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After "No improvement for 40 years"

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A Quantum Field Theory of Physics, Math, Biology & Psychology:  
Part One: An Update of the Psychosocial and Cultural Genomics of Psychotherapy

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The Bio-Psychological Implication Of Happiness Implicated In Neurological  
Disorders' Ministrations

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Beyond Dirac: Exploring The Role Of Quantum Electrodynamics (QED) And  
Quantum Chromodynamics (QCD) In The Continuing Integration Of Quantum  
Physics And Mind-Body Hypnotherapy In The Transformation Of Consciousness  
Within The Professional In The Treatment Of Resistance

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Biodynamic Self-Regulation Demonstrated Through Clinical Biofeedback

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The practitioner's guide to mirroring hands: a client-responsive therapy that  
facilitates natural problem solving and mind-body healing

## Editorial

The next December the most important symposium on psychotherapy in the world "The evolution of the psychotherapy conference" will be held in Anaheim. It is an event that sees the participation of the most important therapists in the world as representative of the major therapeutic approaches, who update the community on their clinical developments, their brilliant insights, and/or innovative techniques. The conference is held every 4 years reaching the 12th edition this year. Starting in 1984, it has an average presence of around 8,000 psychologists, medical doctors and psychotherapists from all over the world. The latest edition was held in December 2013 precisely when Mauro Cozzolino and Giovanna Celia took part as co-faculty in the presentation of Ernest and Kathryn Rossi's report entitled "The Next step in the evolution of Psychotherapy: Facilitating the Psychosocial Genomics of Creating Consciousness" (Rossi E., Rossi K., Cozzolino M., Celia G. (2013))

[...]

Mauro Cozzolino and  
Giovanna Celia



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# AFTER “NO IMPROVEMENT FOR 40 YEARS”

MAURO COZZOLINO AND GIOVANNA CELIA

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The next December the most important symposium on psychotherapy in the world “The evolution of the psychotherapy conference” will be held in Anaheim. It is an event that sees the participation of the most important therapists in the world as representative of the major therapeutic approaches, who update the community on their clinical developments, their brilliant insights, and/or innovative techniques. The conference is held every 4 years reaching the 12th edition this year. Starting in 1984, it has an average presence of around 8,000 psychologists, medical doctors and psychotherapists from all over the world. The latest edition was held in December 2013 precisely when Mauro Cozzolino and Giovanna Celia took part as co-faculty in the presentation of Ernest and Kathryn Rossi’s report entitled *The Next step in the evolution of Psychotherapy: Facilitating the Psychosocial Genomics of Creating Consciousness* (Rossi E., Rossi K., Cozzolino M., Celia G. (2013))<sup>1</sup>.

Exactly at the end of the 2013 Conference, The National Psychologist published a very critical article on the poor evolution that psychotherapy have had from the early 70s until 2013 claiming, as it can be well understood from the title of the article, namely “No improvement for 40 years”, that there hadn’t been essential changes in the way of doing therapy. In the same article, besides the positive considerations for the big names of psychotherapy, which however have always been the same for many years, nothing new had happened from the author’s point of view.

In the same article, together with the bitter consideration of the poor evolution of psychotherapy, two exceptions were reported: the first one referred to Scott Miller’s work on the effectiveness of psychotherapy and the other one was about the work done by Ernest and Kathryn Rossi and their group. In particular, these two contributions, albeit for different reasons, were considered to represent

two isolated cases of innovation and evolution of psychotherapy.

Regarding Rossi’s work, and in particular the Psychosocial Genomics, the article said that attending to one of his workshop was like making a trip into molecular biology moving then to a clinical dimension of great depth and intensity somewhat comparable to transcendental meditation.

The question we can make four years later is “What happened in the meanwhile to this specific area of psychotherapy that is the Psychosocial Genomics, and to the MBT-T which had already appeared to be a great innovation in the world of therapy in expert eyes such as those of John Thomas?”<sup>2</sup>. Below we will briefly try and see what the situation is so far by showing the developments and initiatives promoted by the Psychosocial Genomics International Team (IPSGT) in the period from 2013 to 2017.

From that participation in the “The Evolution of Psychotherapy Conference”, many things have been achieved by the IPSGT: Ernest Rossi, Kathryn Rossi, Mauro Cozzolino, Giovanna Celia and Richard Hill. The group has attended the most important conferences in the world presenting original contributions and research, publishing many articles, books, and developing various innovative research projects.

The Masters Ernest L. and Kathryn Rossi have edited other volumes of the collection of Milton Erickson’s works, they have also took part in many international conferences as Keynotes Speakers (Brief Therapy Conference, Couple Conference, International Ericksonian Congress etc.), and published numerous articles on renowned journals (see the references). Kathryn Rossi has also dealt with a prestigious interview with the famous monk Rinpoche, highlighting the important relationship between Yoga, Meditation and Neuroscience<sup>3</sup>.

<sup>1</sup>ROSSI E., ROSSI K., COZZOLINO M., CELIA G. (2013), “*The Next step in the evolution of Psychotherapy: Facilitating the Psychosocial Genomics of Creating Consciousness*”. The Evolution of Psychotherapy Congress, Milton Erickson Foundation Editor, Phoenix, USA.

<sup>2</sup>THOMAS JOHN (2014), “*Therapy: No improvement for 40 years*”. The National Psychologist. Vol. 23 N.1

<sup>3</sup>K. ROSSI (2016), “*A Conversation with Professor Venerable Samdhong Rinpoche on the Vision and Legacy of His Holiness The Dalai Lama*”. The International Journal of Psychosocial and Cultural Genomics, Consciousness & Health Research. Vol. 2, Issue III (<http://www.psychosocialgenomics.com/images/PDF/THEJOURNAL/2016-VOL2/IJPCGV2I3.pdf>)

Richard Hill has been the author of two very successful volumes<sup>4</sup> where he emphasizes the importance of curiosity in psychotherapy, especially from a neuroscientific point of view, and he has also been the author of the most recent brilliant book written together with Ernest L. Rossi about the mirror hands technique<sup>5</sup>. Richard Hill has also held seminars and lessons in various countries around the world. Mauro Cozzolino and Giovanna Celia were present at the European Society of Hypnosis Congress in 2015, and also at the World Congress of Hypnosis in Paris in August 2015 making two speeches, among which one was about the effectiveness of Mind-Body Transformations Therapy (MBT -T) on Parkinson's patients, they also presented two reports at the 2nd Congress of the Brief Strategic and Systemic Therapy World Network in Florence. They all then took part as a group in the 12th Ericksonian Congress in Phoenix. A major event to unite and develop the Psychosocial Genomics clinical and scientific community in the world has surely been the foundation of The International Journal of Psychosocial Genomics: Consciousness and Health Research which sees correspondents from every country in the world (China, India, Brazil, Australia, Europe, United States, etc.). As many readers will know, a major research project is now engaging and involving the group in the experimental application of the MBT-T clinical

protocol with women affected by breast cancer. Last but not least, as in 2013, Ernest and Kathryn Rossi and us in the working group will take part in the upcoming Evolution of Psychotherapy Conference presenting original and innovative contributions that synthesize the hard and continuous work done in the last years. Furthermore, we are proud that our work team is becoming increasingly stronger and above all that the community of colleagues interested in integrating their psychotherapeutic knowledge with the Psychosocial Genomics is growing ever more. This growth and the ever increasing interest in this new way of doing therapy demonstrates that many colleagues want to get out of the cages that therapeutic models sometimes create, in order to integrate approaches, techniques and even more disciplines, such as psychology, biology, medicine, neuroscience, meditation, yoga and spirituality. The goal of therapy can only be to support the health and well being of our patients, respecting their uniqueness and the natural self-healing form present in each of them. In order to achieve this in the best way we have to abandon the ideological or categorical aspects and embrace all the new available knowledge and strategies of cure, without prejudice, especially when confronted with that precious relationship that exists between mind and genes.

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<sup>4</sup>RICHARD HILL, *Creating an Extraordinary Life* (<https://www.richardhill.com.au/product-page/creating-an-extraordinary-life-audio-download>)  
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<sup>5</sup>R. HILL, E. ROSSI, "The Practitioner's Guide to Mirroring Hands: A client-responsive therapy that facilitates natural problem solving and mind-body healing" (<https://www.richardhill.com.au/mirroring-hands>)

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# A QUANTUM FIELD THEORY OF PHYSICS, MATH, BIOLOGY & PSYCHOLOGY: PART ONE: AN UPDATE OF THE PSYCHOSOCIAL AND CULTURAL GENOMICS OF PSYCHOTHERAPY

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## Abstract

We explore the new quantum magnetic resonance microscope to review and update foundations of the psychosocial and cultural genomics of psychotherapy with an integrated quantum field theory of physics, math, biology and psychology. We review the top-down psychosocial genomic and cultural perspectives that integrate consciousness, cognition and the 4-Stage Creative Cycle with its molecular-genomic RNA-DNA building blocks. Heisenberg's Uncertainty Principle is used to re-conceptualize activity-dependent gene expression, brain plasticity, consciousness, cognition, and dreaming as the new foundation for an integrated quantum field theory of the evolution of psychotherapy. We update Dirac's transformational Bra-Ket notation from early quantum dynamics with the new  $zx$ -calculus that is more appropriate for visualizing and computing the cycles characteristic of life, stress and well-being. We generalize the observer-operators of quantum physics to the molecular biology of the 90-120-minute Basic Rest-Activity Cycle and the 4-Stage Creative Cycle of psychology. We report clinical case studies illustrating how the quantum qualia of these observer-operators are evident in everyday human consciousness and cognition during a wide range of experiences from negative stress and psychopathology to positive life transformations. We propose innovative quantum field theory research to document how the observer/operator of subjective experience can be a causal agent in facilitating health and problem solving on the objective molecular/genomic level in medicine, neuroscience and everyday life as well as psychotherapy with the  $zx$ -quantum calculus.

**Key Words:** Biology, Bra-Ket notation, conflict, cognition, consciousness, creative, Dirac, expectancy, experimental, mathematics, neuroscience, observer-operators, physics, psychology, Qbism, quantum field theory, quantum microscope, quantum qualia, uncertainty,  $zx$ -calculus.

## Introduction

We propose an integrated quantum field theory (QFT) of physics, math, biology and psychology for optimizing human health and wellness. Our integrated quantum field theory brings together a variety of interdisciplinary fields ranging from stress reduction, psychosomatics, psychoneuroimmunology, meditation and mind-body medicine to the psychobiology of optimizing human performance, problem solving and creativity. *We update Paul Dirac's transformational equation set of early quantum dynamics with the new  $zx$ -calculus as an experimental mathematical bridge between physics, math, biology and psychology.* In Box 1 we illustrate how the quantum qualia of human experience during activity-dependent gene expression, brain plasticity, and the creation of new consciousness and cognition may be conceptualized. Students of psychotherapy will learn how the new  $zx$ -calculus can facilitate their practical daily work in bridging the mysteries of Descartes's mind-body gap at quantum level visually in all the figures of this paper together with many clinical case examples.

