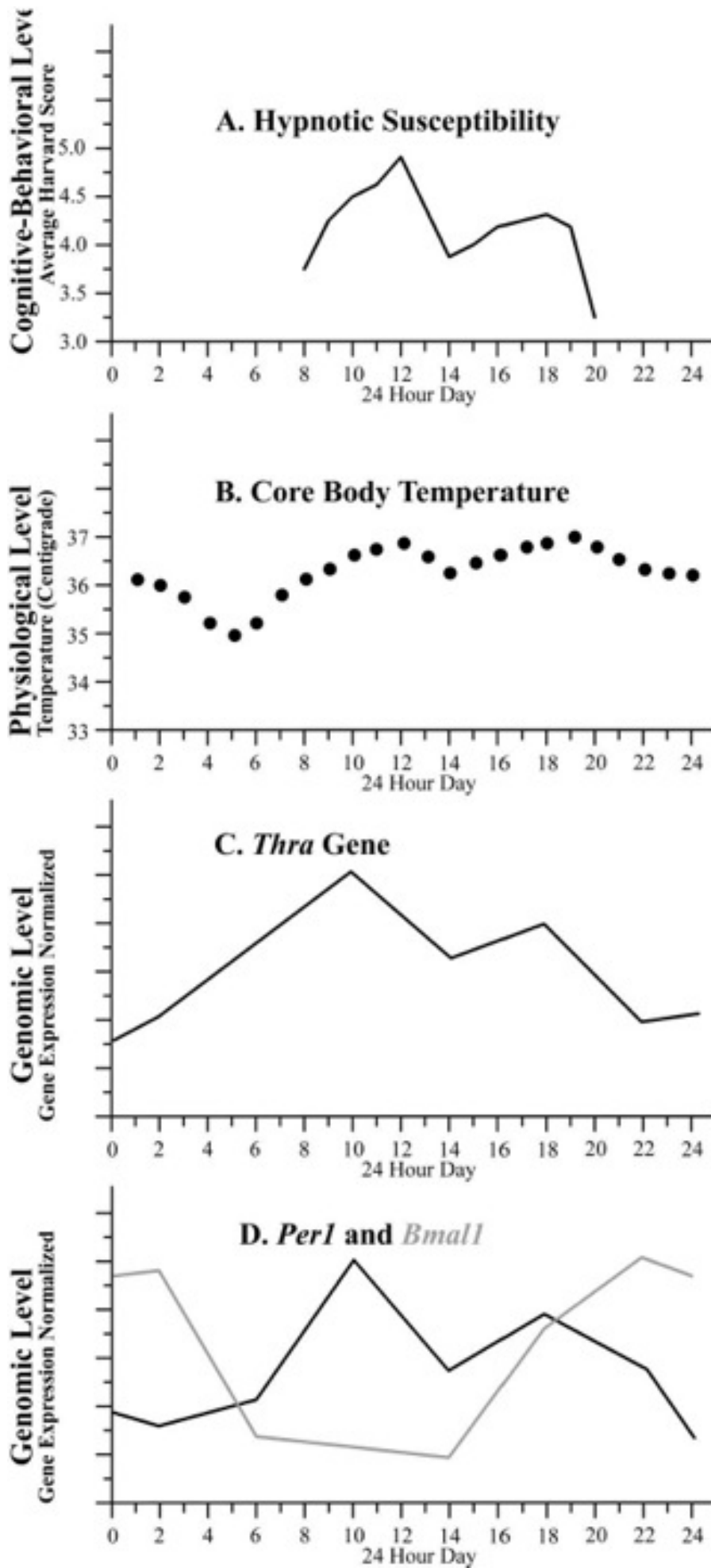


Figure 3: The bioinformatics of hypnotic susceptibility across all levels. A. The bimodal circadian profile of Hypnotic Susceptibility is similar to B. Core Body Temperature, C. *Thra* gene expression, and D. Period one (*Per 1*) gene expression (Nestler, E., 2008).

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.

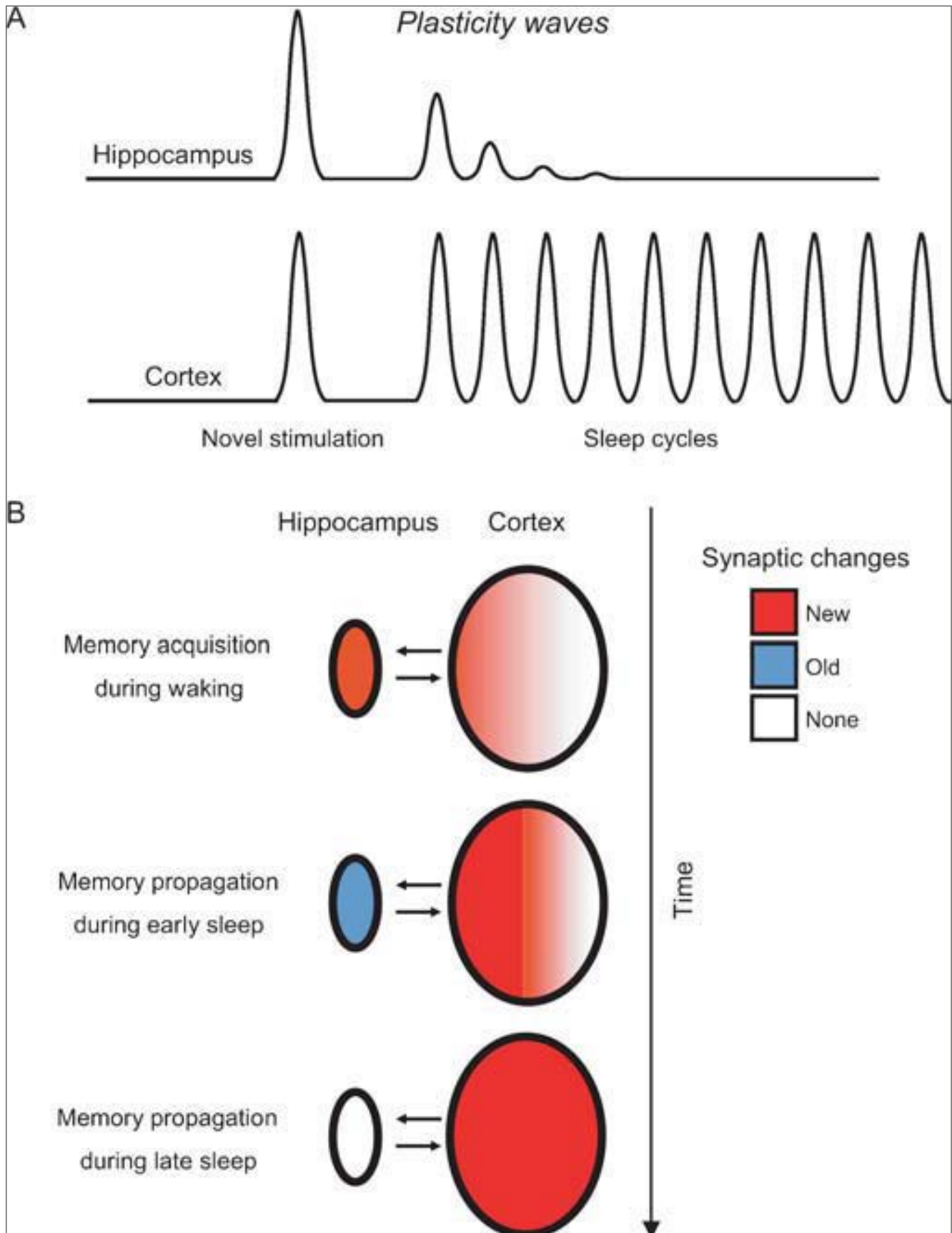


Figure 4. Ribeiro's modeling of the hippocampus-cortical dynamics of new memory and learning. A. The hippocampus initially undergoes a few waves of brain plasticity before fading out. These waves of brain plasticity can maintain memories in the hippocampus for weeks or months. In contrast, the cerebral 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)

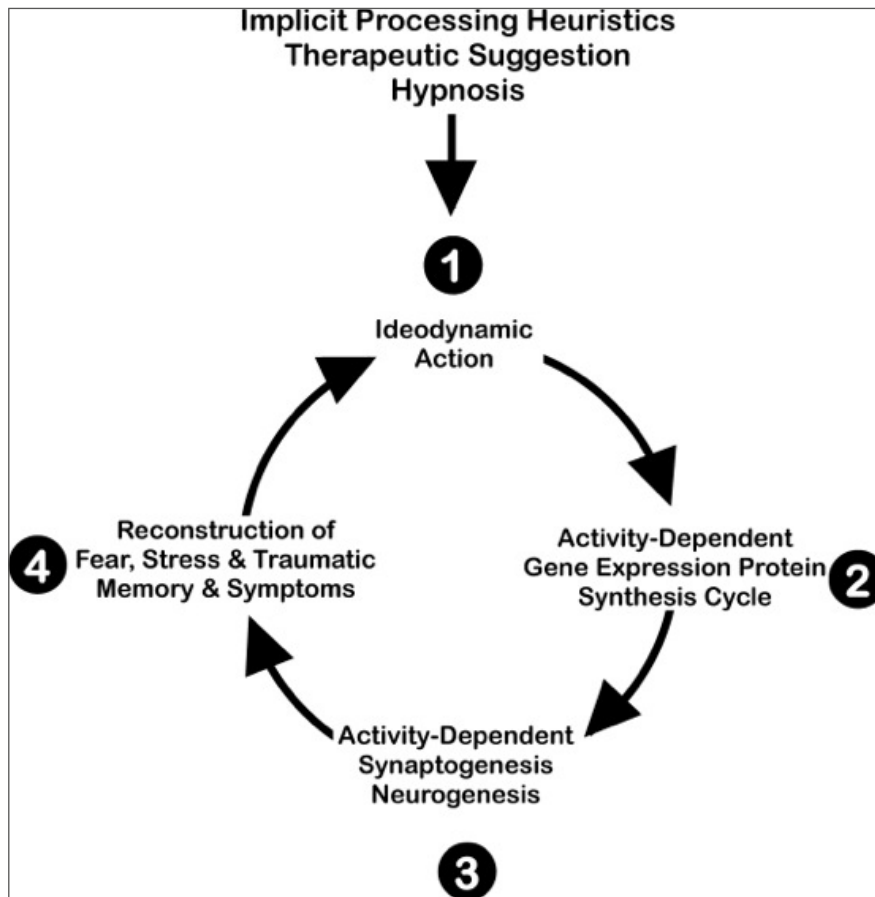


Figure 5: The psychosocial genomics model of therapeutic hypnosis and psychotherapy. Consistent with Ribeiro's neuroscience model of the consolidation of new memory and learning we hypothesize 1. Permissive therapeutic suggestions (implicit processing heuristics) evoke ideodynamic action, which in turn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

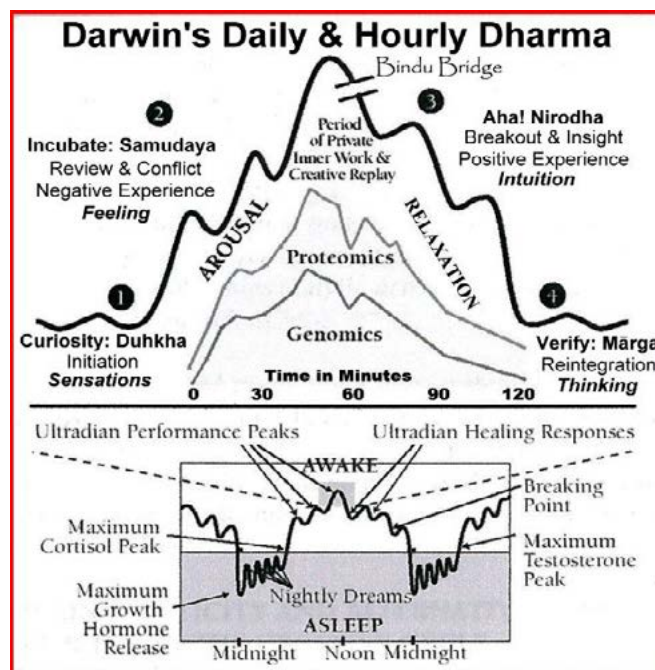


Figure 6a: The Quantum wave form profile of psycho-neuro-physiology during the 4-Stage creative process. The ultradian profile (90-120 minutes) of the 4-Stage creative process shows the psychological level (top most portion of the upper curve). The proteomics (protein) profile in middle curve depicts 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).

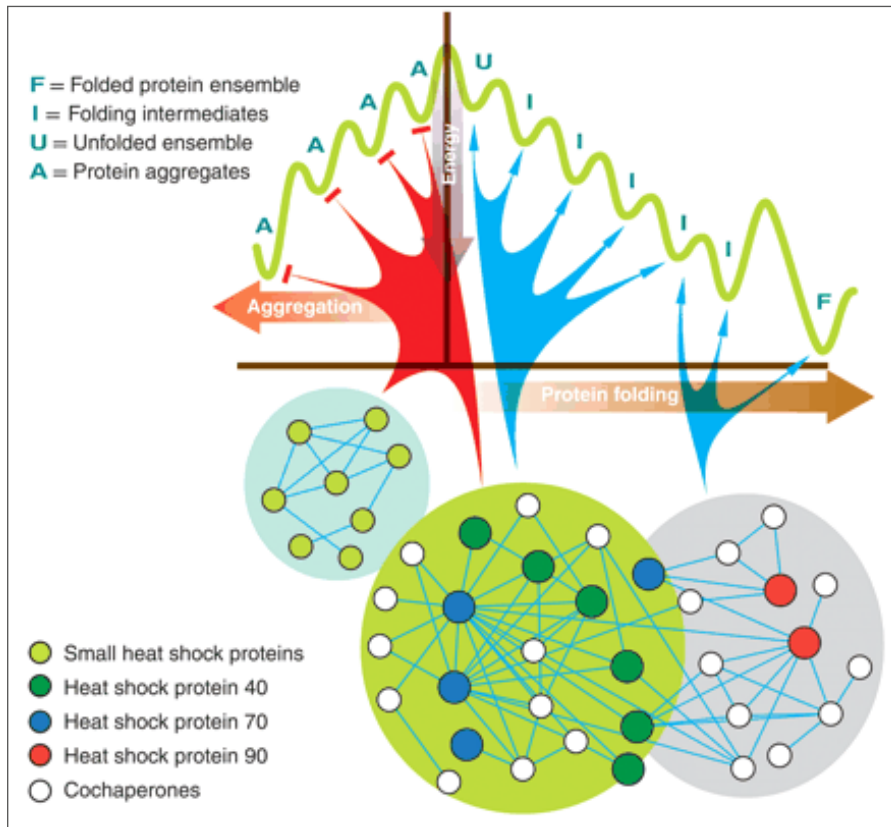


Figure 6b: The Quantum wave form profile of protein dynamics. Protein aggregation and folding are required within cells for physiological processing in development, aging, and disease intervention (Top: wave form profile). Three circular networks of proteins interact with their chaperones (Bottom circles; 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.

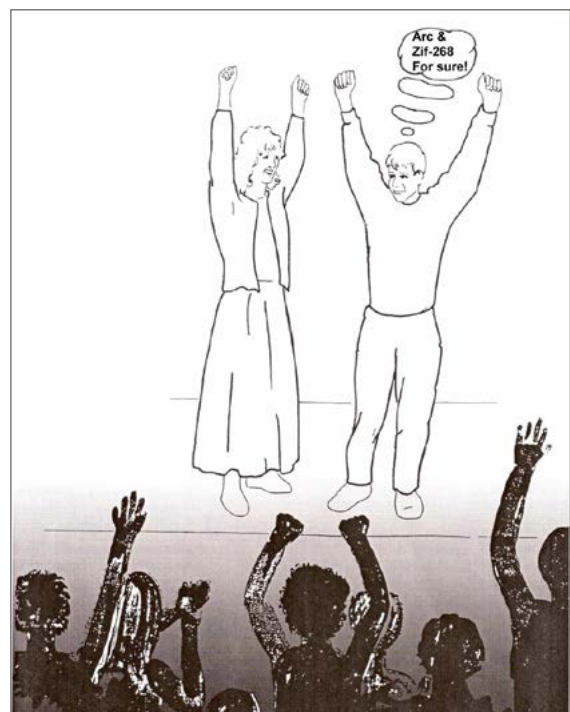


Figure 8d. Stage Four: The patient receives a standing ovation from the audience. The therapist speculates that the arc and zif-268 genes will be expressed in her REM dream states tonight to encode her new therapeutic experiences with brain plasticity supported by this unusually strong show of psychosocial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

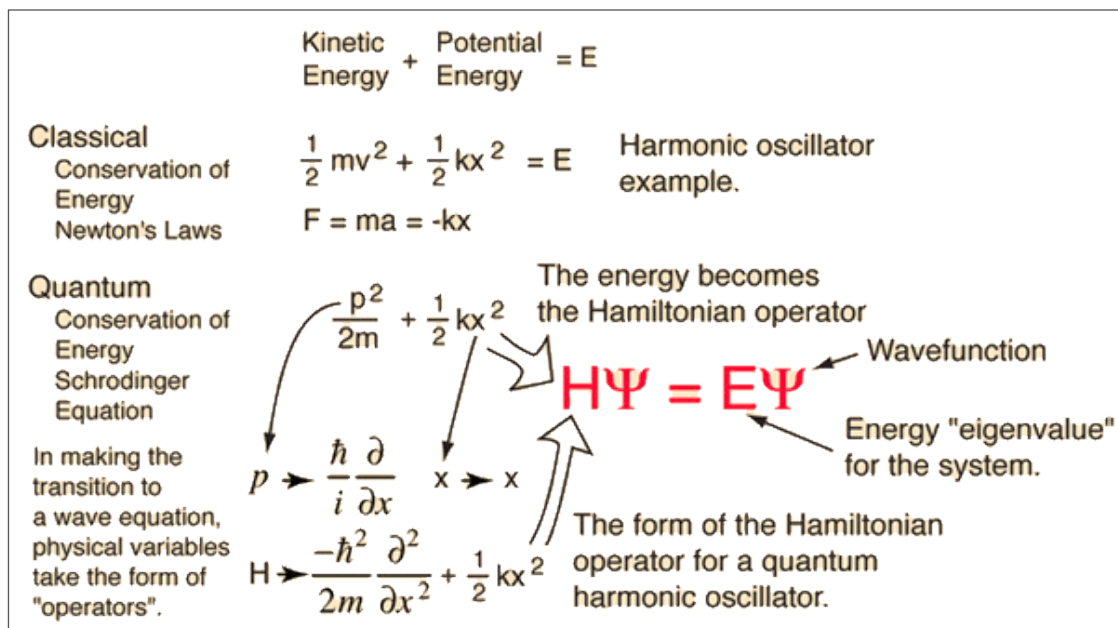


Figure 10. The dynamics of Schrödinger's equation with the Ψ (psi) symbol that is now well recognized in an integrated Quantum Field Theory of the fundamental mathematics of physics (Nave, 2016), which we generalize to quantum biology and psychology.

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

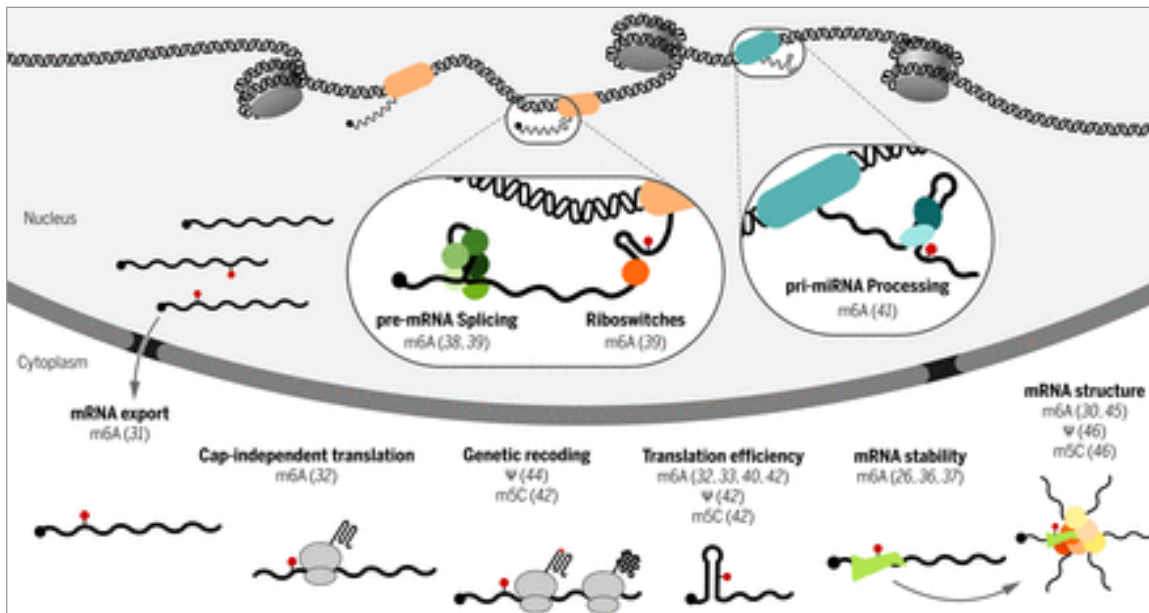


Figure 11. An illustration of some of the quantum level "writer" enzymes within the DNA during Genetic Recording, Translational Efficiency and mRNA Structure (Gilbert, Bell and Schaening, 2016).

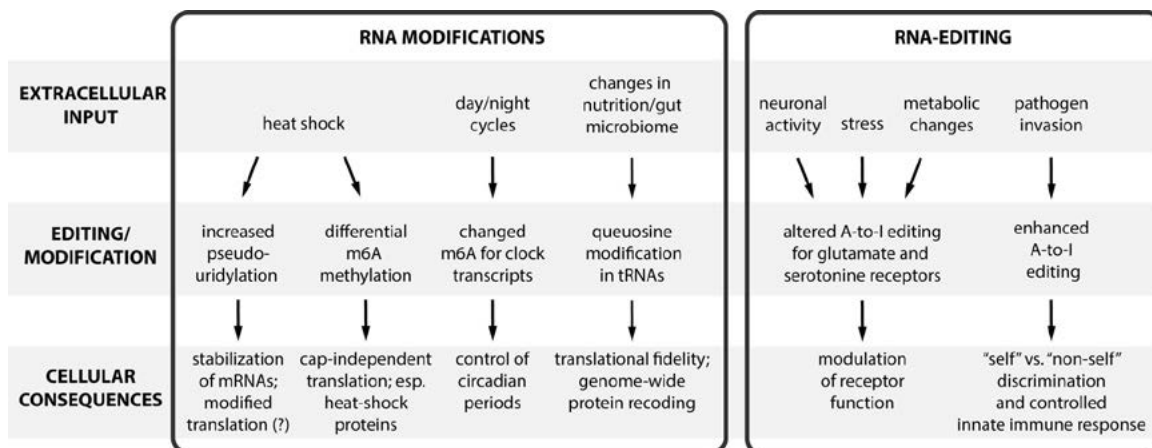


Figure 12. A summary of psychosocial genomic factors related to stress, neuronal activity, nutrition, "Self" and "Non-Self" of the immune system and the daily circadian cycle at the quantum level (adapted from Licht & Janish, 2016).

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

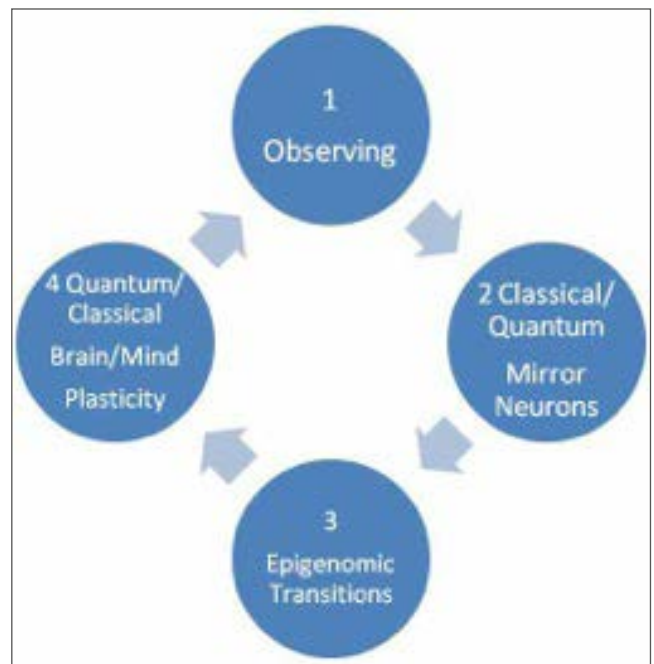


Figure 13. On the fundamental quantum level, the observer/operator effect is the basic insight and central dynamic for an integrative science of physics, biology and psychology.

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*

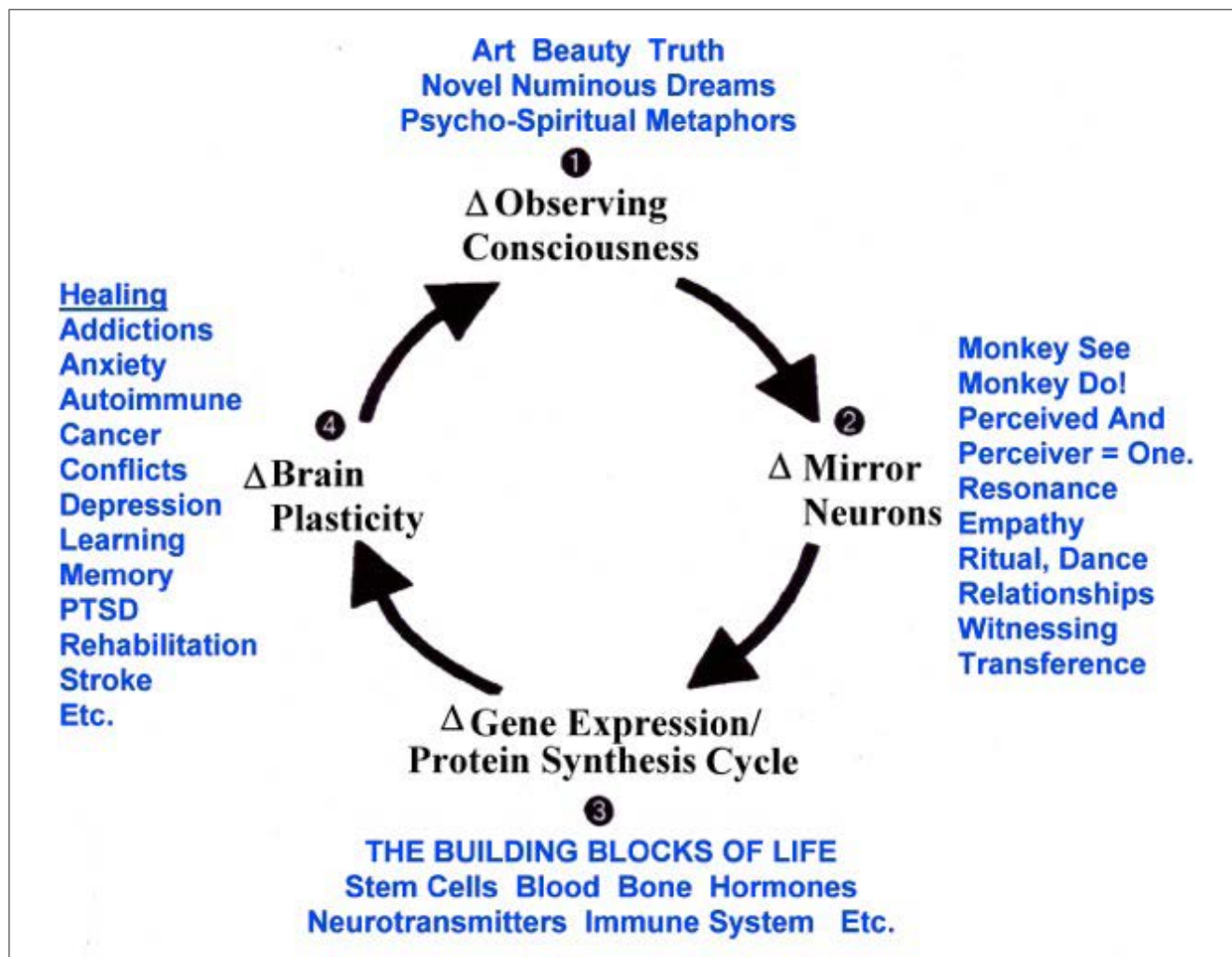


Figure 14. The 4-Stage cycle of health, stress, illness and rehabilitation within individuals, cultures and societies as an integration of art, beauty and truth in the quantum field theory of all schools of mind-body psychotherapy.

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 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.

BRAIN STRUCTURES INVOLVED IN MORAL REASONING: A REVIEW

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Abstract

During the last decade there has been a substantial increase in the number of studies that discuss brain processes and moral reasoning in different fields of research. The aim of this review is to establish the current state of the art of the neurobiological bases of moral reasoning in healthy humans, based on the publications from the last decade.

The results show that the neurobiological bases of moral reasoning are closely associated to several anatomical regions serving a broad variety of functions. Regions that can be highlighted include the prefrontal cortex (PFC), particularly, the dorsolateral-PFC, medial-PFC, ventromedial-PFC and orbitofrontal cortex; the anterior and posterior parts of the cingulate cortex; parts of the temporal cortex including the temporoparietal junction and the superior temporal sulcus; the insular lobe; the precuneus and subcortical structures such as the amygdala.

Those outcomes underline the importance of brain anatomy and functionality for correct moral reasoning.

Keywords: ethics; development; moral; neural; reasoning

Moral reasoning (MR), is an innate ability that evolves during the vital cycle, being influenced, among other factors, by age, sex, personal characteristics, brain development, genes, the relationship with the caregiver, perception, attributions, etc.

This paper focuses on the role of the neurological bases in the process and result of MR, taking into account the importance of plasticity, neural development and individual differences in order to understand and treat processing deficiencies in processing.

The concept of *morality* has been studied from many perspectives throughout history. It formed part of Darwin's (1871) theory, the Descent of Man, according to which it is the product of our phylogenetic makeup and a basic mechanism which contributes to social cohesion.

From an ethological perspective, studies of morality have looked at the social behaviour and needs of animals, including non-human primates. These studies have highlighted the role of biological aspects in MR (de Waal, 2003 & 2006). Psychology has approached this topic from theoretical positions as diverse as psychoanalysis, behaviourism, and cognitivism (Pérez-Delgado & García-Ros, 1991). As Martí-Vilar & Palma-Cortés (2010) point out, in the study of MR we can distinguish at least precognitive and cognitive theories.