## Integrating the Subjective Quantum Qualia of Mind with Objective Molecular/Genomic Dynamics

This new application of Dirac's (1930) original quantum formulations (Rossi & Rossi, 2011, 2013, 2014a & b) is consistent with Penrose (2004), Wilczek (2002, 2015) and Carroll's (2016) insights into "The essence of The Core Theory – The Laws of Physics Underlying Everyday Life." We show how the highly sensitive quantum qualia of problematic dissociations during Stage Two of the 4-Stage Creative Basic Rest and Activity Cycle (BRAC) are the source of quantum level cognitions and conflicts that can lead to war, discord, corruption, hate crimes, terrorism, and other stress related psychosocial pathologies that



We carefully follow Dirac's own concise mathematical reasoning (Dirac, 1978, p. 40-41) in this review. Dirac begins with the idea of Schrödinger's wave function in 3-dimensional space. The wave function is designated as  $\psi$ , a function of the three coordinates  $x_1, x_2, x_3$  that can vary with time:

$$\psi(x_1, x_2, x_3; t). \quad (1)$$

Dirac notes that the usual interpretation of this wave function when normalized is that the square of its modulus  $|\psi|^2$  providing the probability of the particle being localized in a particular place. This wave function  $\psi$  is a complex number so it can be multiplied it by its phase factor  $e^{i\gamma}$ , where  $\gamma$  is a real number and  $e^{i\gamma}$  has a modulus of unity. Dirac then multiplies  $\psi$  by  $e^{i\gamma}$  to get another wave function designated as  $\Psi$ :

$$e^{i\gamma}\psi \equiv \Psi \quad (2)$$

Which now has its modulus squared just as  $\psi$ :

$$|\Psi|^2 = |\psi|^2. \quad (3)$$

This allows  $\Psi$  and  $\psi$  to have the same probability distribution.

Dirac then notes that  $\gamma$  in equation (2) could be a function of position as well as time so that the new  $\Psi$  has the same probability distribution as  $\psi$  in equation (4):

$$\Psi(x_1, x_2, x_3; t) = e^{i\gamma(x_1, x_2, x_3; t)} \psi(x_1, x_2, x_3; t). \quad (4)$$

However, the new  $\Psi$  and the original  $\psi$  do not satisfy the same wave equation! This is becomes evident when Dirac forms  $\partial \Psi / \partial x_r$  with  $r$  taking on the values of 1, 2 or 3 so that he obtains equation 5:

$$\partial \Psi / \partial x_r = e^{i\gamma} (\partial / \partial x_r + iK_r) \psi \quad (5)$$

Where  $K_r$  is a function of position in equation 6:

$$K_r \equiv \partial \gamma / \partial x_r. \quad (6)$$

Dirac then states "We would have to consider  $K_r$  as something more general, something such that when we take  $K_r dx_r$  and integrate around a closed loop, the result need not be zero:

$$\oint K_r dx_r \text{ need not be equal to } 0. \quad (7)$$

Dirac then concludes "If we do that, we get a physical theory which is definitely more general than what we had before" (p. 41). We now interpret Dirac's comment that the contour integration of equation 7 "need not be equal to 0" has profoundly new implications for integrating current day scientific perspectives of physicists, biologists, neuroscientists and psychologists. This integration illustrates how new awareness could arise from a cycle of activity-dependent gene expression brain plasticity and emergent quantum qualia of consciousness and cognition (Rossi & Rossi, 2011, 2013, 2014 a & b, 2015).

Box 1.

Dirac's Transformational Equation Set from Quantum to Classical Calculus: The Quantum Qualia of Brain Plasticity, Behavior, Consciousness and Cognition

can be resolved in Stages Three and Four of the creative cycle. We propose how Quantum Bayesian concepts of the novel observer/operator have insightful applications in counseling, psychotherapy, translational medicine and virtually all the mind/body therapies. We conclude with clinical case illustrations of how innovative applications of the updated Dirac's Bra-Ket notation could conceptualize adaptation and problem solving on the objective molecular/genomic level to facilitate the evolution of psychotherapy (Heunen, Sadrzadeh & Grefenstette, 2013; Coecke & Kissinger, 2017).

Why have many cultures developed practices of rest, relaxation and the inner focusing of attention typical of therapeutic meditation and hypnosis to facilitate health and well-being? Recent research on sleep has uncovered a surprising, yet sensible answer to this question. Sleep clears the mind by permitting 60% more cerebral spinal fluid to wash through the brain to remove the toxic byproducts of normal molecular metabolism (Xie *et al.*, 2013). This unexpected finding integrates what we now believe we know about associations between the quantum qualia of the subjective experiences of mind and the objective molecular/genomic dynamics of consciousness and cognition, as well as their utilization in the holistic healing arts such as meditation, mindfulness and therapeutic hypnosis. Controversial concepts originally formulated in quantum physics (Dirac, 1930; Greene, 2011; Susskind & Friedman, 2014), biology (Baggott, 2011; McFadden, 2000; McFadden & Al-khalili, 2014) and psychology (Rossi, 1972/1985/2000, 2007, 2012; Rossi & Rossi, 2014a & b, 2015) over the last century are reviewed and utilized for developing a new mind/body concept of the observer/operator to optimize self-care and health via psychosocial and epigenomic RNA/DNA molecular mechanisms. We propose and illustrate a new quantum Bayesian mathematical notation for conceptualizing a causal role for consciousness and cognition in the theory, research and practice of psychotherapy on many levels from mind to genes.

Bayesian probability, named after 18<sup>th</sup> century English clergyman, Thomas Bayes, deals with *subjective probability – the degree of belief that an event will occur*. This is in striking contrast with the statistics most of us are taught today, which is about *objective probability – based on counting how frequently something occurs in the outside world*. It is now striking to realize how Bayesian or *subjective probability – the degree of belief that an event will occur* – is very similar to the emerging concepts of psychosocial genomics and *expectancy in therapeutic consciousness and cognition (meditation, counseling, psychotherapy and expectancy theory in therapeutic hypnosis) which is also concerned with subjective belief*.

*In a clear and concise paper the physicist Hans von Baeyer (2013) recently outlined a new Bayesian interpretation of quantum information, which we now apply to brain research on therapeutic*

*consciousness, cognition (Dehaene, 2014) and behavior (Rossi, 2002a, 2007, 2012).*

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, re-imagines 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 wave functions 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, italics added here).

These realizations motivate us to propose and illustrate how quantum field theory could optimize the quantum Bayesian dynamics of expectancy in most schools of therapeutic consciousness and psychotherapy (Rossi, 1988a, b, c, d; Rossi & Rossi, 1996). We begin by outlining a new quantum Bayesian version of the RNA/DNA field theory of life and consciousness (Rossi, 2002a, 2004, 2007, 2012; Rossi & Rossi, 2011, 2013, 2014a & b).

## An Integrated Quantum Field Theory (QFT) of the RNA/DNA Dynamics of Life and Consciousness

Our proposal for a very broad functional definition of the role of genes in the *complex adaptive systems* of life (Gell-Mann, 1994; Holland, 2012) is now applied to the integrated quantum field theory of therapeutic consciousness, cognition, behavior, psychology and health in general in figure one.

We have documented how the fundamental systems of life and consciousness are characterized by the wave nature of circadian (daily) and ultradian (hourly) rhythms on all levels from the mind to genes (Lloyd & Rossi, 1992, 2008). We now outline how neuroscience research illustrated in Figure One underpins a general quantum field theory of consciousness, cognition and creativity (Rossi, 1986/1993, 2002a; Rossi & Rossi, 2011, 2013, 2014a).

### The Classical Mind/Gene Cycle of Molecular Biology, Consciousness and Cognition

The top circle of Figure One updates the classical research on Just Noticeable Differences (JNDs) that was the original foundation of the psychophysics of sensations and perceptions that defined experimental psychology in the 1890's (Boring, 1950) with the most recent consciousness studies of art, beauty, truth in the coming age of quantum biology and psychology (Al-Khailai, 2014;

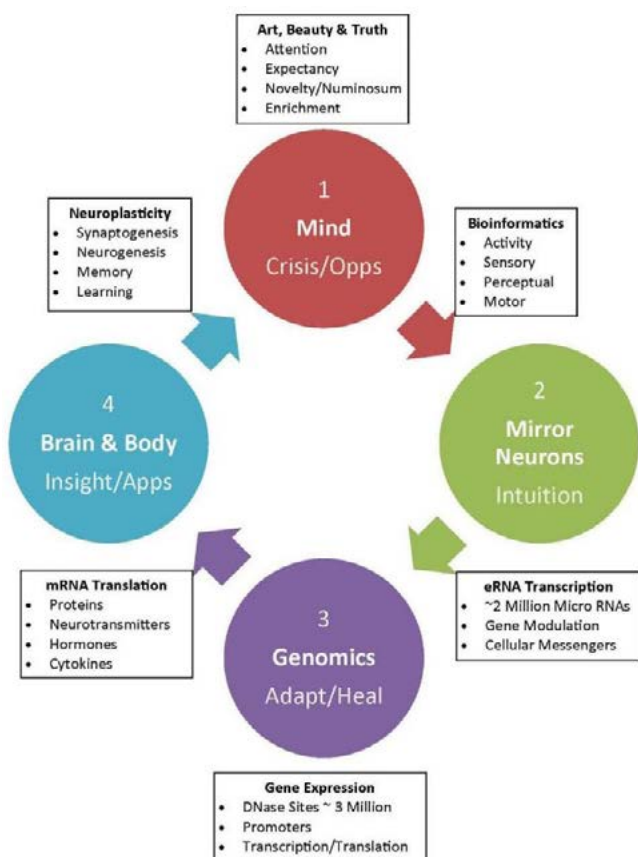


Figure 1. A Integrated Quantum Field Theory (QFT) of the Observer-Operator and the Novelty-Numinosum-Neurogenesis-Effect in the RNA/DNA Dynamics of Psychosocial Genomics and Psychotherapy.

McFadden, 2000; McFadden & Al-Khailai, 2014). We now propose how research on the qualia of Novelty-Numinosum-Neurogenesis-Expectancy Effect (NNNE) operates on the quantum level of molecules that makes life possible (Rossi, 2002a, 2005, 2007, 2012). The subjective experience of *Novelty* evokes highly motivating experiences of the *Numinosum* (*fascination, mysteriousness, and tremendousness*), (Otto 1923/1950) that turn on gene expression and the growth of the brain that gives rise to new levels of consciousness and cognition (Rossi, 1986/1993 to 2012). *Research by the ENCODE project* integrated activity and experience-dependent gene expression and brain plasticity. Key research is now exploring complex adaptive systems of information transduction in the *transcription process* arising from ~2 million eRNAs carrying signals from the physical environment and psychosocial milieus (termed "epigenomics") to genes bearing ~3 million docking sites recently summarized by the ENCODE Consortium (2012).

Current research documents the use of DNA microarray technology to measure the expression levels of many thousands of genes simultaneously (Bar-Joseph *et al.*, 2012). This evidence-based research in molecular biology has become a new standard in for validating personalized medicine. We now propose that this DNA microarray research also can be used to assess the psychosocial genomic validity and reliability of many diverse cultural, historical and holistic traditions of mind-body healing.