With Piaget's (1965, 1971) evolutionary constructivist psychology, moral development began to be understood in relation to the development of other cognitive faculties and its interaction with the environment. Later, Kohlberg (1969) modified Piaget's theory to introduce the importance of the role of consciousness and rational reasoning (Prehn et al., 2008) and recently Hoffman (1992) asserted that moral development happens in a similar way to social cognitive development (Martí-Vilar et al., 2010).

Currently these explanatory models have broadened in order to encompass MR as a process where cognition, intuition and emotion cooperate (Greene, Nystrom, Engell, Darley & Cohen, 2004).

Specifically with the rise of neuroscience, the number of studies dedicated to understand brain functioning in behaviour control has increased meaningfully. Thus morality has not been an exception and the brain has turned into the center of attention in the study of the matter (Caravita, Giardino, Lenzi, Salvaterra, & Antonietti, 2012; Schirrmann, 2013; Youssef et al., 2011).

If morality is an innate capacity of the human being -and possibly of the great primates too- it must have

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a biological basis (Marazziti, Baroni, Landi, Ceresoli & Dell'Osso, 2013; Decety, & Howard, 2013). In fact, for it to function appropriately all areas of the brain must be in good condition (Schirrmann, 2013), and the kind of problems that are presented in moral functioning are area dependent (Parkinson, Sinott-Armstrong, Koralus, Mendelovici, McGeer, & Wheatley, 2011). Many patients with neurological or psychiatric disorders as it is the case of those who present damage in the ventromedial-PFC, frontotemporal dementia, psychopathy, and autism have difficulties to perform moral judgements due to deficits in emotional processing (Harenski, Antonenko, Shane, & Kiehl, 2010; Prehn et al., 2008; Reniers, Corcoran, Völlm, Mashru, Howard & Liddle, 2012; Sylvia et al., 2010; Young & Dungan, 2012). We must recall the case of Phineas Gage (1848), thanks to which the importance of the frontal lobe in personality and social and moral emotions was discovered.

The fact that lesions and or alterations in different regions and cerebral circuits affect moral response, makes this area interesting not just for Affective neuroscience and Moral Psychology, but a huge variety of other areas of the scientific and clinical domains (Marazziti et al., 2013) such as Neurology, Neuropsychology, Scholar Psychology and education in general, Clinical Psychology or Public Communication among others. This interest roots in a better comprehension, prevention, evaluation and treatment of behaviour and interaction moral problems.

Centered in the idea of finding the neurobiological basis involved in MR, many investigations have given support to the idea that there are two neural networks involved in this kind of reasoning, the cognitive network and the emotional network (Caravita et al., 2012; Decety, Michalska & Kinzler, 2010; Forbes & Grafman, 2010; Greene et al., 2004; Prehn et al., 2008; Tassy et al., 2012). Others declare that there are many areas and neural networks that participate in MR (Avram et al., 2014; Fumagalli & Priori, 2012; Moll, Zahn, Oliveira-Souza, Krueger & Grafman, 2005; Parkinson et al., 2011; Schirrmann, 2013; Young et al., 2012) or that quite the contrary, there is only one brain area where moral is integrated, the ventromedial-PFC (Marazziti et al., 2013).

The increasing number of studies into the neurobiological basis of MR which have been published over the last few years reflects a growing interest in this topic. However, such is the diversity of articles and their results that elaborating any sort of meaningful meta-analysis seemed extremely difficult (Christensen & Gomila, 2012). It was decided, therefore, to carry out a systematic review in order to organise and structure the data and attempt to answer the question: what are the neurobiological bases of MR? In particular, we are interested in knowing which neuro-anatomical structures, networks and neural connections are principally involved, and how they relate to each of the three ethics presented in the Triune Ethics Theory (Narvaez, 2010).

The Triune Ethics Theory, based on MacLean's (1990) Theory of the Triune Brain, postulates the existence of three kinds of ethics (security, connection and imagination). Each one of these ethics or moral systems is related to different neurobiological and biochemical bases, which at the same time influence their functioning. Security ethic lie in the first cerebral formation, the so-called reptilian brain, was the name MacLean (1990) gave to the basal ganglia, structures derived from the floor of the forebrain during development, which are supposed to be responsible for species-typical instinctual behaviors involved in aggression, dominance, territoriality, and ritual displays. Connection ethic is found in the second brain structure, the paleo-mammalian. It includes the limbic system and related structures. It is the basis for emotion, personal identity, episodic memory and social feeling of belonging. Lastly, imagination ethic is located in the third cerebral formation (or neomammalian). The neocortex (particularly linked with the frontal lobes and the prefrontal cortex relevant for connections with the rest of the encephalon) and the structures of the thalamus (which connect with the neocortex). Thus, this ethic is the origin of executive functions and the one that allows a dynamic adaptation to new experiences. Experience as well as gene expression are important for the formation for these bases and the corresponding ethics. An individual will only achieve the maximum degree of moral evolution when he or she is able to combine the functioning of all three ethics (Narváez 2010).

There are many and varied terms used in the literature to discuss the concepts appearing in this paper. There follows, therefore, a review of the key terms as they are used here.

We define *MR* as the combination of slow and conscious thought processes (as opposed to unconscious thought processing or intuition) by means of which information with a moral 'weight' or 'load' is processed, and about which a decision is made (or not). Thus it involves the processes of judging and decision making.

Generally the term *reasoning* is interpreted as a general process of cognition and deliberation while *judging* is a process of evaluation in which intuition and deliberate reasoning are involved (Harenski et al., 2010). In specific literature both terms are sometimes used synonymously.

The closely related term *moral decision* is defined as the evaluation of our own actions or those of others with reference to moral norms and values (Heekeren, Wartenburger, Schmidt, Prehn, Schwintowski & Villringer, 2005).

The concept of *perspective* is also relevant where this is understood as the point of view that an individual adopts to interpret an event.

Finally, we must mention the notion of *moral development* as many theories and studies take MR to be a process that develops and evolves during a person's lifetime.

This review attempts to provide a global vision of the research carried out by the international scientific community during the last decade into the neurobiological basis of MR.

Evaluation of MR

The majority of the articles revised use input stimuli such as phrases, stories, images and actions that induce moral dilemmas in which the right decision is not clear, and each participant must choose according to their own values.

The articles distinguish between personal and impersonal moral dilemmas. Personal moral dilemmas have a higher emotional load and, in addition, should satisfy the following three requirements:

1. At least one participant in the situation must have the intention of causing some kind of physical bodily harm.

2. The intention to harm must be directed to a person or persons.

3. The intention to harm cannot be the consequence of an already existing threat, it must be executed in a direct way.

Dilemmas that only satisfy one or two requirements are impersonal dilemmas.

The studied samples vary in age and gender but usually use righthanded subjects (as long as it is mentioned in the studies). The most common (51,28%) are those that use adult men and women in the sample.

Broad neurobiological bases involved in MR

Bearing in mind the variety of neuroanatomical structures involved in MR, and that not all have the same importance, only the main structures are discussed in this section, grouped according to their involvement in individual brain development, in judgment, in adopting a point of view (or perspective) on something, and in perceiving stimuli.

Neuroanatomical structures according to the characteristics of individual brain development

Hemodynamic activation of different areas of the brain indicates their degree of activation (cerebral tissue doesn't store energy substrates so that when neurons are activated they need more glucose, which leads to an increased blood flow of blood in the area). It evolves and varies depending on age and brain development.

Other studies suggest that with aging there is a progressive reduction in activation of the amygdala, the insula, the ventromedial-PFC and the subgenual-PFC when making moral judgements which could harm another person. In contrast, it appears that with aging, activity in the dorsolateral-PFC and the right-side of the frontal inferior gyrus is increased (Decety et al., 2013).

However, Harenski et al., (2012) in a study of moral judgement that compared subjects between 13 and 53 years of age, concluded that the areas that correlate positively with age are the temporoparietal

junction (TPJ), the superior temporal sulcus (STS) and the posterior cingulate cortex (PCC). The PCC is also related with higher activation in adolescence (Pujol et al., 2008). On the other hand, if competence in MR (an ability correlated with cerebral and evolutive maturity) is taken into account, individuals with lower competence have higher activation levels of the ventromedial-PFC, the posterior left STS, the right dorsolateral-PFC, the left orbitofrontal cortex (OFC), and the temporal lobes (Prehn et al. 2008).

Neuroanatomical structures according to the characteristics of the judgement

Comparing correct and incorrect judgements of moral statements and aesthetic statements, it has been observed that moral judgements produce larger activation of the medial frontal gyrus, the medial-PFC, the anterior cingulate cortex (ACC), the PCC, the precuneus, the TPJ and the visual cortex (Avram et al., 2013).

Also the network in charge of deliberation has been distinguished from the one in charge of reaching a verdict when faced with a morally incorrect action. In the former, the ventral-PFC, the PCC and the TPJ have been identified, while in the latter the anterior bilateral insula and the basal ganglia seem to be the key areas (Avram et al., 2013). However, in an experiment reported by Feldman Hall et al. (2012) into deliberations over the necessity of inflicting harm or not on a third party in exchange for a higher economic reward for participating, there was higher activation in the medial-PFC, rostral ACC and the subgenual cingulate cortex, the temporal lobe and the anterior insula. If the verdict was in favour of causing harm, the dorsal ACC, the dorsolateral-PFC, the OFC and the left putamen were significantly activated (FeldmanHall et al., 2012).

Deliberating over the severity of a moral decision activates the ventromedial-PFC, while the severity with which it is judged as incorrect also activates the PCC and dorsolateral-PFC. Hence, it has been suggested that the ventromedial-PFC may contribute more to moral deliberation than moral intuition, whereas the TPJ may contribute more to moral intuition than moral deliberation (Harenski et al., 2010).

Research into the neural networks involved in automatic moral processing indicate a connection between implicit moral judgement and the activation of the right amygdala and the left ventromedial-OFC (Luo, Nakic, Wheatley, Richell, Martin & Blair, 2006). Similarly, Kahane et al. (2012) suggested that it is the degree of intuition of the decision which produces different activation. Thus, faced with non-intuitive judgements the most active area is the ACC, while with intuitive judgements the left premotor cortex is more activated.

The relation between the structures of the default mode network (activated in repose and inactivated during cognitive activity) and cerebral processing during a moral judgement is not homogeneous.

While the precuneus and the medial frontal cortex showed a lower degree of deactivation, the angular gyrus maintained it (Reniers et al., 2012).

Of all kinds of moral judgement, probably the one that has generated the highest interest is utilitarian judgement (Fumagalli et al., 2010; Han et al., 2014; Jeurissen, Sack, Roebroek, Russ & Pascual-Leone, 2014; Moll, et al., 2005; Shenhav et al., 2010; Tassy et al., 2012; Wiech et al., 2013). In this kind of judgement, participants decide whether to carry out an action that endangers the life of one or more innocent people in order to save the lives of a larger group (called a 'utilitarian decision'), or whether not to act (called a 'deontological decision'). These judgements could be the consequence of a hierarchical process of MR, in which the processes of cognitive control produced by the PFC and ACC inhibit the emotional responses coming from the medial-PFC, the PCC and STS (Moll et al., 2005).

The higher activation of the dorsolateral-PFC and the OFC is related with a higher number of utilitarian decisions (Shenhav et al., 2010). Although it has been asserted (Han et al., 2014) that the hemodynamical activation of the dorsolateral-PFC can differ depending on the culture of the subject. Furthermore, activity in the PCC, central insula, the putamen and the inferior parietal lobe changes in a proportional way to the amount of lives saved, while the activity of the left posterior dorsal insula, the putamen, the ventral posterolateral thalamus and the PCC changes proportionally to the probability of the utilitarian action being necessary to save the lives (Shenhav et al., 2010). Additionally, the making of utilitarian judgements is related to an increase in the activity of the OFC and the ventrolateral-PFC, the medial frontal superior gyrus the medial temporal gyrus of the left hemisphere and the superior parietal lobe (Schirrmann, 2013).

The role of the PFC in the making of utilitarian judgements has been confirmed in studies of Transcranial Magnetic Stimulation and transcranial Direct Current Stimulation.

Tassy et al. (2012) showed that the application of Transcranial Magnetic Stimulation in the right dorsolateral-PFC before making a decision, increases the probability of considering a utilitarian judgement as acceptable if it was carried out by a third party, but it decreases the probability if the judgement was carried out by the subjects themselves. However, stimulation of the dorsolateral-PFC was related to lower remorse for making utilitarian decisions and stimulation of the right TPJ with fewer utilitarian responses (Jeurissen et al., 2014).

Fumagalli et al. (2010), in a study of utilitarian judgements that used transcranial Direct Current Stimulation, linked the ventral-PFC with a different role according to gender. However, cathodic stimulation reduced the time of reaction for utilitarian reasoning in both genders, and decreased the utilitarian responses in women, while anodic stimulation augmented these responses in women but not in men.

Lastly, activation of the subgenual cingulate cortex is related to a higher tendency for utilitarian judgments. Furthermore, although the activation pattern is lower in individuals with higher scores in the personality trait of psychoticism, it is higher in subjects with higher scores in the "need for cognition" trait (Wiech et al., 2013).

Neuroanatomical structures according to the characteristics of the point of view adopted

When people pay attention to the beliefs of the agent of the story and the consequences of his or her actions, different activation patterns are produced depending on the interaction between both factors.

Faced with an action intended to cause harm but which has a neutral outcome, a higher activation in the bilateral TPJ, the precuneus and the dorsomedial-PFC (Young et al., 2007). However, activation of the left TPJ is produced when the beliefs are true; that is, when the original motive of the action coincides with the final result (Young, Nichols & Saxe, 2010). Both the TPJ and the PCC are activated with the encoding and integration of others' thoughts, but they follow a different pattern of activation. The right TPJ and the PCC are more activated during encoding, the left TPJ is more active during integration (Young & Saxe, 2008). The application of Transcranial Magnetic Stimulation to the right TPJ before and during a task of moral judgement, makes the participant less dependent on the mental states of the agent to execute a judgement. In this way, the failed attempts to harm; i.e., when harm did not occur, were valued as more permissible than without Transcranial Magnetic Stimulation application. Nevertheless, they were still judged as less acceptable than unintentional harm (Young, Camprodon, Hauser, Pascual-Leone, & Saxe, 2010).

Adopting one or another perspective to interpret the moral dilemma also affects the most activated areas. When the first person was used, the areas that were more activated were the anterior medial PFC, the area of the PCC, the precuneus and the TPJ. However, when the third person was used, the medial-PFC, the hippocampus and the visual cortex were more activated (Avram et al., 2014).

Neuroanatomical structures according to the characteristics of the stimuli

Studying the neural basis in charge of cognitive control during moral judgement has confirmed that the activated areas during the resolution of personal dilemmas were the medial-PFC, the PCC, the STS and the amygdala, while during impersonal dilemmas, the activated areas were the dorsolateral-PFC and the inferior parietal lobes (Greene et al., 2004).

Real and hypothetical moral decisions share as a neural network the activation of the bilateral insula, the medial cingulate cortex, the PCC, the TPJ, the posterior temporal gyrus. However, real decisions produce higher activation in the putamen, the amygdala (bilateral) and the ACC, while hypothetical

decisions show higher activation of the bilateral hippocampus, the posterior parietal lobe, the medial-PFC and the dorsolateral-PFC (FeldmanHall et al., 2012).