The primary research literature of psychosocial genomics today brings together a variety of top-down psychotherapeutic processes. They 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 & Elkins, 2013); *social psychology* (Cole, 2009, Cole *et al.*, 2005, 2007, 2010, 2011), and *yoga* (Lavretsky *et al.*, 2013). The motivation all psychosocial genomic research to facilitate the resolution of *stress related dysfunctions* (Unternaehrer *et al.*, 2012; Yount & Rachlin, 2014). We mentored the use of DNA microarrays, for example, to explore the hypothesis that such top-down therapeutic protocols, epitomized by *The Psychosocial Genomic Healing Experience (CPGHE)* and the *Mind-Body Transformations Therapy (MBT-T)*, as a scientific foundation of a more general theory of mind-body communication and healing with therapeutic hypnosis (Cozzolino *et al.*, 2014). A full description of the administration, scoring and clinical application of the top-down creative protocol for facilitating therapeutic cognition is freely available (Rossi, 2012).

Some of the most recent research that has reached the popular press is how mindful meditation can modulate gene expression in cancer patients that has been reported as follows (Stekra, 2014).



Lead investigator Dr. Linda E. Carlson (2015) and her colleagues found that in breast cancer patients, support group involvement and mindfulness meditation – an adapted form of Buddhist meditation in which practitioners focus on present thoughts and actions in a non-judgmental way, ignoring past grudges and future concerns – are associated with preserved telomere length. Telomeres are stretches of DNA that cap our chromosomes and help prevent chromosomal deterioration – biology professors often liken them to the plastic tips on shoelaces. Shortened telomeres aren't known to cause a specific disease per se, but they do whither with age and are shorter in people with cancer, diabetes, heart disease and high stress levels. We want our telomeres to stay intact.

In Carlson's study, distressed breast cancer survivors were divided into three groups. The first group was randomly assigned to an 8-week cancer recovery program consisting of mindfulness meditation and yoga; the second to 12-weeks of group therapy in which they shared difficult emotions and fostered social support; and the third was a control group, receiving just a 6-hour stress management course. A total of 88 women completed the study and had their blood analyzed for telomere length before and after the interventions. Telomeres were maintained in both treatment groups but shortened in controls. Previous work hinted at this association. Studies led by diet and lifestyle guru Dr. Dean Ornish (2008, 2013) reported that the combination of a vegan diet, stress management, aerobic exercise and participation in a support group for 3 months resulted in increased telomerase activity in men with prostate cancer, telomerase being the enzyme that maintains telomeres by adding DNA to the ends of our chromosomes (Stetka, 2014).

We now propose that further research with these protocols could replicate these findings in a more standardized form to update the mind/molecular/genomic efficacy of translational medicine recommended as a standard of clinical excellence by Insel (2009, 2010, 2012), Director of National Institute of Mental Health.

### The Classical to Quantum Transition of Observer-Operators via Mirror Neurons

The original research on mirror neurons initiated by Rizzolatti and Sinigaglia (2008) Iacoboni (2007, 2008) and others (Grodzinsky & Nelken, 2014) has been greatly expanded in current neuroscience to include epigenomic processes (the integration of nature and nurture) that modulate mind/gene communication. Research on bird song courtship dynamics, for example, documented how eRNAs ("enhancer RNAs" enhance gene expression) respond to thought by

modulating the transcription/translation cycle of activity and experience-dependent epigenomic expression. Clayton, a specialist in songbird neurogenomics, 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? Presumably the wave nature of the sound spectra of the bird song is encoded by the wave nature of molecular eRNAs resonance in mirror neurons. We now propose that an analogous cycle of informational transformation occurs in human consciousness and cognition as illustrated in Figure 2. This is the fundamental insight that integrates the top-down paths of mind, consciousness, and the expectancies of so-called "free will" with the bottoms-up molecular-genomic paths of communication. We now propose that this is a manifestation of the quantum Bayesian observer-operator bridging the so-called "Cartesian gap" between mind and body in psychosocial genomics, meditation and therapeutic hypnosis.

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

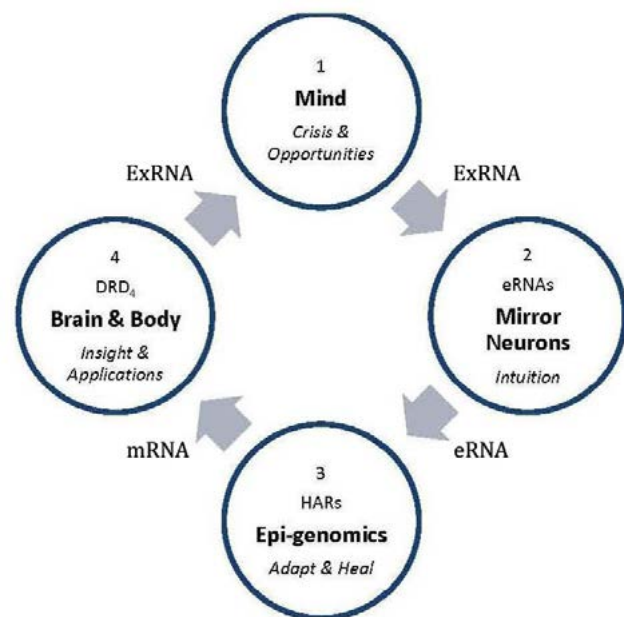


Figure 2. Conscious thoughts dialogue with our genes via the bioinformatic epigenomic loop of communication between nature and nurture. Cognitions are converted into eRNAs (enhancer RNAs) to enhance DNA (gene expression), which codes for mRNAs (messenger RNAs) that generate the proteins (hormones, neurotransmitters, cytokines, etc.) and brain plasticity that generates mind/body communication and problem solving with therapeutic cognition (Rossi, 2002a, 2004, 2007, 2012; Vedral, 2012). In this context, we propose that Ebstein's (1997) saga of the adventure gene, novelty seeking, and substance abuse associated with the dopamine DRD4 receptor gene could be one example of the psychosocial genomic basis of what we call the Novelty-Numinosum-Neurogenesis-Expectancy effect in via the quantum observer-operator. A multimodal mathematical model of the therapeutic quantum observer-operator in the healing arts has been outlined (Leslie, 2013; Rossi, 2002a, pp. 203-251).

Science (Morell, 2014) details how the FOXP2 gene, which is associated with 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.

Such research on bird and bat song syntax and semantics illustrates 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, expectancy and health illustrated in Figures One, Two and Three (Gell-Mann, 1994; 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 in quantum field theory 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 by Francis Collins, Director of the National Institutes of Health (NIH) and are 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 and 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).

Figure Two gives precise bioinformatic meaning to the commonly used terms of the 4-Stage creative cycle such as "Crisis/Opportunity" (Stage One), "Intuition" (Stage Two), "Adaption/Healing" (Stage Three) and "Insight/Applications" (Stage Four). The integration of such psychological terms with brain/body research is the psychogenomic foundation in the RNA/DNA transcription/translation cycle of coding for mRNAs, proteins at the molecular-genomic level of therapeutic hypnosis. Key research explores how these proteins, often called "mother molecules," are cleaved into the neurotransmitters, hormones, and cytokines of the complex adaptive system of psychoneuroimmunology (Irwin & Vedhara, 2005), which integrate cells of the mind, brain and body that ultimately facilitate the dynamics of memory, learning, behavior, and the qualia of consciousness

itself in therapeutic cognition (Rossi & Rossi, 2013). *Research illustrated in Figure Two lead us to propose how the quantum field theory of ExRNAs signaling between nature and nurture are the molecular/genomic underpinning of the complex adaptive dynamics of normal everyday life as well as meditation psychotherapy, and other therapeutic approaches to psychosocial and cultural health* (Gell-Mann, 1994; Holland, 2012).

### **Brain/Mind Plasticity and the Classical Quantum Transitions**

Psychosocial genomic transitions between classical-to-quantum dynamics of Stage Two and quantum-to-classical dynamics of Stage Four are experienced psychologically as illustrated in Figure Three. Genomics Research via the ENCODE project that includes qualia and experience-dependent gene expression is currently manifesting a profound breakout on the epigenomic level in Figure Three. As was stated earlier key research is now exploring complex adaptive systems of information transduction in the transcription process arising from ~2 million eRNAs carrying signals from the physical environment and psychosocial milieu to genes bearing ~3 million docking sites recently summarized by the ENCODE Consortium (2012). Pollard (2006, 2012) has recently pioneered research into the Human Accelerator Regions (HARs) that are now recognized as groups of genes that are undergoing very rapid adaptation distinctively different from our nearest primate relatives.

### **Brain/Mind Plasticity and the Quantum to Classical Transition**

Figure 3 illustrates how the transitions between classical-to-quantum dynamics in Stage Two, and quantum-to-classical dynamics in Stage Four, are experienced in the nonlinear dynamics of therapeutic consciousness and cognition (Chiarucci *et al.* 2014). It is interesting to ask, for example, whether the *intuitions of Stage Two* are psychologically sensed, or felt, to be the same or different in comparison with the experience of *insights during Stage Four*. This is important because Stage Four of the creative cycle is the quantum-to-classical transition that purportedly takes place in the Penrose/Hameroff "Orch OR" model of consciousness entangled with microtubules within the cells of brain (Hameroff & Penrose, 1996;). Jeong, Lim & Kim (2014) recently investigated the classical/quantum and quantum/classical transitions in a manner that we believe are consistent with the deep psychosocial genomic dynamics of therapeutic consciousness and cognition.

In two pioneering books, the highly-esteemed neurobiologist Lowenstein (1999, 2013) presents detailed overviews of how quantum level dynamics underpin the molecular biology of the body, brain and mind. Such research supports some little known but startling research at Carleton University, in Canada, that implies how the quantum Bayesian dynamics

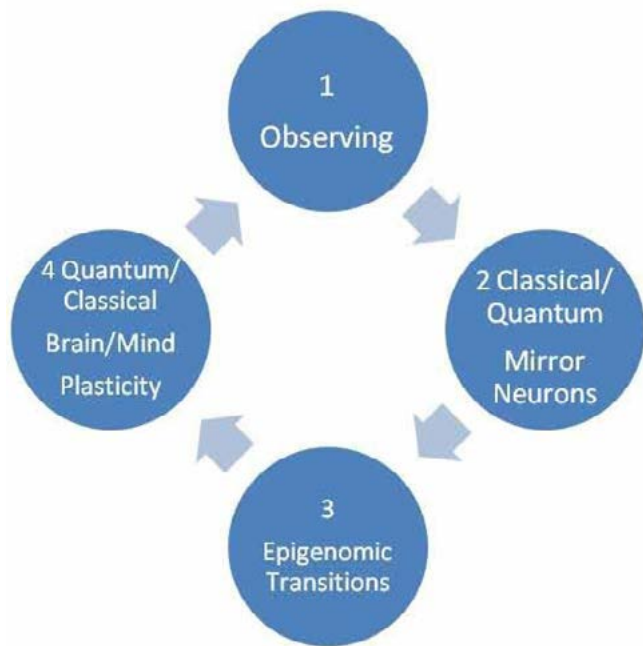


Figure 3. The Communication Cycle between (1) Observing Consciousness, (2) The Classical to Quantum Transitions of Mirror Neurons, (3) The RNA to DNA Epigenomic Transitions, and (4) The Quantum to Classical Transitions on the "The Road to Reality" (Penrose, 2004) in therapeutic consciousness and health (Rossi, 1986/1993, 2002a, 2012).

are manifest in the wave nature of sleep, dreams and therapeutic quantum observer/operators (Rossi, 1972/1985/ 2000).