Regarding daily moral reasoning, during daily dilemmas (choosing between a personal egoistic desire and an altruistic action) there is a higher activation of the ventromedial-PFC and the OFC, the superior, medial and orbital frontal gyri, the medial and superior temporal gyri, the TPJ, the angular gyrus and the supramarginal gyrus, the PCC, the precuneus and the thalamus (Sommer et al., 2010).

In relation to cerebral activation when faced with a violent stimuli, different results have been found. Some studies assert a deactivation of the anterior temporal lobes of the participants (Heekeren et al., 2005), while others register a higher activation of the supplementary motor area, the STS and the ACC, along with the dorsomedial-PFC, also activated by dishonest and annoying stimuli. Dishonest stimuli appear to be linked to the dorsolateral-PFC and PCC (Parkinson et al., 2011) and with the activation of the ACC, the supplementary motor area, dorsolateral-PFC, dorsomedial-PFC and ventrolateral-PFC (Greene et al., 2009).

Discussion

During the last ten years scientific investigation has narrowed its focus to the neurobiological basis of MR. The majority of studies have centered on the implication of the cortical regions, possibly due to the technical limitations to register activity of subcortical regions.

All the studies highlight the importance of more than one brain area for the processing of MR. Despite this, the most active region during moral dilemmas, both in text based and image based stimuli, is the ventromedial-PFC (Young et al., 2012). Many other regions are seen to have variable relevance depending on the evolutive phase of the subject (Harenski, Harenski, Shane & Kiehl, 2012), the context and the presentation of the stimuli (Forbes et al., 2010).

New studies focus on the neurons called *von Economo* (Woodwards & Allman, 2007) which exist only in the great apes and humans, and are found in specialised regions of MR (insula, ACC, dorsolateral-PFC) and suffer selective destruction in frontotemporal dementia (which, during the first stages, causes difficulties in moral intuition).

The bibliographical revision highlights the existence of a set of cerebral regions that participate, influence and modify the processing and results of MR, as well as maintaining a close relation with the three ethics of the TET.

The highlighted cerebral regions participate in functions of a different nature, which emphasises the complexity of MR, and its interaction with other cognitive functions, such as abstract reasoning, emotional and cognitive control, information integration, theory of mind, episodic memory, action

planning, decision making and inadequate response inhibition.

Among the structures identified, some regions specially stand out in the prefrontal cortex (dorsolateral-PFC, ventromedial-PFC and OFC), in the cingulate cortex (ACC and PCC), parts of the temporal lobes (TPJ and STS), the insula lobe, part of the parietal lobe (the precuneus) and the amygdala as a subcortical structure (LeDoux, 1992).

Firstly, the PFC (related with imagination ethics) reacts to social signals and is associated with emotional activity and cognitive control regulation, planning and supervisory decisions and inhibiting egoistic or socially unacceptable impulses.

The ventromedial part affects particularly the interaction between moral deliberation and the association with the most immediate moral responses, while the dorsomedial region is in charge of modulating the ambiguity of situations, evaluating the objective of the motivated actions and the thought processes that direct them. For its part, the dorsolateral area affects deliberation and abstract reasoning, participates in the evaluation of the information of the context, the consequences of the decision and the integration of secondary emotion. Lastly, the medial area is more involved in emotional processing, cognitive control and decision making in relation with contingencies.

The OFC is implicated in social cognition, especially in the attribution of mental states and in deciding if an action is adequate according to the context, as well as regulating implicit decisions.

The cingulate cortex (affecting both, connection ethics and imagination ethics) performs an important role in the mediation of conflict between rational and emotional components of MR. Thus the areas most involved in MR (anterior, posterior and subgenual cingulate cortex) differ in role and activation patterns. While the anterior part focuses more on cognitive control, the posterior and subgenual ones are more linked with emotion perception.

Secondly, the structures of the temporal lobes implicated in MR are those that participate in motivation moral emotions and theory of mind (identified as a part of connection ethics).

In this way, the insula controls the perception of social meaning and allows a response to stressors; the STS participates in emotional processing, perception and interpretation of intentions. The TPJ is in charge of the representation of mental states as well as of using this information for judgement, redirecting attention, while distinguishing between intentional and accidental behaviour.

In the third place, the structures of the parietal lobe are especially relevant in deliberation and comprehension of the theory of mind (elements that combine the two ethics of imagination and connection). The precuneus and the PCC recover information from episodic memory and integrate it with the stimuli of moral situations. For this reason, these regions present a particular activation (pattern)

during moral judgement; specifically if the relation intention-action-result is taken into account as it is important to empathise with both, the author and the victim in order to perform a good moral judgement.

Finally, the importance of the amygdala in MR must be mentioned. The amygdala is key in survival ethic and necessary for proper functioning of MR. It is involved in the perception of the social meaning of facial expressions and in the production of adequate responses.

All these areas have a particular ontogenetic maturity which is reflected in differential activation according to age. Synaptic development, the gradual process of myelination and cell formation, are dynamic processes which, among other functions, allow continuous brain development during the life cycle. With age related cerebral evolution, the degree of implication of each structure varies, as it is reflected by the hemodynamic activation of the corresponding areas.

Thus, we can observe how the most activated areas during moral judgements are the most primitive in young subjects or in subjects with lower moral competencies, and the ones which are also most active in the presence of emotions such as the amygdala, the insula, the STS, the ventromedial-PFC and the PCC.

Gender differences related to the activation patterns in cerebral regions could be explained by differential cerebral organisation (functional and structural), which is fundamentally the consequence of prenatal exposition to androgens. The most relevant differential structural characteristics are: higher masculine asymmetry and higher inter-hemispherical communication. These anatomical differences have been adduced in order to explain gender characteristics such as higher speed when giving an answer in men, and a higher degree of information processing in women, which could make them more sensitive to contextual influences.

In sum, MR, like the rest of cognitive processes, is not a process that takes place in one exclusive region of the brain, but many diverse inter-related and specialized regions participate.

Thus the broad combination of neurobiological substrates make MR particularly sensitive to plasticity and neural development and hence susceptible to changes derived from maturation and experience.

Therefore, an alteration in these regions or inter networks could affect MR. However, this susceptibility to change also allows different techniques to be implemented in order to achieve better development as much in the general population as in school-age children, autists, psychopaths and other criminals, and even in people with damage to the vmPFC and with frontotemporal dementia.

Contributions from neuroscience to a comprehensive and profound knowledge of MR are of great utility for disciplines such as Neuroethics,

or Moral Psychology and also can make relevant contributions to the areas of Neuropsychology, Clinical Psychology, Educational Psychology, Forensic Psychology and even Public Communication.

As education has the ability to model to some extent the brain (Han, Glover i Jeong, 2014), it may be concluded that an adequate moral educational programme applied throughout schooling could create a population oriented towards cooperation and mutual help.

Neuropsychology can benefit from the contributions mentioned in this work and devise implicit MR tasks which stimulate the prefrontal cortex, the cingulate cortex, the temporal lobes and the amygdala. Thus, it would be interesting to investigate whether active participation in tasks that stimulate these areas, without subjects being aware that they are working with MR, could be a good strategy to improve processing. These techniques, if they turn out to be useful, could be applied to neurological and psychopathological disorders and to people with deficits in MR processing.

Furthermore, studies designed to investigate the possibility of modulating morality and altruism could contribute to explain criminal behaviour and produce new rehabilitation programmes for psychopaths and other criminals, apart from being of great utility to Forensic Psychology.

Through the field of Public Communication, a correlation could be studied between the abundance of images with dubious morality which are shown constantly in the news and how it can affect the behaviour of the individuals that watch them. The possibility that this reiteration can generate habituation in the brain of average citizens, leading them to react indifferently in the face of moral violation, is relevant enough to justify the implementation of studies that can clarify this matter.

As changes in brain activity can manipulate emotions and cognition, thus affecting MR, it is possible that techniques used in Clinical Psychology with the objectives of varying these processes could also influence MR and improve it. In order to achieve this methodology, exhaustive training would be required, as an improper use of these techniques could also deteriorate the competence of this reasoning.

At this point, it is important to be aware of the great diversity of stimuli and techniques used for the study of the neurobiological basis of MR. This complicates the possibility of generalizing the results to a unified sample.

It would appear that MR is located primarily, although not exclusively, in the PFC the cingulate cortex, the temporal lobes and the amygdala. For this reason, even though there is much to investigate and discover, it can be said that MR is a fundamental, complex and malleable process. Due to cerebral plasticity, it can be trained during the whole life cycle.

Bibliography

- ÁLVARO-GONZÁLEZ, L. C. (2014). *Neuroética (I): Circuitos morales en el cerebro normal [Moral networks in the normal brain]*. *Revista De Neurología*, 58(5), 225-233.
- AVRAM, M., GUTYRCHIK, E., BAO, Y., PÖPPEL, E., REISER, M., & BLAUTZIK, J. (2013). *Neuro-functional correlates of esthetic and moral judgments*. *Neuroscience Letters*, 534, 128-132.
- AVRAM, M., HENNIG-FAST, K., BAO, Y., PÖPPEL, E., REISER, M., BLAUTZIK, J., ... GUTYRCHIK, E. (2014). *Neural correlates of moral judgments in first-and third-person perspectives: Implications for neuroethics and beyond*. *BMC Neuroscience*, 15(1), 39.
- BONETE PERALES, E. (2011). *Neuroética práctica [Practical Neuroethics]*. Bilbao: Desclée de Brouwer.
- CARAVITA, S. C., GIARDINO, S., LENZI, L., SALVATERRA, M., & ANTONIETTI, A. (2012). *Socio-economic factors related to moral reasoning in childhood and adolescence: The missing link between brain and behavior*. *Frontiers in Human Neuroscience*, 6
- CHRISTENSEN, J., & GOMILA, A. (2012). *Moral dilemmas in cognitive neuroscience of moral decision-making: A principled review*. *Neuroscience & Biobehavioral Reviews*, 36(4), 1249-1264.
- CROCKETT, M. J., CLARK, L., HAUSER, M. D., & ROBBINS, T. W. (2010). *Serotonin selectively influences moral judgment and behavior through effects on harm aversion*. *Proceedings of the National Academy of Sciences of the United States of America*, 107(40), 17433-17438. doi:10.1073/pnas.1009396107
- DECETY, J., & HOWARD, L. H. (2013). *The role of affect in the neurodevelopment of morality*. *Child Development Perspectives*, 7(1), 49-54.
- DECETY, J., MICHALSKA, K. J., & KINZLER, K. D. (2011). *The developmental neuroscience of moral sensitivity*. *Emotion Review*, 3(3), 305-307.
- FELDMAN HALL, O., DALGLEISH, T., THOMPSON, R., EVANS, D., SCHWEIZER, S., & MOBBS, D. (2012). *Differential neural circuitry and self-interest in real vs hypothetical moral decisions*. *Social Cognitive and Affective Neuroscience*, 7(7), 743-751. doi:10.1093/scan/nss069
- FORBES, C. E., & GRAFMAN, J. (2010). *The role of the human prefrontal cortex in social cognition and moral judgment**. *Annual Review of Neuroscience*, 33, 299-324.
- FUMAGALLI, M., VERGARI, M., PASQUALETTI, P., MARCEGLIA, S., MAMELI, F., FERRUCCI, R., . . . PRAVETTONI, G. (2010). *Brain switches utilitarian behavior: Does gender make the difference?* *PLoS One*, 5(1), e8865.
- FUMAGALLI, M., & PRIORI, A. (2012). *Functional and clinical neuroanatomy of morality*. *Brain: A Journal of Neurology*, 135 (Pt 7), 2006-2021. doi:10.1093/brain/awr334
- FUNK, C. M., & GAZZANIGA, M. S. (2009). *The functional brain architecture of human morality*. *Current Opinion in Neurobiology*, 19(6), 678-681.
- GARCÍA-ROS, R., & PÉREZ-DELGADO, E. (1991). *La psicología del desarrollo moral: Historia, teoría e investigación actual [Moral development Psychology: History, theory and current research]*. Madrid etc.: Siglo XXI de España.
- GIMÉNEZ AMAYA, J. M., & SÁNCHEZ-MIGALLÓN, S. (2010). *De la neurociencia a la neuroética [From Neuroscience to Neuroethics]*. Pamplona: Ediciones Universidad de Navarra.
- GREENE, J. D., NYSTROM, L. E., ENGELL, A. D., DARLEY, J. M., & COHEN, J. D. (2004). *The neural bases of cognitive conflict and control in moral judgment*. *Neuron*, 44(2), 389-400.
- GREENE, J. D., & PAXTON, J. M. (2009). *Patterns of neural activity associated with honest and dishonest moral decisions*. *Pnas*, 106(30)
- HAN, H., GLOVER, G. H., & JEONG, C. (2014). *Cultural influences on the neural correlate of moral decision making processes*. *Behavioural Brain Research*, 259, 215-228.
- HARENSKI, C. L., ANTONENKO, O., SHANE, M. S., & KIEHL, K. A. (2010). *A functional imaging investigation of moral deliberation and moral intuition*. *Neuroimage*, 49(3), 2707-2716.
- HARENSKI, C. L., HARENSKI, K. A., SHANE, M. S., & KIEHL, K. A. (2012). *Neural development of mentalizing in moral judgment from adolescence to adulthood*. *Developmental Cognitive Neuroscience*, 2(1), 162-173.
- HEEKEREN, H. R., WARTENBURGER, I., SCHMIDT, H., PREHN, K., SCHWINTOWSKI, H., & VILL-RINGER, A. (2005). *Influence of bodily harm on neural correlates of semantic and moral decision-making*. *Neuroimage*, 24(3), 887-897.
- JEURISSEN, D., SACK, A. T., ROEBROECK, A., RUSS, B. E., & PASCUAL-LEONE, A. (2014). *TMS affects moral judgment, showing the role of DLPFC and TPJ in cognitive and emotional processing*. *Frontiers in Neuroscience*, 8, 18.
- KAHANE, G., WIECH, K., SHACKEL, N., FARIAS, M., SAVULESCU, J., & TRACEY, I. (2012). *The neural basis of intuitive and counterintuitive moral judgment*. *Social Cognitive and Affective Neuroscience*, 7(4), 393-402. doi:10.1093/scan/nsr005
- KOSTER-HALE, J., SAXE, R., DUNGAN, J., & YOUNG, L. L. (2013). *Decoding moral judgments from neural representations of intentions*. *Proceedings of the National Academy of Sciences of the United States of America*, 110(14), 5648-5653. doi:10.1073/pnas.1207992110
- LEDoux, J. E. (1992). *Brain mechanisms of emotion and emotional learning*. *Curr Opin Neurobiol*, 2(2):191-7
- LUO, Q., NAKIC, M., WHEATLEY, T., RICHELL, R., MARTIN, A., & BLAIR, R. J. R. (2006). *The neural basis of implicit moral attitude—an IAT study using event-related fMRI*. *Neuroimage*, 30(4), 1449-1457.
- MARAZZITI, D., BARONI, S., LANDI, P., CERESOLI, D., & DELL'OSO, L. (2013). *The neurobiology of moral sense: Facts or hypotheses?* *Annals of General Psychiatry*, 12(1), 6-859X-12-6. doi:10.1186/1744-859X-12-6