**The Quantum Wave Nature of Mindfulness: Consciousness, Cognition, Sleep and Dreams: The 4-Stage Creative Cycle and the Psychosocial Genomics of Therapeutic Hypnosis**

The wave nature of psychosocial genomics, meditation, mindfulness, and indeed, all holistic forms of mind/body psychotherapy is mapped onto the Biological 90-120 minute 4-Stage Basic Rest-Activity Cycle (Lloyd & Rossi, 1992, 2008), and the Psychological 4-Stage Creative Cycle (Rossi, 1967, 2007, 2012) illustrated in yellow in the upper curve of Figure Four. 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 (Cheung *et al.*, 2004). 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 of Figure Four illustrates how the quantum qualia of consciousness cognition and behavior are typically experienced within the normal circadian cycle of waking, as well as REM dreams while sleeping (Rossi, 2002b, 2004; Rossi & Nimmons, 1991).

Our most recent addition to figure 4 is to map the quantum equations of Heisenberg's (1927) Uncertainty Principle and Dirac's (1978) quantum notation (introduced above in Box 1) onto the Biological 4-Stage Basic Rest-Activity Cycle, and the Psychological 4-Stage Creative Cycle, illustrated in the top colored part of figure 4. In a remarkable book, *The Great Equations*, Robert Crease, chairman of the philosophy department at Stony Brook University tells the engaging story of Heisenberg's emotional journey as he experienced the ups and downs of the 4-Stage creative cycle during his discovery of the uncertainty principle and the equations that formulated it. In the following quote from Crease (2010, pp 242-245), we intersperse in square brackets [our comments on the 4-Stage creative cycle] that Heisenberg is apparently experiencing when he writes his epoch-making uncertainty paper.

The paper showed how to *compile tables of amplitudes and frequencies associated with transitions between states – he called such tables "quantum-theoretical quantities" – and how the tables could be related by a new kind of calculus, which he called "quantum-mechanical relations."* [This is Stage One of the 4-Stage Creative Cycle integrating *quantum quantities and relations – this may ring a bell for students of psychotherapy who may have struggled to understand the what, why and how of Dirac's integration of math and relationships in Box 1 above.*] ...

Heisenberg then hit a snag. [snag means stuck, which is the defining characteristic of Stage Two of the 4-Stage Creative Cycle.] The tables and the multiplication rule he invented for them obeyed a new kind of algebra that mathematicians had discovered long before, but was unfamiliar to most physicists, himself included. Most strikingly, the rule did not follow the "commutative law," the mathematical principle according to which the order in which one multiplies two numbers does not affect the result:  $ab = ba$ . When Heisenberg used his new calculus to multiply one quantum-theoretical table (let's call it *A*) by another (*B*), the result depended on the order:  $AB \neq BA$ . The feature "was very disagreeable to me," he said later, and try as he might he could not rid his theory of it. "I felt this was the only point of difficulty in the whole scheme, otherwise I would be perfectly happy." Heisenberg then did what many people do when a nuisance threatens to spoil an invention: he swept it under the rug ... Heisenberg concluded his paper with a disclaimer of the sort that is often seen in early papers in a field ... The answer, he declared, would have to await "a more penetrating mathematical investigation." (Crease (2010, 243, Italics added here.)

Heisenberg, still a very young student, wisely recognized he was stuck at this point and gave his paper to his academic supervisor, Max Born,



to determine if it was worth publishing. Born in due time finally recognized that “Heisenberg’s funny quantum-mechanical relations were actually the most natural way that mathematicians had discovered to “multiply” matrices. Crease continues by penetrating to the heart of the so-called mystery of quantum dynamics, which is a math logic that is different from what seemed natural and common sense concept of “commutation” we were all taught in the standard classes of elementary algebra, geometry and trigonometry as follows.

Born was overjoyed. [Overjoyed is characteristic of Stage Three – the Aha! Of the 4-Stage Creative Cycle] ... He knew that matrices can be noncommutative – the order in which one multiplied them mattered. This explained Heisenberg’s embarrassing difficulty that, for instance, the matrix **p** associated with momentum and **q** with position did not commute; the matrix **pq** was not the same as **qp** (by convention, physicists often indicate matrices with bold symbols). But there was more. This pair of variables – known as canonically conjugate variables – was not commutative, but in a special way. Though Born could not prove it, the difference between **pq** and **qp** seemed to be a specific matrix proportional to Planck’s constant:  $\mathbf{pq} - \mathbf{qp} = \mathbf{I}h / 2\pi i$ , where **I** is the unit matrix – “ones” along the diagonal entries and zeros everywhere else ... Its central feature is what they called the “fundamental quantum-mechanical relation,” the strange equation  $\mathbf{pq} - \mathbf{qp} = \mathbf{I}h / 2\pi i$ . The paper is a landmark in the History of physics, for it is the first map of the quantum domain. (Crease, 2010, pp. 242-245).

In QBism, the subjective inner world of personal experience, the so-called mysterious and weird physical paradoxes of the objective outer world quantum mechanics vanish (von Baeyer, 2013). This motivates us to propose that the physicist’s problem of paradoxical quantum observations (measurements) over the past century may be transformed into an opportunity for the psychologist today in our Integrated Quantum Field Theory of Physics, Biology and Psychology: we call this the “**Observer/Operator** ( $\mathbf{O}_b / \mathbf{O}_p$ )” and illustrate where takes place at the peak of the 4-Stage Creative Cycle in Figure Four. The quantum wave nature of the Observer/Operator is often experienced psychologically as The Novelty-Numinosum-Neurogenesis Effect (NNNE) – whereby the wondrous, Novel and Numinous **Observations** ( $\mathbf{O}_b$ ) experienced during “peak experiences” (Maslow (1968) in the arts, humanities, sciences and positive empathic psychosocial relationships – automatically **Operate** ( $\mathbf{O}_p$ ) to turn on adaptive activity-dependent epigenetic gene expression and brain plasticity to underpin the new Quantum Qualia of Creative Consciousness, Cognition and Behavior (Rossi, 2002 a & b, 2007, 2012). Our New Quantum Microscope of the Creative Mind reveals

that the ultimate microdynamics of Freud’s so-called “unconscious” now could be expressed in the “fundamental quantum-mechanical relations,” of the strange equation  $\mathbf{pq} - \mathbf{qp} = \mathbf{I}h / 2\pi i$  of Heisenberg, Born, Jordan and others. Fedaka and Prentisb (2009) describe the profound implications of this quantum equation as the commutation law.

Indeed, the commutation law is one of the most fundamental relations in quantum mechanics. This equation introduces Planck’s constant and the imaginary number “i” into the theory in the most basic way possible. It is the golden rule of quantum algebra and makes quantum calculations unique. The way in which all dynamical properties of a system depend on “h” can be traced back to the simple way in which  $\mathbf{pq} - \mathbf{qp}$  depend on h. In short, the commutation law stores information on the discontinuity, the non-commutativity, the uncertainty, and the complexity of the quantum world (Fedaka & Prentisb, 2009, p. 133).

Figure 4 illustrates Stage One of the 4-Stage Creative Cycle, which is often described as data collection in science, or the initial recognition of a problem or issue that needs to be resolved in everyday life. Stage 2 is often accompanied by experiences of turning inward, incubation and/or conflict, cognitive dissonance (Festinger, 1957), emotional negativity (Bilalić & McLeod, 2014), stress, emotional regression and/or uncertainty as one searches for a solution (Rossi, 2007, 2012). In poetry, myth and saga Stage Two is often called “the storm before the light” or “the dark night of the soul” or some other such metaphor. Stage Three is the Aha! or Eureka flash experience of a new insight or solution of the problem. In neuroscience and psychosocial genomics, we cite research documenting how experience-dependent gene expression, brain plasticity and new consciousness develop during Stage Three. Stage Four completes the cycle with the growth integrated into new networks of cognitions for formulating a more adaptive reality and self-identity.

In figure 4 we underpin these 4-Stage Cycles of Biology and Psychology with the quantum mathematical formulation of Heisenberg’s (1927) **Uncertainty Principle:  $\Delta x \Delta p \geq \hbar/2$** ; Born & Jordan’s (1925) **Fundamental Quantum-Mechanical Relation:  $\mathbf{pq} - \mathbf{qp} = \mathbf{I}h / 2\pi i$**  and Dirac’s (1928) **Quantum Notation: Bra  $\langle \Psi_+ |$  Ket  $|\Psi_- \rangle$** , which will be illustrated with clinical case studies later.

Pioneering electronic monitoring of catalepsy during hypnosis by Milton H. Erickson and his early student, Leonard Ravitz (1950, 1962), motivated the formulation of a new two-factor theory of therapeutic hypnosis by Ernest Rossi. These compiled graphs and *tables of amplitudes and frequencies associated with transitions between states* – [that Heisenberg] called “*quantum-theoretical quantities*” (Erickson & Rossi, 1981; Rossi, Erickson-Klein & Rossi, 2008-2016) that are now being investigated with more advanced EEG methods