- MARSH, A. A., CROWE, S. L., HENRY, H. Y., GORODETSKY, E. K., GOLDMAN, D., & BLAIR, R. (2011). *Serotonin transporter genotype (5-HTTLPR) predicts utilitarian moral judgments*. PLoS One, 6(10), e25148.
- MARTÍ VILAR, M., & PALMA CORTÉS, J. (2010). *Progreso en los modelos teóricos de la psicología sociomoral [Progress in theoretical models of Socio-moral Psychology]*. En M. Martí Vilar (Coord.). Razonamiento moral y prosocialidad: Fundamentos (75-98). Madrid: CCS.
- MOLL, J., & SCHULKIN, J. (2009). *Social attachment and aversion in human moral cognition*. Neuroscience & Biobehavioral Reviews, 33(3), 456-465.
- MOLL, J., ZAHN, R., DE OLIVEIRA-SOUZA, R., KRUEGER, F., & GRAFMAN, J. (2005). *The neural basis of human moral cognition*. Nature Reviews Neuroscience, 6(10), 799-809.
- MONTOYA, E. R., TERBURG, D., BOS, P. A., WILL, G., BUSKENS, V., RAUB, W., & VAN HONK, J. (2013). *Testosterone administration modulates moral judgments depending on second-to-fourth digit ratio*. Psychoneuroendocrinology, 38(8), 1362-1369.
- NARVÁEZ, D. (2010). *La teoría de la ética triuna: Premisas básicas e implicaciones [Triune Ethics Theory: Basic Tenets and implications]*. Postconvencionales: Ética, Universidad, Democracia, (2), 74-96.
- NARVAEZ, D. (2014). *Neurobiology and the development of human morality: evolution, culture, and wisdom*. New York: WW Norton & Co.
- PARKINSON, C., SINNOTT-ARMSTRONG, W., KORALUS, P. E., MENDELOVICI, A., MCGEER, V., & WHEATLEY, T. (2011). *Is morality unified? Evidence that distinct neural systems underlie moral judgments of harm, dishonesty, and disgust*. Journal of Cognitive Neuroscience, 23(10), 3162-3180.
- PREHN, K., WARTENBURGER, I., MERIAU, K., SCHEIBE, C., GOODENOUGH, O. R., VILLRINGER, A., ... HEEKEREN, H. R. (2008). *Individual differences in moral judgment competence influence neural correlates of socio-normative judgments*. Social Cognitive and Affective Neuroscience, 3(1), 33-46. doi:10.1093/scan/nsm037
- PUJOL, J., REIXACH, J., HARRISON, B. J., TIMONEDA-GALLART, C., VILANOVA, J. C., & PÉREZ-ALVAREZ, F. (2008). *Posterior cingulate activation during moral dilemma in adolescents*. Human Brain Mapping, 29(8), 910-921.
- RENIERS, R. L., CORCORAN, R., VÖLLM, B. A., MASHRU, A., HOWARD, R., & LIDDLE, P. F. (2012). *Moral decision-making, ToM, empathy and the default mode network*. Biological Psychology, 90(3), 202-210.
- SCHAICH BORG, J., SINNOTT-ARMSTRONG, W., CALHOUN, V. D., & KIEHL, K. A. (2011). *Neural basis of moral verdict and moral deliberation*. Social Neuroscience, 6(4), 398-413.
- SCHIRMANN, F. (2013). *Invoking the brain in studying morality: A theoretical and historical perspective on the neuroscience of morality*. Theory & Psychology, 23(3), 289-304.
- SHENHAV, A., & GREENE, J. D. (2010). *Moral judgments recruit domain-general valuation mechanisms to integrate representations of probability and magnitude*. Neuron, 67(4), 667-677.
- SOMMER, M., ROTHMAYR, C., DÖHNEL, K., MEINHARDT, J., SCHWERDTNER, J., SODIAN, B., & HAJAK, G. (2010). *How should I decide? the neural correlates of everyday moral reasoning*. Neuropsychologia, 48(7), 2018-2026.
- STARCKE, K., POLZER, C., WOLF, O. T., & BRAND, M. (2011). *Does stress alter everyday moral decision-making?* Psychoneuroendocrinology, 36(2), 210-219.
- SYLVIA, T., GUY, K., SARAH, M., JULIAN, S., NEIL, L., MILES, H., I COWEN, P. J. (2013). *Beta adrenergic blockade reduces utilitarian judgement*. Biological Psychology, 92(2), 323-328.
- TASSY, S., OULLIER, O., DUCLOS, Y., COULON, O., MANCINI, J., DERUELLE, C., ... WICKER, B. (2012). *Disrupting the right prefrontal cortex alters moral judgement*. Social Cognitive and Affective Neuroscience, 7(3), 282-288. doi:10.1093/scan/nsr008
- WALTER, N. T., MONTAG, C., MARKETT, S., FELTEN, A., VOIGT, G., & REUTER, M. (2012). *Ignorance is no excuse: Moral judgments are influenced by a genetic variation on the oxytocin receptor gene*. Brain and Cognition, 78(3), 268-273.
- WIECH, K., KAHANE, G., SHACKEL, N., FARIAS, M., SAVULESCU, J., & TRACEY, I. (2013). *Cold or calculating? Reduced activity in the subgenual cingulate cortex reflects decreased emotional aversion to harming in counterintuitive utilitarian judgment*. Cognition, 126(3), 364-372.
- WOODWARD, J., & ALLMAN, J. (2007). *Moral intuition: Its neural substrates and normative significance*. Journal of Physiology-Paris, 101(4), 179-202.
- YOUNG, L., & DUNGAN, J. (2012). *Where in the brain is morality? Everywhere and maybe nowhere*. Social Neuroscience, 7(1), 1-10.
- YOUNG, L., NICHOLS, S., & SAXE, R. (2010). *Investigating the neural and cognitive basis of moral luck: It's not what you do but what you know*. Review of Philosophy and Psychology, 1(3), 333-349.
- YOUNG, L., & SAXE, R. (2008). *The neural basis of belief encoding and integration in moral judgment*. Neuroimage, 40(4), 1912-1920.
- YOUNG, L., CUSHMAN, F., HAUSER, M., & SAXE, R. (2007). *The neural basis of the interaction between theory of mind and moral judgment*. Proceedings of the National Academy of Sciences of the United States of America, 104(20), 8235-8240. doi:0701408104
- YOUNG, L., CAMPRODON, J. A., HAUSER, M., PASCUAL-LEONE, A., & SAXE, R. (2010). *Disruption of the right temporoparietal junction with transcranial magnetic stimulation reduces the role of beliefs in moral judgments*. Pnas, 107(15), 6753-6758.
- YOUSSEF, F. F., DOOKEERAM, K., BASDEO, V., FRANCIS, E., DOMAN, M., MAMED, D., ... DITSHOTLO, P. (2012). *Stress alters personal moral decision making*. Psychoneuroendocrinology, 37(4), 491-498.

THE ROLE OF THE EQUATIONS OF MOTION IN THE EVOLUTION OF THE INTEGRATION OF MATHEMATICS AND PHYSICS WITH MIND-BODY HYPNOTHERAPY IN THE TRANSFORMATION OF CONSCIOUSNESS

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Abstract

The evolution of the integration of mathematics and physics with mind-body hypnotherapy is addressed from the frame of reference of the role of the equations of motion. Principles of set theory are utilized to organize a group of subsets of motion that include; thoughts, molecular-genetic cascades, relationship to phenomenological experience, electron transport chains, and communication within relationships, in relation to the implied directive, the focus of consciousness, and the role of novelty in focusing attention. Similarities and differences between different meditation approaches, classical music composition theory, and psychotherapy are discussed.

Introduction

Motion underlies all human experience and behavior. From the perspective of scale, a fundamental aspect of physics, on the macro level, is the motion of the earth around the sun that sustains life. In contrast, on the micro or quantum level, it is the motion of photons from the sun that initiates processes of photosynthesis that drive the carbon dioxide/oxygen cycle. In addition, on the micro level, it is the motion of electrons within the seven hundred trillion mitochondria along a complex electron transport chain composed of fifteen protein molecules between a hydrogen and electron atom that drives the ATP cycle, and sustains life by providing energy. Multi-layered, complex psychological defenses involve processes of motion. Processes like classical music, tai chi, meditation, and activity dependent gene expression that provide comfort and healing all are dependent on motion (Campbell, 1997, Chang and Fleming, 2009, Greene, 1999, Loewenstein, 1999, Rossi, 1986, 2002, Rossi and Rossi, 2016).

In mathematical physics, equations of motion relate to the behavior of a physical system as a

function of time. Motion is generally understood in the context of two primary subsets; dynamics and kinematics. Dynamics is more general with momentum, forces and the energy of particles as the primary variables. Kinematic on the other hand, considers only positions of objects and time.

For the purposes of this article the subsets (Dunham, 1991, Gregory, 2011, 2015) of motion shall be expanded to include the perspectives of scale, uniform and accelerated motion to enhance opportunities for application in terms of novelty, yes sets and the focusing of attention (Erickson and Rossi, 1979, Gregory, 2011, 2015, Isaacson, 2006, Rossi, 2002).

The understanding of the dynamics of motion and their relevance to human experience has been evolving for three thousand years. The initial breakthroughs were made by priests, astrologers, and astronomers in predicting solar and lunar eclipses. The spread of knowledge of mathematics in Europe prior to the thirteenth century was primarily the result of bringing the collected works of the Muslims to Spain. These works were from Greek, Indian, and Islamic scholars that included Euclid's Elements, the works of Archimedes, and Al-Khwarizmi's treatises (Katz, 1998).

In the latter half of thirteenth century scholars at Merton College at Oxford, led by the work of Bradwardine, explored the relationships between force, resistance, velocity and time. These efforts served as the foundation for the breakthrough contributions of Galileo and those that followed him. Galileo provided a proper definition of momentum, one of the prime variables in the dynamics of motion and advocated from the perspective of the macro scale for the Copernicus view that the earth revolved around the sun, not vice versa, for which he was imprisoned by the church. His thought experiment

concerning uniform motion initiated explorations of relativity that served as a springboard for Einstein's future discoveries regarding relativity, which was to include both uniform and accelerated motion (Isaacson, 2006).

Galileo's thought experiment was;

Shut yourself up with some friend in the main cabin below deck on some large ship, and have with you there some flies, butterflies, and other small flying animals. Have a large bowl of water with some fish in it; hang up a bottle that empties drop by drop into a wide vessel beneath it. With the ship standing still, observe carefully how the little animals flay with equal speed to all sides of the cabin. The fish swim indifferently in all directions; the drops fall into the vessel beneath; and, in throwing something to your friend, you need throw it no more strongly in one direction than another, the distances being equal; jumping with your feet together, you pass equal spaces in every direction. When you have observed all these things carefully, have the ship proceed with any speed you like, so long as the motion is uniform and not fluctuating this way and that you will discover not the least change in all the effects named,

a planet is proportional to the cube of the semi-major axis of its orbit. This law is illustrated in figure 1. These laws served as one of the foundations for Newton's laws of universal gravitation. The mathematics of the third law is represented in Newtonian terms in Figure 1 below.

Newton, continuing the exploration of the dynamics of motion on the macro level, discovered three laws of motion that served as the foundation for classical mechanics. The first law is; in an inertial reference frame, an object at rest stays at rest, unless acted upon by a force. The second law is: the vector sum of the forces F on an object is equal to the mass of an object m multiplied by the acceleration vector of an object a : Mathematically this is represented by the formula; $F=ma$. The third law is; when one body exerts a force on a second body, the second body simultaneously exerts a force equal in magnitude and opposite in direction on the first body. These laws, complemented by Newton's discovery of calculus, provided the foundation for the advancement of technology, by integrating *motion* with forces, time and *rates of change*. Rates of change in combination with motion would become important variables

$$\frac{P^2}{a^3} = \frac{4\pi^2}{G(M+m)} \approx \frac{4\pi^2}{GM} = \text{constant}$$

Figure 1: Kepler's third law of planetary motion in Newtonian terms.
Where M is the mass of the sun, m is the mass of the planet, and G is the gravitational constant.
 P is the time for the earth to go around the sun, and a is the average distant between the earth and the sun.

nor could you tell from any of them whether the ship was moving or standing still." (Isaacson, 2006, pp. 108, 109).

Galileo's thought experiment, from the perspective of the implied directive, was a precursor to the distinction between uniform and acceleration motion, subsets of the general set of motion. This distinction would have more profound implications when Newton developed calculus, the mechanism for evaluating rates of change.

Drawing inspiration from the work of the Greek scientist Pythagoras who explored the relationship between the proportions and harmonies in music, another subset of motion, and their correspondence with nature's harmonies, Kepler (Miller, 2009) worked on the macro level and advocated for the Copernican view. Kepler explored the motion of the planets and developed three laws of planetary motion. The first law stated that the orbit a planet is an ellipse with the Sun at one of the two foci. The second law stated that a line segment joining a planet and the Sun sweeps out equal areas during equal intervals of time. The third law identified that the square of the orbital period of

in the treatment of trauma. The significance of the relationship between motion and time with regards to the treatment of trauma was evidenced by the patient being frozen in time, being in a chronic state of T-1 (one second before the trauma) (Erickson, 1982, Greene, 1999, Grove and Panzer, 1989, Levine, 1997).

Following Newton, there were a series of discoveries over the following two centuries concerning subsets of motion by Bernoulli, Euler, Lagrange, Hamilton and others, some which are summarized in the bullet points below.

- 1690 - James Bernoulli shows that the cycloid is the solution to the tautochrone problem
- 1691 - Johann Bernoulli shows that a chain freely suspended from two points will form a catenary
- 1691 - James Bernoulli shows that the catenary curve has the lowest center of gravity that any chain hung from two fixed points can have
- 1696 - Johann Bernoulli shows that the cycloid is the solution to the brachistochrone problem
- 1714 - Brook Taylor derives the fundamental frequency of a stretched vibrating string in terms

of its tension and mass per unit length by solving an ordinary differential equation

- 1733 - Daniel Bernoulli derives the fundamental frequency and harmonics of a hanging chain by solving an ordinary differential equation
- 1734 - Daniel Bernoulli solves the ordinary differential equation for the vibrations of an elastic bar clamped at one end
- 1738 - Daniel Bernoulli examines fluid flow in Hydrodynamica
- 1739 - Leonhard Euler solves the ordinary differential equation for a forced harmonic oscillator and notices the resonance phenomenon
- 1742 - Colin Maclaurin discovers his uniformly rotating self-gravitating spheroids
- 1743 - Jean le Rond d'Alembert publishes his "Traite de Dynamique", in which he introduces the concept of generalized forces for accelerating systems and systems with constraints
- 1747 - Pierre Louis Maupertuis applies minimum principles to mechanics
- 1759 - Leonhard Euler solves the partial differential equation for the vibration of a rectangular drum
- 1764 - Leonhard Euler examines the partial differential equation for the vibration of a circular drum and finds one of the Bessel function solutions
- 1776 - John Smeaton publishes a paper on experiments relating power, work, momentum and kinetic energy, and supporting the conservation of energy
- 1788 - Joseph Louis Lagrange presents Lagrange's equations of motion in Mécanique Analytique
- 1789 - Antoine Lavoisier states the law of conservation of mass
- 1813 - Peter Ewart supports the idea of the conservation of energy in his paper On the measure of moving force
- 1821 - William Hamilton begins his analysis of Hamilton's characteristic function

en.wikipedia.org/wiki/History_of_classical_mechanics

Einstein (Isaacson, 2006) revolutionized the understanding and *appreciation of motion* in his work with special and general relativity which addressed uniform and accelerated motion on macro levels respectively. Einstein highlighted the roles of light and gravity through his appreciation of the Lorentz transformation, the connection between space and time, and frames of reference. His work demonstrated some of the limitations of Newton's classical mechanics.