# CRISIS/OPPORTUNITY

$$\Delta x \Delta p \geq \hbar/2$$

$$pq - qp = -i\hbar$$

$$pq - qp = I \hbar/2$$

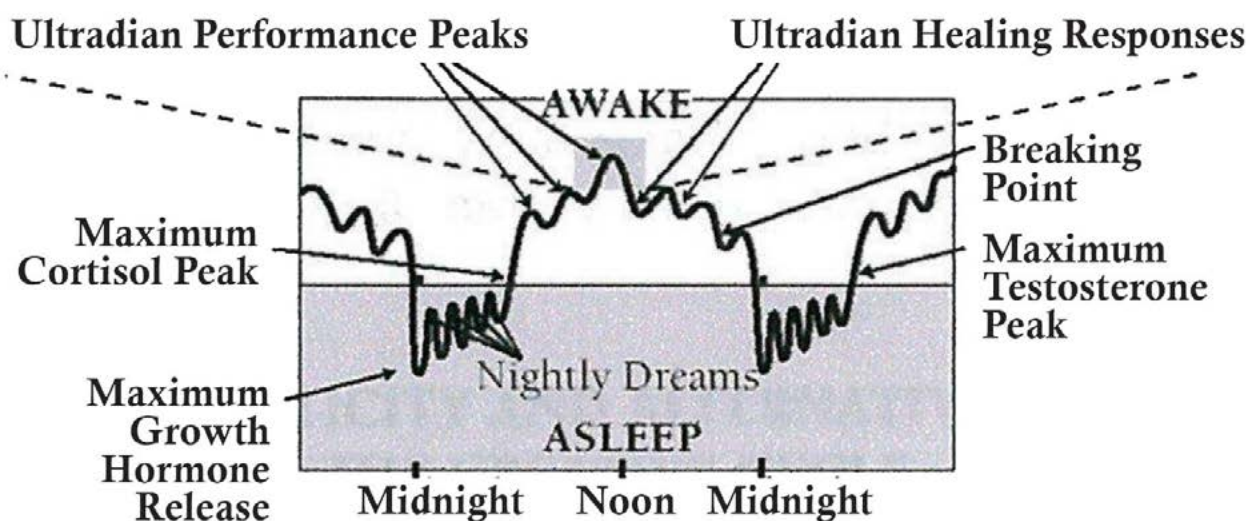
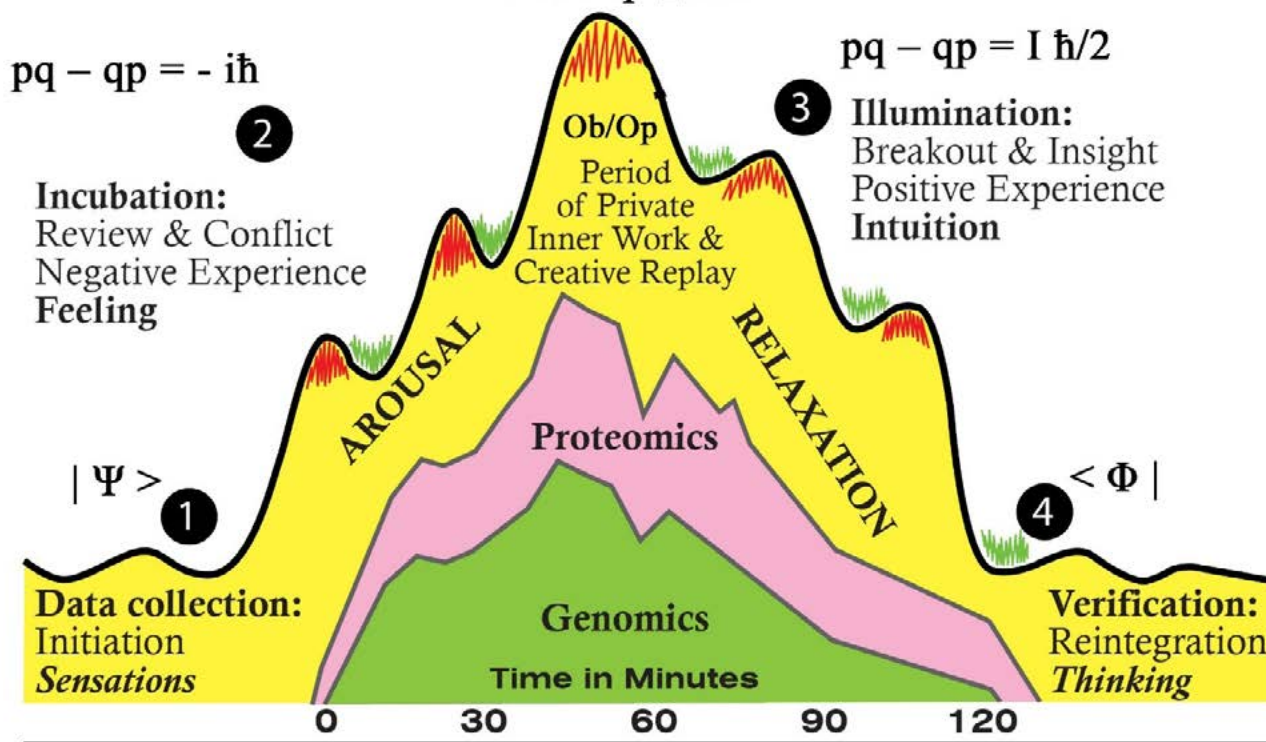


Figure 4. The quantum wave nature of the **Observer/Operator** ( $O_b / O_p$  in the top yellow tip of the **Crisis/Opportunity** at the peak of uncertainty) in our Integrated Quantum Field Theory of Physics, Biology and Psychology maps the psychosocial genomics, consciousness and therapeutic cognition onto the biological profile of the 90-120- Minute Basic Rest-Activity Cycle (Lloyd & Rossi, 1992, 2008) and the psychological 4-Stage Creative Cycle (Rossi, 1967, 2007, 2012).

(Chiarucci, *et al.*, 2014; Jamieson & Burgess, 2014). Such research documents how the overall domain of hypnotherapeutic work is a wave function of high and low phase hypnosis in chaotobiological time of mathematical chaos theory illustrated in Figure Five (Rossi, 2002a & b), which is consistent with the recent calls for reorienting the education, theory and practice of therapeutic hypnosis (Alter & Sugarman, 2017; Hope & Sugarman, 2015).

The high-performance phases of activity 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 Six 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).

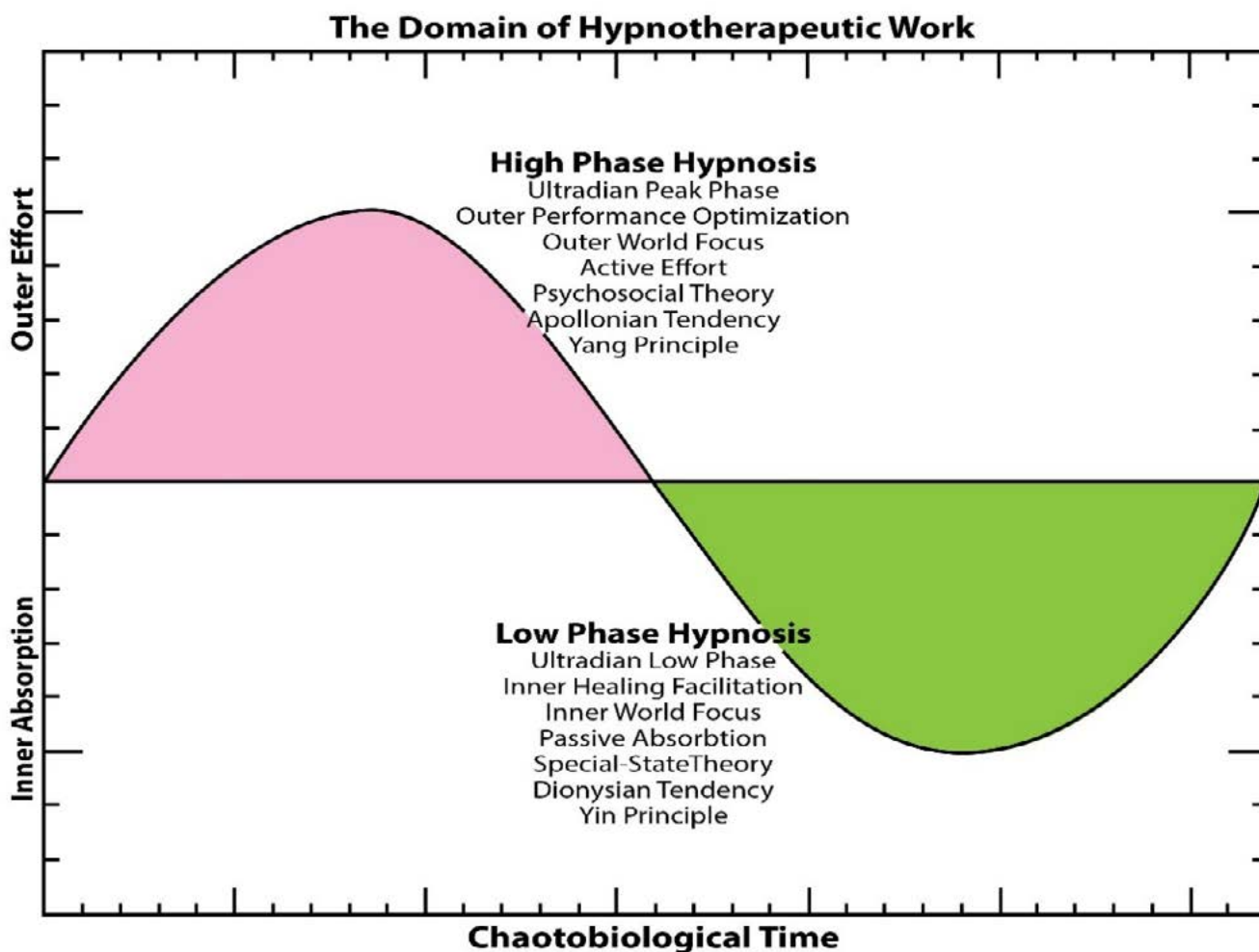


Figure 5. The wave nature of the observer/operator quantum qualia of subjective experiencing during the high and low phases of therapeutic hypnosis are conceptualized as the 4-Stage Creative Cycle mapped onto the 90-120-Minute Basic Rest-Activity Cycle of everyday life (Rossi, 1997a, b, 1982, 1998, 1999; Lloyd & Rossi, 1992, 2008; Rossi, 2002a, b, c, 2005; Mazzoni, Venneri, McGeown, Kirsch, 2013; Pekala, Kumar, Maurer et al., 2011; Rossi, Erickson-Klein & Rossi, 2008-2016; Wagstaff, 2010).

The small rainbows in the lower half of figure 6 imply how 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 during sleep could be the molecular/genomic foundation of many therapeutic practices that emphasize rest and relaxation (therapeutic hypnosis, prayer, meditation, yoga, etc.) developed independently over the ages by many cultures. In Part 2 we will outline how recent developments in the zx-quantum calculus could become the new scientific picture language for documenting our Integrated Quantum Field Theory of the Creative Mind. Part 2 illustrates how the quantum dynamics figures 7a through 7e and the zx-quantum calculus in Box 2 are apparently isomorphic with the gentle curves of the changing states and phases of the 4-stage basic rest-activity and creativity cycles in figures 4, 5 and 6 of Part 1. These isomorphisms (similar structures) imply how the classical psychobiological dynamics of Part

1 are underpinned by the quantum dynamics of Part 2. In Part 2 we will learn that the classical calculus with numbers and equations invented 3 centuries ago by Newton and Leibniz is only a special case of the more general and easier-to-learn picture zx-quantum calculus that makes an integration of the arts, humanities and sciences that bridges the so-called "mind/body gap" of Descartes possible.

**Part 2**  
**Quantum Magnetic Resonance Microscope and the Quantum Qualia of Consciousness: How the ZX-Calculus May Documents a Quantum Field Theory of the Creative Mind**

The alternating wave phases of consciousness, cognition and creativity, as well as rest, sleep and therapeutic hypnosis in figures 4, 5 and 6 derived from research on the *classical level of our usual perspectives of everyday life* are like the *independently derived images on the quantum level produced by the wave equations in various perspectives* in figures 7a, 7b, 7c. More recent research with the innovative quantum magnetic resonance microscope illustrated in figures



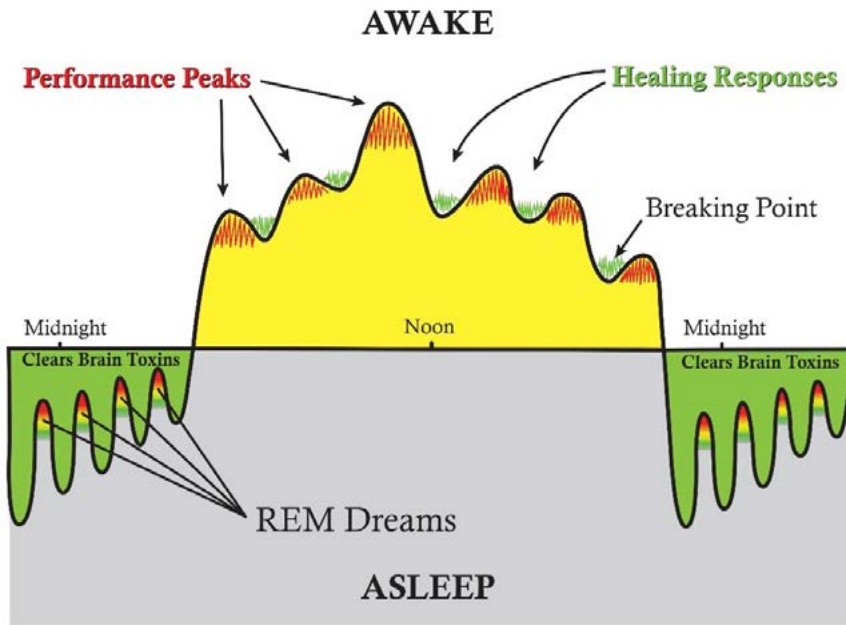


Figure 6. Top: A-2-Dimensional Pyramid Profile of the quantum wave nature of the 4-Stage creative process as a basic paradigm of the epigenomic RNA/DNA quantum field theory in the mind/body healing of stress and PTSD during the 90-120-minute basic rest-activity cycle in everyday life, sleep, dreams as well as meditation and therapeutic hypnosis. Notice the rainbow-like periods (usually about 20 minutes) of symmetry between waking consciousness (top yellow part) and dreaming (bottom green part) that implies how Emmy Noether's Theorem that covers all types of conserved transformations in the integrated quantum field theory that we here generalize from mathematical physics and biology (Klauber, 2015; Lancaster & Blundell, 2014) to applications in the psychology of consciousness, cognition and behavior (Rossi & Rossi, 2014).