The breakthroughs in quantum mechanics and quantum field theory in the 1920s led by Schrodinger, Heisenberg, Dirac and Pauli, advanced

the understanding of motion on the micro or quantum level by following the behavior of the electron (Greene, 1999, 2004). These breakthroughs completed the mathematical and physics validation of the role of the macro and micro in providing comfort metaphorically, through the utilization of the implied directive, and indirect associative focusing (Erickson and Rossi, 1979, Gregory, 2011, 2015, Rossi, 2002).

Some of the primary equations of motion/major subsets of Equations of Motion are represented below in Figure 4.


These equations of motion, in addition to identifying the variables operating, point like mathematical vectors toward a variety of types of motion that affect human experience. These types or subsets of motion can be considered in terms of two primary subset groups, healthy and unhealthy motion. When validated these types of motion can be utilized to direct attention (additional mathematical vector), especially in terms of direction, scale, and rates of change to unconscious healing processes that can facilitate activity dependent gene expression.

Figure 5 and 6 below illustrates subsets of types of motion.

Recent advances in neuroscience have identified the flow/ motion of information within the hippocampus during learning, and between the hippocampus and cortex during dreaming that supports the integration of old and new experiences, and activity dependent gene expression (Ribiero, 2004, Rossi, 2002, Squire and Kandel, 1999). These advances have identified the networks of physiological resources utilizing *motion* on a micro level that support the transformation of symptoms, defenses, and maladaptive positions and behaviors into self-empowering positions that represent inner and outer harmony (Erickson and Rossi, 1979, Masterson, 1981, Gregory, 2011, Rossi, 1996). The treatment application with regard to the value of these advances is simply to direct attention to the sources of comfort when the patient is receiving. This can be done through the interspersal approach or basic accessing questions, supplemented by pacing (Erickson and Rossi, 1979, Gregory, 2010, Lankton and Lankton, 1983, Rossi, 1986).

Maladaptive, dysfunctional conversations in relationships that produce tension, frustration and distance have reflected disharmonious *motion* (Gregory, 2007, Haley, 1973, Masterson, 1981, Laing, 1971), as contrasted with the harmonious motion of classical music and tai chi that facilitates comfort and healing (Campbell, 1997, Levitin, 1989, Man Ch'ing, 1985, Yang, 1981). These conversations either go around in circles or are reactive, without leading to a mutually satisfying resolution.

Similar parallels are evidenced on an intrapersonal level with thoughts. From a cognitive behavioral perspective, obsessional thinking represents the *motion* of thoughts in directions that increase anxiety. Thinking errors represent thoughts whose *motion* is



Schrödinger Wave Equation

Entanglement/Relations


$$i\hbar \frac{\partial}{\partial t} \Psi = \hat{H} \Psi$$

Imaginary Unit → i

Plank's Constant Opposites/Capacity → \hbar

Quantum Wave Function → Ψ

Hamiltonian/ Behavior Context → \hat{H}



Dirac Equation & Psychotherapy

Momentum/Activity/
Brain Plasticity

TimeBRAC

$$\left(\beta mc^2 + \sum_{k=1}^3 \alpha_k p_k c \right) \psi(\mathbf{x}, t) = i\hbar \frac{\partial \psi(\mathbf{x}, t)}{\partial t}$$

Integration/
Dissociation

Entanglement/Relationship

Figures 2 and 3 below present the Schrodinger equation for quantum mechanics and the Dirac equation which integrated quantum mechanics and special relativity, inaugurating quantum field theory (Farmelo, 2006).
[en.wikipedia.org/Dirac_equation/August 12, 2014 additions by Bruce Gregory, Ph.D.](https://en.wikipedia.org/Dirac_equation/August%2012,%202014%20additions%20by%20Bruce%20Gregory,%20Ph.D.)
[en.wikipedia.org/Schrodinger_equation/ August 12, 2014 additons by Bruce Gregory,, Ph.D Copyright 2013](https://en.wikipedia.org/Schrodinger_equation/August%2012,%202014%20additons%20by%20Bruce%20Gregory,,%20Ph.D%20Copyright%202013)

Major Equations of Motion

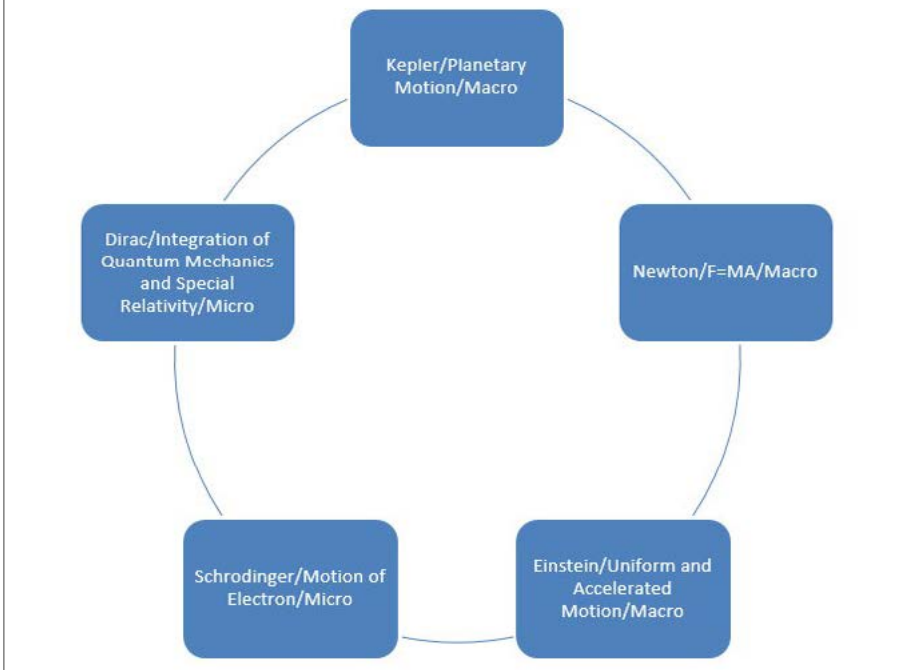


Figure 4. Copyright 2016 Bruce Gregory, Ph.D.

Types of Motion Subsets

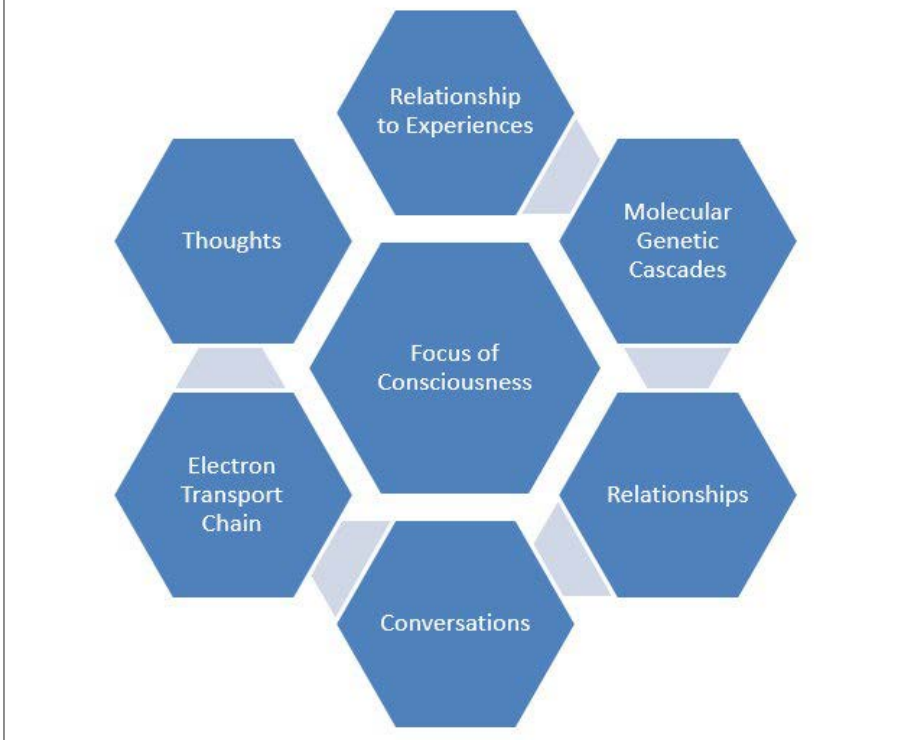


Figure 5. Types of motion subsets - Copyright 2016 Bruce Gregory, Ph.D.

General types of Motion for Yes Sets



Figure 6. Copyright 2016 Bruce Gregory, Ph.D.

in the direction that produces anxiety and stress from activating the sympathetic nervous system. From a Tibetan Buddhist perspective thoughts whose *motion* is directed toward the future instead of the present represent thoughts that are disharmonious, perpetuating increased anxiety and pressure (Beck, 1987, Rossi, 1986, Tulku, 1979) In addition, Tibetan Buddhist meditation practice appreciates the direction component of attending to thoughts. This represents an integration of one of the primary components of motion; direction.

Tai Chi and classical music are two disciplines that reflect, appreciate and utilize the effects of *harmonious motion*. These effects can lead to a reduction of anxiety, a sense of well-being and healing (Campbell, 1997, Levitin, 2006, Rauscher et. al., 1993, Tomatis, 1991, Tsao, et.al., 1991, Walker, 1992). These included; improvement of immune system's functioning, lowering of blood pressure, improved performance on spatial and temporal tasks, increased safety and depth during hypnotherapy which provided comfort.

The Role of Motion in the Continuing Integration of Mathematics and Physics with Mind-Body Hypnotherapy in the Transformation of Consciousness

The integration of physics with psychology has been evolving since the collaboration between Jung and Pauli in 1952 (Jung, 1952, Miller, 2009, Pauli, 1952). Pauli thought that quantum mechanics was incomplete and that it needed psychology to complete itself. Jung advocated that synchronicity and subsets involving connection would play

significant roles in this integration. The initial efforts of Jung and Pauli explored aspects of *motion* in the context of the role of opposites, with an emphasis on the relationship of certainty and uncertainty, and the roles of space and time, within the architecture of the mandala. They had a sense of some of the key words and principles that would be involved with the integration. These included; time, space, unconscious, opposites, connection, and energy. They did not, however, consider this integration in the context of sets and subsets of motion and opposites of motion. They also did not consider the roles of scale, subsets of consciousness, focus of attention, and activity dependent gene expression (Dunham, 1991, Gregory, 2015, Rossi, 2002).

Capra (Capra, 1975) explored the parallels between the consciousness and principles of the Eastern disciplines of Hinduism, Buddhism and Taoism with quantum physics, appreciating the role of uncertainty, opposites, time, space, relativity, and the need and capacity for connection.

Erickson (Erickson, 1964) integrated the quantum principles and variables of opposites, uncertainty, and momentum to contain and transform resistance and treat trauma by focusing attention and introducing novelty. Erickson's appreciation and utilization of validation functioned as creation and destruction operators identified by Dirac. Erickson's appreciation and utilization of time and space parameters, which validated the Dirac equation on a psychological level, was also consistent with Tibetan Buddhist concepts. This was reflected by the consistent incorporation and subtle emphasis on the spatial and temporal

components of experience (Erickson, 1964, Erickson, 1989, Farmelo, 2009, Gregory, 2011, 2015, Tulku, 1979).

Rossi (Rossi, 1996) showed how the appreciation of the *implications* of attractors from chaos theory could be integrated into the hypnotherapeutic treatment of symptoms, chronic dysfunction, and trauma in the transformation of consciousness (Rossi, 1996, Rossler, 1992).

Mindell (Mindell, 2000) stressed the role of the shamanic perspective and appreciation of 'dreaming', which translated to a trusting of nonlinear unconscious process in the integration of psychology and physics. He reinforced this integration by contrasting the perspectives of classical and quantum physics. Mindell appreciated and illustrated some of the ways mathematics could be applied to support this integration, by incorporating aspects of relativity, multi embedded metaphors and indirect associative focusing (Abbott, 1885, Erickson and Rossi, 1979, Lankton and Lankton, 1983). These processes were utilized to support the transformation of consciousness (Isaacson, 2006, Mindell, 2000).

Goswamy (1993, 1999, 2015) emphasized the role of creativity and the appreciation of a consciousness of non- locality which reflected quantum states of interconnectedness. This was consistent with the work of Erickson and Rossi, which focused on the exploration, accessing, connecting and trusting of resources (Erickson and Rossi, 1979).

Rossi and Rossi (2014b, 2015) identified how the interference patterns in self-reflective dreaming were similar to the patterns of the double-slit experiment for electrons. Rossi and Rossi also noted how Bayesian probability and its application to quantum physics was very similar to the concept of expectancy in hypnosis.

Rossi and Rossi (Rossi and Rossi, 2016) identified the quantum particles of photons, electrons, and excitons as subsets of sources of comfort in the photosynthesis process. They hypothesized the resemblance between Erickson's many paths suggestions with Feynman's Path Integral approach.

These quantum resources, however, do not exist independently. They function as waves or particles in motion, that either are carriers or mediate one of the four forces of nature. From the perspective of the implied directive, they point to a capacity and need for depth, an important consideration in the treatment of trauma.

They can be viewed as consistent with and corresponding to Erickson's appreciation of the need to build bridges when working with unconscious processes (Cox and Forshaw, 2006, Greene, 2004, Erickson and Rossi, 1979). Quantum resources' connections to the four forces of nature can be applied in the context of Erickson's treatment of resistance as a force with momentum (Erickson, 1964, Gregory, 2011, 2015).

The ability to focus and redirect attention is a function of the consciousness of the professional

providing the treatment. Figure 7 below illustrates the combination of resources that support this consciousness.

The integration of the equations of motion into treatment can be facilitated by the appreciation of:

- *Novelty*
- *Implied directive*
- *Set theory*
- *Yes sets*
- *Utilization of opposites*
(i.e. freezing in time vs. motion;)

When patients come for treatment, they are often stuck in rigid dysfunctional patterns of processing their experience that can include being frozen in time, obsessing on symptoms, disharmonious motion, and chronic and periodic recurrence of symptoms (Erickson and Rossi, 1979, Grove and Panzer, 1989, Levine, 1991, Rossi, 1996, 2002). These patterns represent functioning in the past component of the old/new polarity, and an *implied* accompanying need for the new (Rossi, 2002, Matthews and Butler, 2011).

These presentations are accompanied by the following implications:

- *There are different kinds of motion available.*
- *Motion is important.*
- *Unconscious has relevant information about motion.*
- *There are opposites connected to motion.*
- *Motion can be a bridge to comfort.*
- *Negative/unhealthy motion leads to negative consequences.*
- *The patient's experience of motion needs support to explore and access resources.*
- *The patient needs the support of the professional to contain unhealthy motion and focus attention around motion differently.*

When an appreciation for novelty is factored with a yes set for motion within the professional, motion can be utilized in a variety of ways to facilitate unconscious processes and activity dependent gene expression. The therapeutic interventions include; truisms, intersperal approach/seeding, megaphor and utilization of opposites (Erickson and Rossi, 1979, Grove and Panzer, 1989, Lankton and Lankton, 1983, Zeig, 1985).