7d and 7e (Simpson *et al.*, 2017). What could these apparently isomorphic correspondences between the classical and quantum levels mean? Could they all be:

1. A simple coincidence?
2. An artifact explained by Qbism and the subjective nature of all human sensation, perception and cognition, as measured by

the early psychophysics of Just Noticeable Differences (JNDs)?

3. The quantum reality of nature on the ultra-small scale of Planck's Constant ( $\sim h = 6.626 \times 10^{-34}$  J.s) revealed by images of the quantum magnetic resonance microscope?

If the reader believes in either or both 1 & 2 you are implying your belief in Descartes' Mind/Body

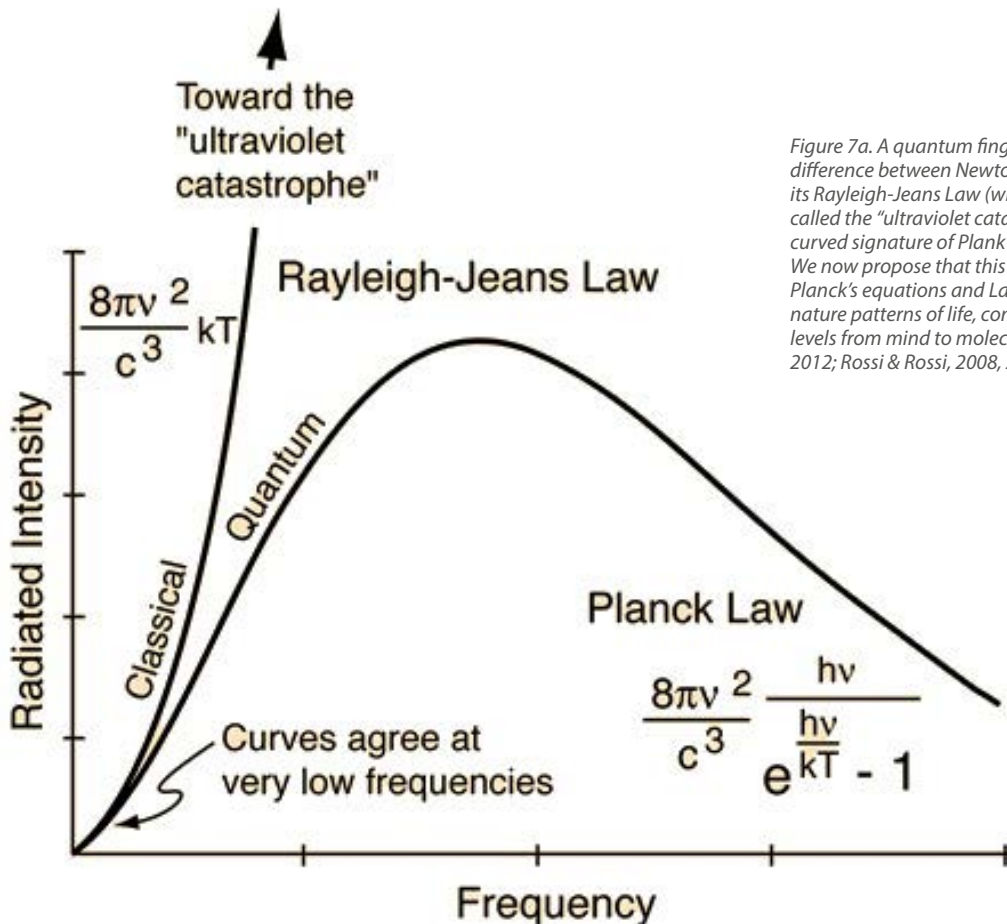
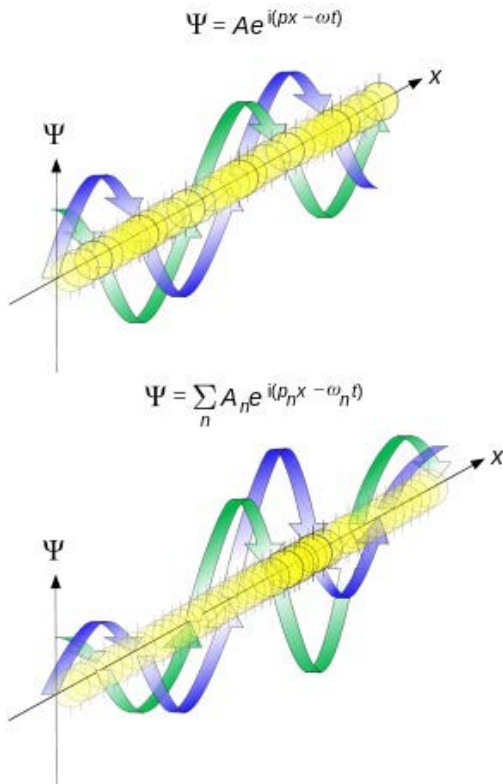
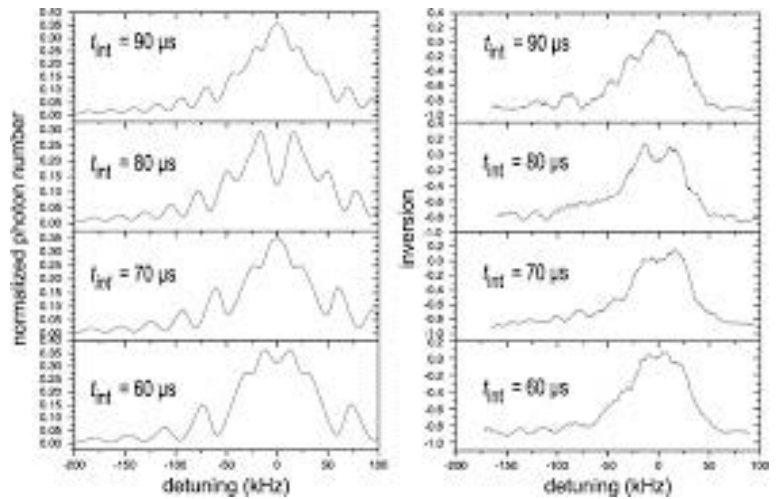


Figure 7a. A quantum fingerprint that helps us visualize the difference between Newton's classical dynamics that fails in its Rayleigh-Jeans Law (which implies an impossible infinity called the "ultraviolet catastrophe") versus the quantum curved signature of Planck's Law (with permission, Nave 2016). We now propose that this gently curved quantum signature of Planck's equations and Law is consistent with the cyclic wave-nature patterns of life, consciousness and cognition on most levels from mind to molecules (Rossi & Lippincott, 1992; Rossi, 2012; Rossi & Rossi, 2008, 2013, 2014 a, b).

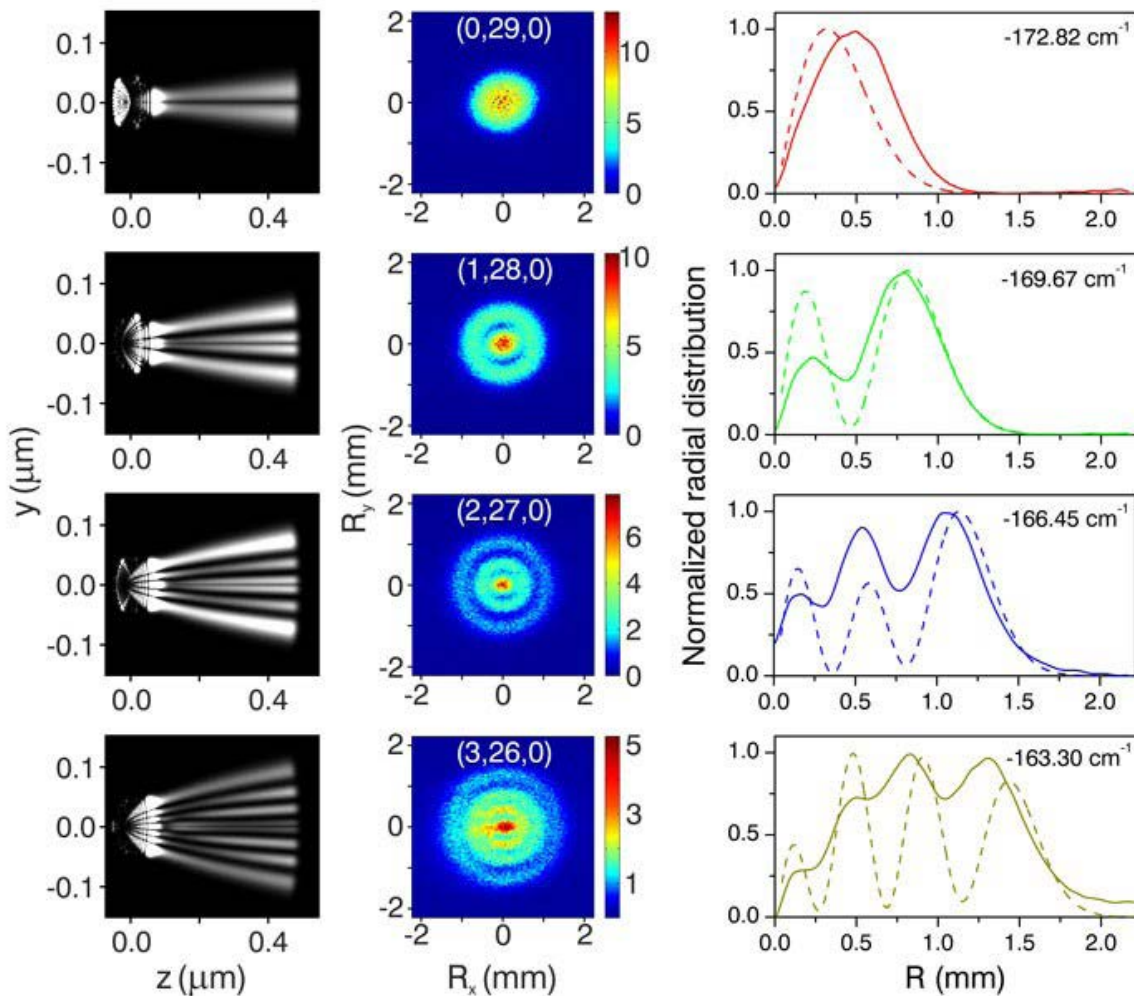


↑ Figure 7b. De Broglie Matter Waves and their accompanying quantum wave equations that now await "a more penetrating mathematical investigation" for the unification of our Integrated Quantum Field Theory of Physics, Biology and Psychology (Creative Commons Wikipedia, 2017).



↑ Figure 7c. The wave nature of the normalized quantum photon numbers of light often found in the fundamental experiments of quantum physics are strikingly similar to those found in biology and psychology (see figures 1 through 6 above in part one).

↓ Figure 7d. The first direct observation of the orbital structure of an excited hydrogen atom has been made with the quantum microscope by an international team of researchers. The observation was made using a newly developed quantum microscope, which uses photoionization microscopy to visualize the structure directly. The team's demonstration proves that "photoionization microscopy", which was first proposed more than 30 years ago, can be experimentally realized and can serve as a tool to explore the subtleties of quantum mechanics (Commissariat, 2013).



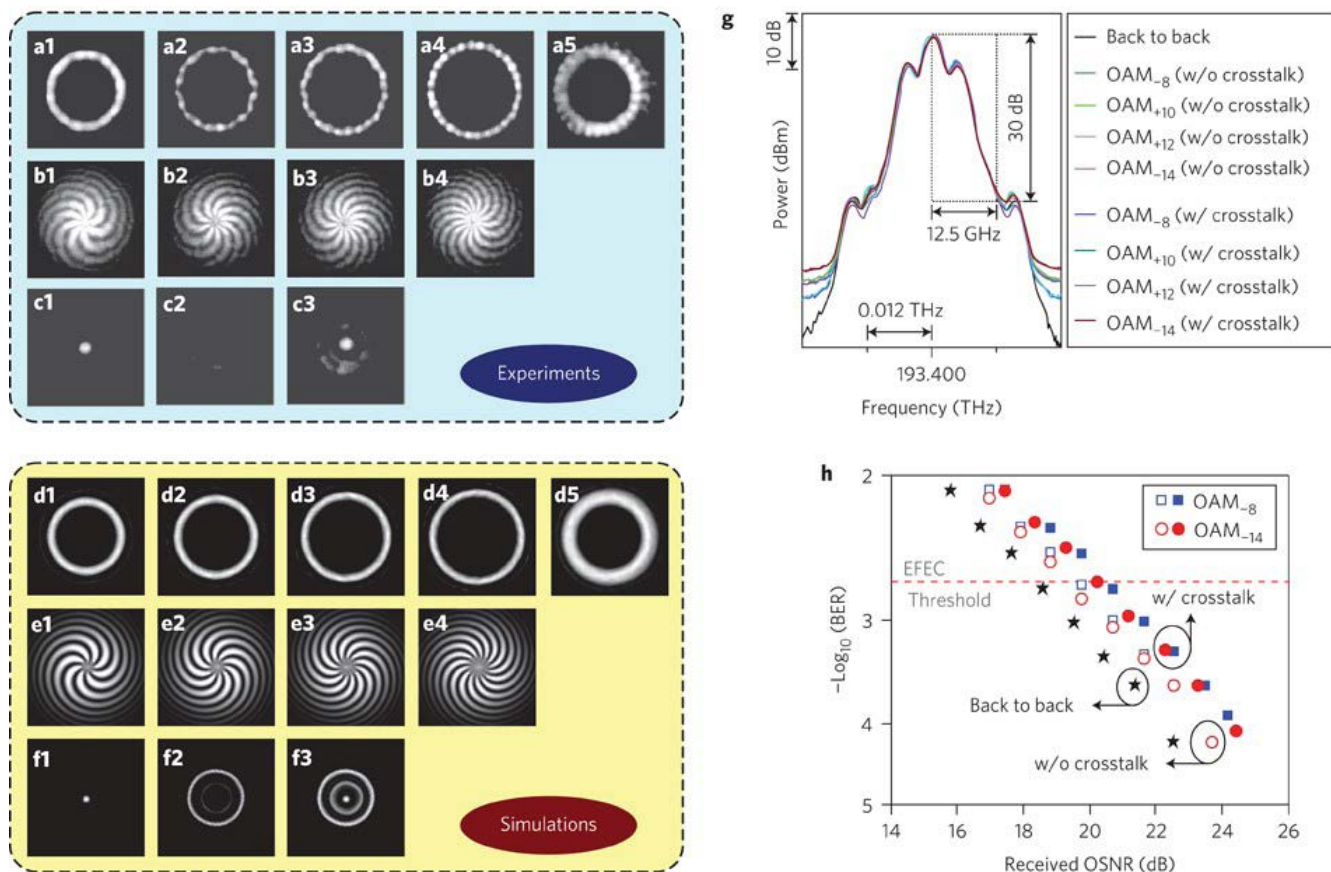


Figure 7e: Experimental and theoretical results of measuring the wave function of angular momentum beams of the quantum microscope (Wang et al., 2012). The wavefunction is a central tenet of information flow in our integrated quantum field theory of physics, biology the psychology of consciousness and cognition. Mathematically the wavefunction is the solution to the Schrödinger equation. Notice the similarity between the pyramidal profile in the upper right of this quantum level construction and the pyramidal profiles of biology and psychology in Figures 4 and 6.

philosophical gap and the Hard Part of Consciousness Research remains controversial and unresolved (Chalmers, 1996; Rossi 2007, 2012; Rossi & Rossi, 2015). If you believe in 3, the convincing reality of the quantum magnetic resonance microscope, then you join those researchers in physics, math, biology and psychology who believe that the Second Creation of Quantum Reality (Crease & Mann, 1996) is, indeed, as real as all the modern quantum level technology that makes your iPhone, GPS and smart TV possible. You may now be ready to explore the enlightening possibilities of the quantum qualia of your own personal experience, as well as the therapeutic possibilities of modern mind/body psychology, medicine and the zx-calculus that may become the wave of the future. In figures 7a through 7e, we present a series of images of the fundamentally wave nature of the quantum domain in *physics*. We hypothesize that they are consistent with the fundamental wave nature of all the molecular genomic cycles of *biology* and *psychology* discovered earlier in figures 1-6 originally documented (Lloyd & Rossi, 1992, 2008) and Rossi (1967, 2007, 2012).

This apparent isomorphism between data on the classical Newtonian macroscopic level (in figures 4, 5 and 6) with microscopic data from the new

quantum microscope (figures 7a through 7b) leads us to propose how the basic quantum Bayesian wave nature of many natural epigenomic processes could enhance psychotherapy and all schools of therapeutic consciousness. We now need to assess how such wave patterns are consistent with a more general quantum RNA/DNA psychosocial genomic theory of consciousness, cognition, creativity and positive expectancy. To do this we introduce some fundamentals about quantum Bayesianism dynamics, which are consistent with the zx-quantum calculus as a fundamental language for an integrated quantum field theory of physics, math, biology and psychology as well as the arts, humanities and therapeutic consciousness, cognition and creativity in general.

### Quantum Bayesian Notation 101 for the ZX Calculus of Therapeutic Consciousness and Cognition

The original publication that began the current quantum Bayesian revolution emphasized how the extreme accuracy of the calculations of *quantum physics probability replaces the determinism of classical Newtonian physics* (Caves, Fuchs & Schack (2001). What could Bayesian dynamics really mean for the quantum field theory of mindfulness, psychotherapy, therapeutic consciousness and cognition?



The first fundamental insight for physics, math, biology and psychology is that the quantum qualia of subjective experience are probabilistic in the normal consciousness and behavior of everyday life (Crease and Mann, 1996; Rossi, 1972/1985/2000, 2012; Rossi & Rossi 2014a & b, 2015).

The second fundamental insight is that the highly sensitive quantum qualia of subjective experience are discrete; this means they are quantized into tiny, separate, natural Planck units of sensation and/or perception, and emotions (Fuchs, 2001, 2010; Schiller, 2015). 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 colors depending on how we humans choose to interpret them. Mathematicians have formulated an axiom of choice in logical systems (Doxiadis & Mazur, 2012) 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 (Baggott, 2011, 2015). We now note that letters, words, emotions and states of consciousness as well as cognition, mathematics, music, emotions and 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 the human's most highly acute and sensitive subjective experiences are manifestations of an infinite axiom of choice in creating and organizing its own world. The vast possibilities of human choice can be confusing and stressful, however, 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), which find their ultimate source quantum level source of Heisenberg's uncertainty principle.

The third fundamental insight is that quantum Bayesian dynamics are manifest (observable) on all levels from mind to genes in living systems (Fuchs, 2011, 2012). Although quantum physics began with the need to resolve the paradoxes that emerged from atomic and subatomic levels, early theorists like Bohr, Dirac, Heisenberg and Schrödinger realized that the quantum level underpinned the dynamic of the entire universe on the macroscopic scale as well as the microscopic scale atoms and the molecular chemistry of life and consciousness and cognition (Baggott, 2011, 2015; Susskind & Friedman, 2014; Wilber, 1993).

The fourth fundamental insight is the central role of quantum Bayesian expectancy in an uncertain world (Fuchs, Mermin & Schank, 2013; Fuchs & Schank, 2013). Heisenberg's fundamental uncertainty relationships are the basis for understanding the broad scope of how modern Quantum Field Theory (Klauber, 2015; Lancaster & Blundell, 2014) is challenging our conceptions about our ever expanding universe and more sensitive quantum qualia of creating and recognizing our emergent new consciousness,

cognition, and emotions as well as our sense of free will and reality itself (Rossi & Rossi, 2014 a, b; Rossi & Rossi, 2015). In figures 7a-e we illustrated how the core concepts and equations of the Born, Heisenberg and Jordan's matrix mechanics and uncertainty (Crease and Mann, 1996) play a fundamental role in the 4-Stage Basic Rest-Activity Cycle of biology, which is isomorphic with the 4-Stage Creative Cycle of the newly emergent causal quantum qualia of consciousness, cognition and emotions.

### Dirac Notation Illustrating the Psychosocial and Cultural Genomics of the Quantum Observer/Operator in Consciousness, Dreaming and Psychotherapy

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 learning, REM dreaming and cognition (Rossi, 1972/1986/2000; Rossi & Rossi 1996; Rossi & Rossi, 2015) can be easily evaluated with our new quantum Bayesian notation. We illustrate this with the dream and therapeutic intervention in 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 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 observer/operator [O] in positively transformative bra-ket notation like this.

$$\langle \psi_{+FUTURE} | O_{Psy+} | \psi_{-PAST} \rangle$$

Consciousness can function as a Janus-faced positive quantum operator/observer [O] in the intense focus of the dream work; to observe is to operate simultaneously on the past as well as the future! The patient still has an urgent question. He needs the

help from the psychotherapist [ $O_{\text{Psy}+}$ ] to convert the *quantum probability amplitude* of a possible therapeutic reframing of his life story with his father into the *qualia of new quantum Bayesian psychological reality in Hilbert space* (math notation for infinite possibilities). The patient urgently needs the therapist to witness and validate the patient's own newly created and nascent reality by answering, "Yes, this is the result of gene expression and brain plasticity operating successfully within you!" Suppose the psychotherapist 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.

Upon awakening the young woman's first sleepy early morning thoughts spontaneously replays her dream: she would have told the nice inspector the truth about how the baker was indeed responsible for making the huge sandwich. She intuitively needed this information so someone could be *rewarded* for such excellent work.