The implied directive was originally used by Erickson in the context of contingency suggestions and is a fundamental tool in mathematical processes.. The concept had wider applications and became the cornerstone of Erickson's approach. It's value is expressed by following quote:

An understanding of how Erickson uses implication will provide us with the clearest model of his indirect approach to hypnotic suggestion. Since his use of 'implication' may involve something more than the

Consciousness of the Professional that Provides Containment

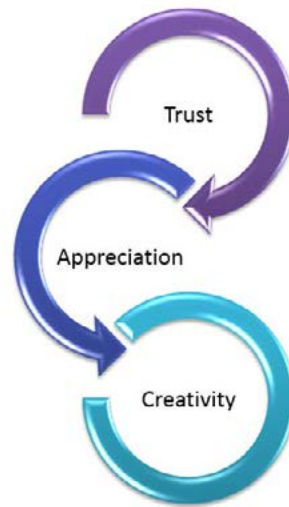


Figure 7. Copyright 2016 Bruce Gregory, Ph.D.

typical dictionary definition of the term, we will assume that he may be developing a special form of 'psychological implication' in his work. For Erickson, psychological implication is a key that automatically turns the tumblers of a patient's associative processes into predictable patterns without awareness of how it happened. The implied thought or response seems to come up autonomously within patients, as if it were their own response rather than a suggestion initiated by the therapist. Psychological implication is thus a way for structuring and directing a patient's associative processes when they cannot do it for themselves. The therapeutic use of this approach is obvious. If patients have problems because of the limitations of their ability to utilize their own resources, then implications are a way of bypassing these limitations. (Erickson & Rossi, 1976, pp. 59-60).

Thus implication can become an integral component of the treatment process. When the professional's consciousness trusts implication, it can be utilized to focus and redirect the direction of the patient's attention around a variety of themes. The interspersal technique and metaphor are two basic ways that implication can be employed. More importantly, however, it can be viewed as the foundation for the utilization of opposites.

In his Resistance Protocol (Erickson, 1964, Gregory, 2011, 2015), Erickson treated resistance as a force with momentum, a *subset of motion*, which is mass times velocity, another subset of motion, which is a change in position over time.

Through his *appreciation* of implication, Erickson would focus attention like a vector in mathematical terms, redirecting the motion of the patient's resistance, while appreciating the patient's needs for time. Sometimes he would utilize time explicitly by commenting on the timing of insight, surprises, integration, etc., while in others it would be implicitly. For example, Erickson would often extend his sessions to ninety minutes, which was consistent with the ultradian rhythm, and the timing parameters of certain types of genes (Rossi, 1992, 1996, 2002). Erickson's timing parameters may correspond to the rates of change described by Newton's calculus.

Set theory

Set theory was developed by Cantor in his efforts to understand the dynamics of infinities. Through the utilization of the principle of correspondence Cantor was able to demonstrate the relevant distinctions between countable and uncountable infinities (Dunham, 1991). To do this, he developed the notion of power sets, to augment and expand sets and subsets. Although set theory was later shown to have some limitations, thinking in terms of sets can support the reduction of anxiety and pressure within the professional, which can facilitate more unconscious searches and subsequent activity dependent gene expression. Examples of this can be found in the work of Erickson in his utilization of possibilities in indirect suggestions (Erickson and Rossi, 1979). The reduction in anxiety and pressure supports the opening of space and time, which in turn allows for more creativity. The primary way this is done is to creatively focus attention. Erickson often employed this process with learning sets (Erickson,

Rossi and Rossi, 1976, Erickson and Rossi, 1979). A notable case that illustrates this application was the phantom limb case.

In terms of set theory, motion can be recognized as a subset of the sources of comfort, that metaphorically implies capacity for depth and safety, two important components in the treatment of trauma. This will be addressed further in the case example. Erickson would often address sources and capacity for comfort by directing attention on the patient's experiential learnings (Erickson and Rossi, 1979). Rossi further appreciated patient's capacity for receiving comfort by identifying the vast unconscious physiological networks providing comfort on different levels of scale (Rossi, 1986, 1996, 2002). The exploration of sources of comfort is consistent with Tibetan Buddhist techniques of utilizing time and space directly as sources of comfort (Tulku, 1979).

In addition, a yes set for motion implies the following;

- *An interruption in chronic, dysfunctional patterns.*
- *An opening for unconscious exploration in accordance with indirect associative focusing.*
- *An alignment with a core process of nature utilized in tai chi, classical music, and meditation.*
- *Opportunity for new direction.*
- *Opportunity for new relationship with motion that is driven by appreciation.*

The subsets of motion above can be utilized to focus and redirect attention when the professional has an internal yes set for motion, and trusts the value of motion, and its potential for facilitating new forms of comfort that can be consistent with previous experiential learnings the patient has experienced on conscious or unconscious levels.

Yes Sets

Yes sets refer to a mutual state of acceptance between the patient and the professional conducting treatment. Yes sets were used by Erickson to develop rapport with patients and enhance receptivity. They can also be known as response sets (Lynn and Sherman, 1990). Erickson utilized interest and acknowledgment of the patient's experience to facilitate yes sets. They could also be facilitated through the validation of resistance. In addition, the utilization of the interspersal approach, a subset of seeding, and truisms can facilitate a 'yes set' within the unconscious that reflects the recognition of the value and potential comfort available from exploring the theme being addressed (Erickson and Rossi, 1979, Lynn and Sherman, 1990, Zeig, 1985).

Building a yes set for *motion* can provide value and potentially new forms of comfort by allowing the professional to trust motion, and as a result creatively focus attention around it in a series of steps which directly or indirectly eventually lead to the identification and exploration of the polarity between healthy and unhealthy motion, two of the

subsets of motion. A basic knowledge of calculus and the concept of vectors can support the professional to redirect attention around a series of truisms about motion. These truisms can include direction, uniform and accelerated motion, circular motion, elliptical, wavelike, or exponential motion.

Other types of motion not included in figure 7 that can be utilized to develop yes sets for motion include; planes, electrons, falling bodies, nonverbal communication, the flow of information within the hippocampus during learning, and the communication flow of information between the hippocampus and cortex during sleep.

Utilization of Opposites

The appreciation of opposites has been evolving in both eastern and western cultures for over two thousand years. The Greek philosopher Heraclitus around 500 B.C. taught that the changes in the world were a function of the dynamics and cyclical interaction between opposites. One of the basic tenets of Taoism is the interplay between the opposites of yin/yang, which is reflected in the practice of tai chi. Musical composition is designed around the creative interplay of the opposites of tonic and dominant in chord progressions. Neural plasticity and therapeutic healing in general involve the integration of the old and new polarity. In 1916 Jung introduced the concept of the transcendent function which integrated the opposites of the conscious and unconscious minds. Almost a century later, research in neuroscience would identify the primary resources in the hippocampus, cortex, and the genes related to them that facilitated this process that ended in the Krebs cycle (Levitin, 2007, Squire and Kandel, 1999, Rossi, 2002, Yelle, 2000).

The primary subset of opposites with motion to be utilized is the polarity between healthy and unhealthy. Other polarities to be employed include; macro vs. micro motion, uniform vs. accelerated motion, wave vs. particle and circular vs. linear motion.

The figure above represents an *appreciation of the temporal aspect* of the application of motion in treatment. It represents an appreciation of the need for the professional to trust the role of time. This appreciation can be a major factor in sustaining the creative focusing of attention.

Time and space are the underlying component of motion. Motion *implies* that time and space is important and has value.

When yes sets for motion have been established, there are three additional ways of focusing attention with regard to motion that can utilize the value of novelty. These are;

- *Macroscopic motion.*
- *Microscopic/atomic/subatomic motion.*
- *Motion approaching the speed of light*

The utilization of the above when utilizing truisms (Erickson and Rossi, (1979), or basic accessing

Motion Polarity

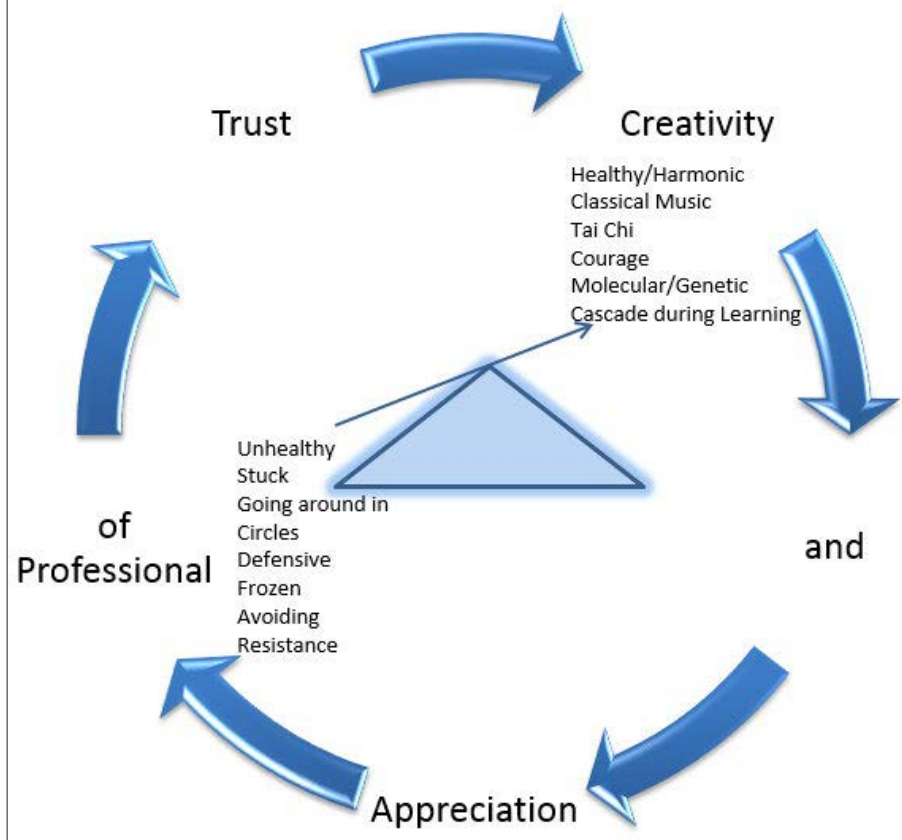


Figure 8 Motion polarity - Copyright 2016 Bruce Gregory, Ph.D.

Progression of Stages of Application of Motion

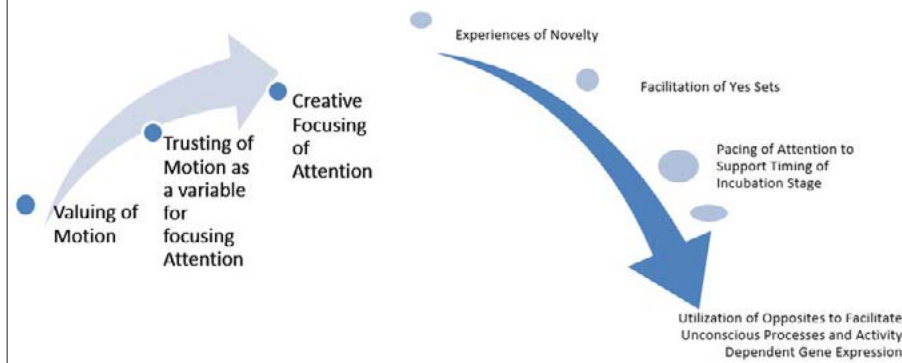


Figure 9 below illustrates the progression for the utilization of motion. Copyright 2016 Bruce Gregory, Ph.D.

questions (Rossi, 1986) supports the unconscious to choose vectors/direction for exploration of the relevant experiential associations (indirect associating focusing/ Erickson and Rossi, 1979). This is significant because it represents and implies an opposite to the negative motion the patient has been experiencing and participating in. It also metaphorically introduces issues of scale, which may have been affecting symptom formation. By *appreciating* the components of scale and direction, the professional will be utilizing novelty to contain anxiety, chronic frustration and feelings of hopelessness.

to slow down the interaction between yourself and the woman prior or during intercourse?

When you consider or imagine positive, pleasurable experiences with motion, what images or memories come to mind?

When you remember a time when you had positive, satisfying experiences with motion, what comes to mind? Have you ever considered or explored the distinctions between sensations, feelings and needs?

Do you think it was a conscious or unconscious response when you lost your erection?

When you think about the fear and pressure, do you have any particular thoughts, or images?

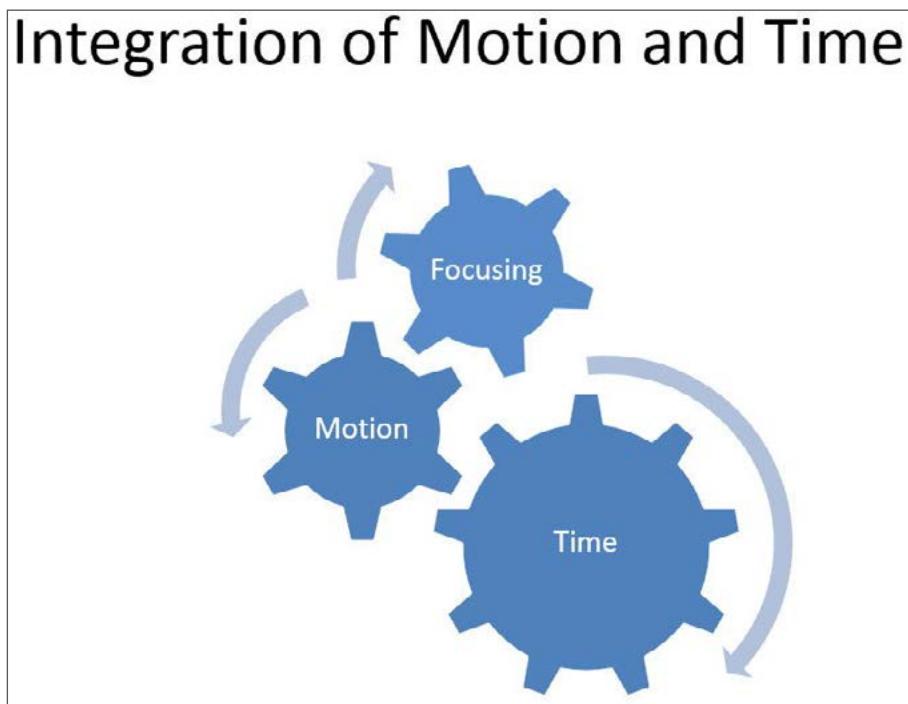


Figure 10. Integration of Motion and Time
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Case example: 24 year old male whose primary complaint and symptom was the losing of his erection during sexual experiences, primarily just prior to intercourse, although the loss of his erection could also be facilitated either by him being touched in a number of nonsexual zones, or the woman being in the dominant position. Duration of symptoms had been over three years, and the frequency was approximately 80% of sexual encounters.

Patient's experiences, which included frustration, disappointment, inadequacy, anxiety, fear of failure, and extensive pain and suffering over time were validated consistently, with interspersed questions to refocus attention and evaluate receptivity for unconscious processes. Patient's attention had been fixated on his symptoms, and feelings of fear, failure and inadequacy.

Questions asked to focus attention and facilitate unconscious processes included:

Have you ever considered giving yourself permission

Do you ever visualize or remember the flow of wave sets coming toward you when you are out on your surfboard, and the feelings and needs that accompany them?

These questions were complemented by general truisms about motion, and a thorough review of the patient's abundant memories of positive experiences surfing. When the patient would naturally enter a mind-body state following the unconscious searches activated by the above questions, his experience would be reinforced by pacing comments that included;

"I wonder how the motion of the information and comfort being provided by your unconscious is providing is related to the imbalance with the pressure and permission that was in the motion of what your mother conveyed to you about a variety of experiences that were directly and indirectly related to interactions with women in general, and with sex..... and the comfort that may be available from the information contained in the motion of your unconscious, and the resulting

reorganization within your unconscious relative to some of your experiences, and the accompanying gene expression that may follow it."

Patient had fifteen mind-body sessions with approximately 80 % relief from symptoms, and an accompanying sense of confidence with all sexual experiences except those when the woman was in the dominant position. Patient's experiences in the mind-body state were primarily of the sensory modality, with a wavelike periodicity between pain and comfort.

Summary

The utilization of motion in the continuing integration of mathematics and physics with mind-body hypnotherapy has been discussed from the perspectives of the implied directive, set theory, and the utilization of opposites. The utilization of the frame of reference of motion is complemented by an appreciation of the role of novelty and yes sets in focusing, maintaining, and redirecting attention. As a result, the appreciation of motion may play a significant role in facilitating unconscious healing processes and activity dependent gene expression in the transformation of consciousness. In the building of yes sets, and the recognition of the role of motion in trauma and its treatment, parallels are made with meditation, tai chi, and classical music. Within the discussion the roles of time and space are highlighted with comparisons to Tibetan Buddhist practices and the work of Milton Erickson, M.D.

References

- ABBOTT, E. (1884). *Flatland*. London: Dover.
- ASH, A. & GROSS, R. (2006). *Fearless Symmetry*. Princeton: Princeton University Press.
- BANDLER, R. & GRINDER, J. (1975). *Patterns of the Hypnotic Techniques of Milton Erickson, M.D.* Vol. 1. Cupertino: Meta Publications.
- BECK, A. (1976). *Cognition Therapy and the Emotional Disorder*. New York: International University Press.
- CAMPBELL, D. (1997). *The Mozart Effect*. New York: Avon Books.
- CAPRA, F. (1975). *The Tao of Physics*. Berkeley: Shambala Press.
- CHENG, Y.-C. & FLEMING, G. R. (2009). Dynamics of light harvesting in photosynthesis. *Annual Review of Physical Chemistry*. 60, 241-262.
- COX, B. AND FORHSAW, J. (2011). *The Quantum Universe*. Boston: Da Capo Press.
- DUNHAM, WILLIAM (1991). *Journey through Genius*. London: Penguin Books.
- DU SAUTOY, M. (2008). *Symmetry*. New York: Harper Collins.
- EINSTEIN, ALBERT. (1961). *Relativity: The Special and the General Theory*. New York: Three Rivers Press.
- ERICKSON, M. (1958/1980). Naturalistic techniques of hypnosis. In Rossi, E. (Ed.), *The Collected Papers of Milton H. Erickson on Hypnosis. Vol. I. The Nature of Hypnosis and Suggestion* (pp. 168-176). New York: Irvington.
- ERICKSON, M. (1964). An Hypnotic Technique for Resistant Patients, the Technique, and its Rationale and Field Experiments. *American Journal of Clinical Hypnosis*. 7, 8-32.
- ERICKSON, M. & ROSSI, E. (1976). "Two -Level Communication and the Microdynamics of Trance and Suggestion". *American Journal of Clinical Hypnosis*. 18, 153-171.
- ERICKSON, M. & ROSSI, E. (1979). *Hypnotherapy: An exploratory casebook*. New York: Irvington.
- ERICKSON, M. & ROSSI, E. (1982). *The February Man: Evolving Consciousness and identity In hypnotherapy*. New York: Bruner/Mazel.
- GALILEO, GALILEI. (1632). Dialogue Concerning the Two Chief World Systems. Translated by Stillman Drake. Los Angeles: University of California Press. (1967).
- GREENE, BRIAN. (1999). *The Elegant Universe: Superstrings, Hidden Dimensions, and the Quest for the Ultimate Theory*. New York: Norton.
- GREENE, BRIAN. (2004). *The Fabric of the Cosmos*. New York: Alfred Knopf.
- GOSWAMY, A. (1993). *The Self-Aware Universe: How Consciousness Creates the Material World*. New York: Tarcher/Putnam.
- GOSWAMY, A. (1999). *Quantum Creativity*: Cresskill, NJ: Hampton Press.
- GOSWAMY, A. (2015). Quantum Consciousness. *International Journal for Transformation of Consciousness*. 1, 39-55.
- GREGORY, B. (2011). The Expanding Role of Creativity in the Treatment of Resistance: An Integration of Erickson's Resistance Protocol with Principles of Physics and Classical Music Composition Theory. *European Journal of Clinical Hypnosis*. 10, 42-59.
- GREGORY, B. (2005/2007). "Integration of Rossi's Mind Body Hypnotherapy with other Therapeutic Modalities". Workshop presentation at Ericksonian Foundation Conference. Phoenix.
- GREGORY, B. (2015). The Roles and Integration of Set Theory and Group Theory in the Transformation of Consciousness from a Hypnotherapeutic Perspective: A Discussion of views of Penrose/Hameroff and Rossi/Rossi from the standpoints of the Erickson Resistance Protocol and the implied directive. *International Journal of the Transformation of Consciousness*.
- GREGORY, B. & GREGORY, B. (2014). The Integration of Quantum Physics in the Transformation of Consciousness in Individuals, Couples, and Organizations. *Journal of Psychology and Psychotherapy Research*. 2, 1-19.
- GROVE, DAVID, AND PANZER, BASIL. (1989). *Resolving Traumatic Memories: Metaphors and Symbols in Psychotherapy*. New York: Irvington.
- ISAACSON, W. (2006). *Einstein: His Life and Universe*. New York: Simon and Schuster.
- HALEY, J. (1973). *Uncommon Therapy: The Psychiatric Techniques of Milton H. Erickson, M.D.* New York: Norton.
- HULL, C. (1933/1968). *Hypnosis and suggestibility*. New York: Appleton-Century-Crofts.
- JUNG, C. (1916). *The transcendent function*. In R. F. C Hull, *The collected works of C. G. Jung: Vol. 8 The structure and dynamics of the psyche*, 67-91, Princeton, NJ: Princeton University Press.
- JUNG, C. (1923). *Psychological types or the psychology individuation*. New York: Pantheon.
- JUNG, C. (1952). Synchronicity: an acausal connecting principle. In *The Interpretation of Nature and the Psyche*. New York: Pantheon Books.
- JUNG, C. (1960). *The Collected works of C.G. Jung: Vol. 8. The Structure and dynamics of the psyche*. (R.F.C. Hull, Trans.). Princeton, NJ: Princeton University Press.
- LAING, R.D. (1971). *The Self and Others*. New York: Penguin Books.
- LEVITIN, D. (2006). *This is your Brain on Music*. New York: Dutton/ Penguin.
- KATZ, V. (1998). *History of Mathematics*. New York: Addison-Wesley.
- KOHUT, H. (1971). *The analysis of the self*. New York: International University Press.
- LANKTON, S. & LANKTON, C. (1983). *The Answer Within: A Clinical Framework of Ericksonian Hypnotherapy*. New York: Bruner/Mazel.
- LEVINE, PETER. (1997). *Waking the Tiger*. Berkeley: North Atlantic Books.

- LIVIO, M. (2005). *The Equation that couldn't be solved*. New York: Simon and Schuster.
- LOEWENSTEIN, W. (1999). *The Touchstone of Life: Molecular Information, Cell Communication and the Foundations of Life*. New York: Oxford University Press.
- LYNN, S. & SHERMAN, S. (2000). Clinical Implication of socioconitive models of hypnosis Response set theory and Milton Ericsson's strategic interventions. *American Journal of Clinical Hypnosis*, 42, 294-315.
- MASTERTON, JAMES (1981). *The Narcissistic and Borderline Disorders*. New York: Brunner Mazel.
- MATTHEWS, L. AND BUTLER, P. (2011). Novelty -seeking DRD4 polymorphisms are associated with human migration distance out-of-Africa after controlling for neutral population gene structure. *Am J. Phys. Anthropol.* 45(3):382-9.
- MILLER, A. (2009). *Deciphering the Cosmic Number*. New York: W.W. Norton.
- MINDELL, ARNOLD. (2000). *Quantum Mind: The Edge between Physics and Psychology*. Portland: Lao Tse Press.
- PAGELS, HEINZ. (1983). *The Cosmic Code: Quantum Physics as the Language of Nature*. New York: Dover.
- PAULI, W. (1952). "The Influence of Archetypal Ideas on the Scientific Theories of Kepler: In *The Interpretation of Nature and the Psyche*. New York: Pantheon Books.
- PERLS, F.S. (1973). *Gestalt therapy verbatim*. Moab, UT: Real People.
- PHILLIPS, M. (1997). Spinning straw into gold: Utilization of transference resources to strengthen the hypnotic relationship. *American Journal of Clinical Hypnosis*, 40, 118-129.
- POINCARÉ, H. (1905). *Science and Hypothesis*. New York: Dover.
- RAUSCHER, F.H., SHAW, G.L., & KY, K.N. (1993). Music and Spatial Task Performance. *Nature*, 365, 611.
- RIBIERO, S., GERVASONI, D., SOARES, E., ZHOU, Y., LIN, S., PANTOJA, J., LAVINE, M. & NICOLELIS, M. (2004). LONG -LASTING NOVELTY-INDUCED NEURONAL REVERBERATION during slow wave sleep in multiple forebrain areas. *Public Library of Science, Biology, (PLoS), 2(1), 126-137*.
- ROGERS, C.R. (1961). *On becoming a person*. Boston: Houghton.
- ROSEN, S. (1982). *My voice will go with you: The Teaching Tales of Milton H. Erickson*. New York: Norton.
- ROSSI, E. (1986/1993). *The Psychobiology of Mind Body Healing* (Rev. ed.). New York: Norton.
- ROSSI, E. (1996a). *The Symptom Path to Enlightenment: The new dynamics of self-organization in hypnotherapy*. New York: Zeig, Tucker, Theisen.
- ROSSI, E. (2002). *The Psychobiology of Gene Expression: Neuroscience and Neurogenesis in Therapeutic Hypnosis and the Healing Arts*. NY: W. W. Norton Professional Books.
- ROSSI, E. (2004b). Art, Beauty and Truth: The Psychosocial Genomics of Consciousness, Dreams, and Brain Growth in Psychotherapy and Mind-Body Healing. *Annals of the American Psychotherapy Association, 7*, 10-17.
- ROSSI, E. (2005b). The Memory Trace Reactivation and Reconstruction Theory of Therapeutic Hypnosis: The creative replaying of gene expression and brain plasticity in stroke rehabilitation. Hypnosis explained: The four stage creative process in art, science, myth, and psychotherapy. *Annals of the American Psychotherapy Association, 8*, 4-11.
- ROSSI, E., LANNOTTI, S., & ROSSI, K. (2006). The new neuroscience school of therapeutic hypnosis, psychotherapy, and rehabilitation. *HypnosNytt, 2*, 3-14.
- 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, 3*, 183. Doi: 10.4172/2168-9679.1000183
- ROSSI, E., ROSSI, K., COZZOLINO, M. & JOLY, J. (2015). The quantum field theory of Psychosocial genomics: Quantum Bayesian notation for therapeutic consciousness and cognition. *The International Journal of Psychosocial and Cultural Genomics: Consciousness & Health Research, 2(1)*, 11-25.
- ROSSI, E. & ROSSI, K. (2016). Quantum Field Theory of Life and Consciousness: The Quantum Heat Engine of Psychosocial Genomics. *The International Journal of Psychosocial and Cultural Genomics, Consciousness & Health Research*. Vol 2, Issue 1, 6-27.
- SHELIN, Y., WANG, P., GADO, M., CSERNANSKY, J., & VANNIER, M. (1996). Hippocampal atrophy in recurrent major depression. *Proceedings of the national Academy of Sciences, 93*, 3908-3913.
- SQUIRE, L., AND KANDEL, E. (1999). *Memory: From Mind to Molecule*. New York: Scientific American Press.
- STACHEL, JOHN. (1980). "Einstein and the Rigidity Rotating Disk." In AD. Held, ed., *General Relativity and Gravitation: A Hundred Years After the Birth of Einstein*. New York: Plenum, 1-15.
- STALEY, R. (2009). *Einstein's generation: The origins of the relativity revolution*. Chicago: Chicago Press.
- TOMATIS, A. (1991). *The conscious ear: My life of transformation through listening*. Barrytown, N.Y.: Station Hill Press.
- TSAO, C.C., GORDON, T.F., MARANTO, C.D., LERMAN, C. & MURASKO, D. (1991). The effects of music and directed biological imagery on immune response (S-G1). In C. Maranto (Ed). *Applications of music in medicine* (pp. 85-121). Washington, D.C. National Association for Music Therapy.
- TULKU, T. (1979). *Time, Space, and Knowledge*. Berkeley: Dharma Publishing.
- WALKER, W.L. (1992). Combining music and words as a pathway through hypnosis: Practical Guidelines. *Australian Journal of Clinical Hypnosis.*, 20, 117-132.
- WINNICOTT, D.W. (1965). *The maturation and the facilitating environment*. New York: International Universities Press.
- WINNICOTT, D.W. (1971). *Playing and reality*. London: Tavistock.
- ZEIG, J. (1985). *Experiencing Erickson: An Introduction to his work*. Seeding. New York: Bruner/Mazel.

TRANCELLULOIDE. HYPNOSIS & CINEMA

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About the Book:

This book by Amedeo Caruso, psychotherapist, expert of film and the proponent of MediCineTerapia, is the first dictionary of the cinema and hypnosis. He analyzes three centuries of movies (1897-2015) and over 300 rare films, hardly seen or predictable, where hypnosis is described in a total, partial and even marginal way. This guide can turn into a true course to understand, through film, what is and what is not hypnosis.

This adventure through the films starts with the Lumière brothers and Georges Méliès, through Griffith and Dr. Mabuse Fritz Lang, admiring the hypnotic dance of Fred Astaire and Ginger Rogers; meeting the terrible hypnotist Korvo, in the movie by Otto Preminger; stumbling in the first case of multiple personality identified by American psychiatrists who used hypnosis to flush out the three personalities of a woman and the case became a film directed by Nunnally Johnson, then the protagonist Joanne Woodward won an Oscar.

Discussion:

We can consider two types of cinematic trance, which is the cinematic trance OF the cinema and the cinematic trance IN the cinema. When we talk about cinematic trance, we intend the trance OF

the cinema, the trance that invests the spectator and which involves an altered state of consciousness induced by the vision of the movie. When we talk about the cinematic trance IN the cinema, instead, we refer to the movies that directly represent the hypnotic trance phenomena, shake or suffered by characters in the film.

In the book it will be described first of all the trance that involves the viewer, and then it will draw up an historian and annotated list of hypnotic trance in the film.

Georges Lapassade defines the trance "an altered state of consciousness culturally elaborated"; This definition of the trance will return very useful for the discourse. Our personal definition of hypnosis, is that this is one altered state of consciousness that allows, in different ways and times, rapid communication of the Subject with which you are working, in mutual agreement, following a sincere and spontaneous, perhaps necessary, request of help, we call, tout court, therapeutic.

Perhaps this event is precisely what happens during the vision of the movies. People don't go to the cinema, of course, to get a true and proper therapy, but wish to surrender to a form of relaxation, based on an incontrovertible request to leave outside of us the outside world and to penetrate in a virtual world. In fact, the film creates a virtual space for the viewer with all the features evoking the reality, but only virtual, as the dream.

Conclusion:

The study of the relationships between cinema and hypnosis is very modern. Consider the increasing use of Arts in educational and therapeutic purposes. An example of the most famous or interesting use of Art for a therapeutic purpose is the Cinematerapia. Future research will help us to understand the benefits that this correlation between psychology and art can bring us. This book will be an interesting read not only for psychologists or for film experts, but also for all those who want to get a clearer idea about hypnosis in all its aspects.