In this dream the observer/operator ( $O_{\pm\text{BAKER}}$ ) was her ambivalent identification the baker. In bra-ket notation there was no complete positive transformation in her dream. She is still stuck in an ambivalent and puzzled Stage Two at the end of her dream.

$$\langle \Psi_{\pm\text{PUZZLED}} | O_{\pm\text{BAKER}} | \Psi_{\text{-CYNICAL}} \rangle$$

Fortunately, this young woman has the wit to utilize the *axiom of choice* in her early morning thoughts to give her identity a wonderful makeover that generated a positive transformative to Stage Four of the creative cycle. This is expressed in bra-ket notation:

$$\langle \Psi_{\text{+REWARDED}} | O_{\text{+CHOICE}} | \Psi_{\text{-CYNICAL}} \rangle$$

During her nighttime of sleep her brain was cleared of metabolic toxins (she had been stressfully overworked lately) so she could more objectively re-consider the cynical side of her personality that requires 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) so she can be appropriately recognized and *rewarded*.

A depressed middle age man reports a spontaneous daydream during psychotherapy.

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 bomb begins exploding above. In quantum Bayesian bra-ket notation:

$$\langle \Psi_{\text{+INCUBATION}} | O_{\text{+GUARD}} | \Psi_{\text{-WAR}} \rangle$$

Together the depressed man and therapist intuited a helpful and hopeful therapeutic interpretation of this dream. The man's depressing dream is a Stage Two 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 an emergent manifestation of the positive observer/operator in his dream protecting him and others so they can safely incubate about their condition. The need to incubate in Stage Two until appropriate *quantum Bayesian probability amplitudes* of the adaptive RNA/DNA transition/translation dynamics of experience-dependent gene expression and brain plasticity evolve new Stage Three therapeutic possibilities. This hopeful *expectancy* will optimize his ability to recognize the fruits of a good night's sleep in clearing his brain to facilitate gene expression and brain plasticity for creating new quantum qualia of consciousness.

We propose that these clinical vignettes of Dirac's brief Bra-Ket notation document how initially dysfunctional quantum qualia of consciousness and cognition have a state identified with a negative subscript such as Ket  $|\Psi_{-}\rangle$ , that could be a medical or psychological symptom, which is then therapeutically transformed by the observer/operator into a positive final state identified with a positive subscript such as a Bra  $\langle \Psi_{+}|$ . This concise Dirac notation characterizes the typical human condition as problematic – needing a 4-Stage Creative 90-120-minute Basic Rest-Activity Cycle (BRAC) on all levels from mind to activity-dependent gene expression and brain plasticity 12 times a day to evolve life, consciousness and cognition in an optimal manner.

But why all this negativity in the first place? Why after 4.5 billion years of Darwinian evolution has life and mind not achieved a state of permanent positive bliss and nirvana? Our Integrated Quantum Field Theory of Physics, Math, Biology & Psychology proposes that the quantum level of existence and ontology is *a priori* to even Darwin's theory of evolution by natural variation and selection. It is easy to understand how Heisenberg's quantum uncertainty principle underpins Darwin's Perspective of *The Origin of Species*. Our psychologically oriented quantum field theory of cosmos and consciousness suggests an obvious hypothesis about these questions in the following mathematical statement about "That little minus sign makes a huge difference?" between real and quantum numbers by Wilczek (2015).

We map ordinary dimensions onto ordinary, so-called “real” numbers. We pick a reference point, usually called the origin, and label any point by a (real) number that describes how far you must go to get there from the origin. Real numbers, in a word, are suitable for measuring distances, and labeling continua. They satisfy the usual multiplication rule

$$xy = yx$$

Quantum dimensions use a different kind of numbers, called Grassmann numbers. They satisfy a different multiplication law,

$$xy = -yx$$

*That little minus sign makes a huge difference?* Notably, if we put  $x = x$  we get  $x^2 = -x^2$ , and so we conclude  $x^2 = 0$ . That strange rule encodes, in the physical interpretation of quantum dimensions, Pauli’s exclusion principle: you can’t put two things in the same (quantum) place.

After those preparations, we’re ready to meet SUSY. Supersymmetry is the claim that our world has quantum dimensions, and that transformations exist which interchange ordinary with quantum dimension (change), without changing the laws of physics (without change).

*Supersymmetry, if correct, will be a profound new embodiment of beauty in the world. Because the transformations of supersymmetry turn substance particles into force particles, and vice versa, supersymmetry can explain, based on symmetry, why neither of those things can exist without the other: Both are the same thing, seen from different perspectives. Supersymmetry reconciles apparent opposites, in the spirit of yin-yang.* (Wilczek, 2015, p. 311, Italics added here.).

It will require a great deal of the further research on our psychologically oriented quantum field theory to confirm “*That little minus sign makes a huge difference*” in the therapeutic transitions from negative stress to positive states of creativity. As we have seen above “*That little minus sign makes a huge difference*” because it is the sign of *non-commutation* in “fundamental quantum-mechanical relations,” evident in that strange equation  $\mathbf{pq} - \mathbf{qp} = \mathbf{lh} / 2\pi i$ , which is a landmark in the history of physics. It is the first map of the quantum domain that underpins all life, biology, psychology and the profoundly sensitive quantum qualia of human experience. Consciousness, cognition and creativity as we experience them in daily life, as well as meditation and therapeutic consciousness could not exist without it.

## The ZX-Calculus Integrates the Quantum Field Theory of Math, Physics, Biology and Psychology

In this presentation, we have introduced the new concept of the observer/operator ( $\mathbf{O}_b / \mathbf{O}_p$ ) as a pair of mind/body conjugate variables to replace the  $\mathbf{pq} - \mathbf{qp}$  in the non-commutation relation in the fundamental quantum-mechanical equation so that it becomes:  $\mathbf{O}_b \mathbf{O}_p - \mathbf{O}_p \mathbf{O}_b = \mathbf{lh} / 2\pi i$ . At present however, this remains an open problem requiring proofs for our proposed Integrated Quantum Field Theory. The major speculation of this chapter is that the new zx-quantum calculus that has been developed over the past decade will prove to be a fertile field for investigating the quantum foundations of an integrated quantum field theory of all the sciences, humanities and healing arts. Coecke & Kissinger (2017), two leaders in current quantum theory, outline their introduction to the zx-calculus in this way.

The unique features of the quantum world are explained in this book through the language of diagrams, setting out an innovative visual method for presenting complex theories. Requiring only basic mathematical literacy this book employs a unique formalism that builds an intuitive understanding of quantum features while eliminating the need for complex calculations. This entirely diagrammatic presentation of quantum theory represents the culmination of 10 years of research, uniting classical techniques in linear algebra and Hilbert spaces with cutting-edge developments in quantum computation and foundations.

Written in an entertaining and user-friendly style and including more than 100 exercises, *this book is an ideal first course in quantum theory, foundations, and computation for students from undergraduate to PhD level, as well as an opportunity for researchers from a broad range of fields, from physics to biology, linguistics, and cognitive science to discover a new set of tools for studying processes and interactions.*

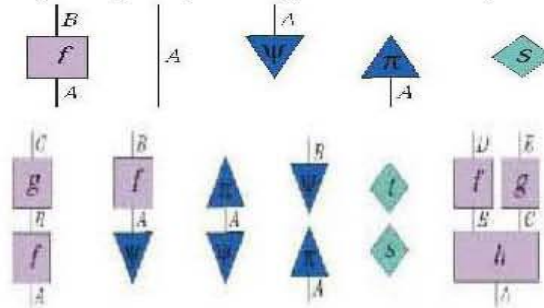
*Quantum pictorialism* refers to the use of diagrams to capture and reason about the essential features of interacting quantum processes, in a manner that these diagrammatic equations become the very foundation of quantum theory (2017, p. 2-7, Italics added here).

Box 2 introduces a few of the axioms, theorems and dynamics of the kindergarten picture approach to the zx-calculus (Coecke 2005, 2009; Coecke & Duncan, 2011; Backus, 2015; Coecke & Kissinger 2017), which we propose as a new language for expressing concepts, dynamics and relationships that are consistent with our integrated quantum field theory of math, physics, biology and psychology – particularly as it is applied to psychotherapy, consciousness, cognition and emotional well-being.

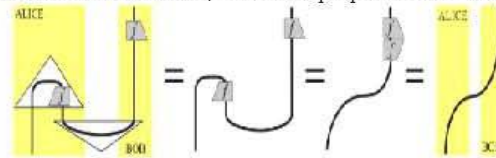


## Box 2: A Few Axioms & Proposed Psychodynamics of the ZX-Quantum Calculus

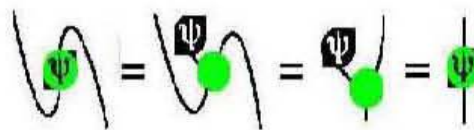
The primitive data of our formalism consists of (i) boxes with an input and an output which we call 'operation' or 'channel', (ii) triangles with only an output which we call 'state' or 'preparation procedure' or 'ket', (iii) triangles with only an input which we call 'co-state' or 'measurement branch' or 'bra', (iv) diamonds without inputs or outputs which we call 'values' or 'probabilities' or 'weights', (v) lines which might carry a symbol to which we refer as the 'type' or the 'kind of system', and the  $A$ -labeled line itself will be conceived as 'doing nothing to a system of type  $A$ ' or the 'identity on  $A$ ' (Coecke, 2005).



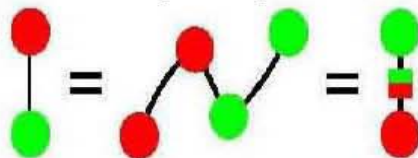
The caps and cups of quantum communication, which we propose as the transference in psychotherapy.



A basic cups and caps picture of the 4-stage basic rest-activity cycle, cognition and creativity.



An initial effort to picture the ultradian cups and caps of addictions (red) and recovery (green).



The major practical implication for our integrated quantum field theory of physics, math, biology and psychology for the current evolution of psychotherapy is to help people learn to value and tune in appropriately to the most highly sensitive, emergent and seemingly ineffable quantum qualia of their observer/operator to help them navigate the perils of everyday acute and chronic stress that generate the most common forms of psychopathology and the addictions. We need to do away with the common disparagement of "merely subjective experience of intuition and imagination" that favors the pursuit of the so-called "virtues of objective thinking and rational," which can so easily become corrupted by narcissism, ego power, advertising, avarice and war in cultures that over-value competition and personal excellence

whatever the cost. We need to transcend the rather stale reductive ideologies and manipulative models of psychotherapy as stimulus/response conditioning, gaming, programming, suggestion and rather dry cognitive-behavioral transactions by returning to the living, experiencing, and primacy of the vivid Novelty-Numinosum-Neurogenesis-Effect (NNNE) to realize our best creative selves in the quantum evolution of psychotherapy. But how can we do this with a practical easy-to-learn therapeutic protocol? We propose that *The Mirroring Hands Protocol* (Hill and Rossi, 2017; Rossi, 2012) for optimizing research on therapeutic consciousness, cognition and communication would be consistent with the innovative zx-calculus of quantum mechanics, logic and communication (Cicala, 2017; Coecke and Duncan, 2011; Coecke and Kissinger, 2017).

## Summary

The integrated quantum field theory of physics, math, biology and the psychology of consciousness, cognition, creativity and health is proposed for a new conception of the quantum evolution of psychotherapy that is made possible with the innovative quantum magnetic resonance microscope. Research in the integrated quantum field theory is updated with an adaptive RNA/DNA theory of the quantum Bayesian transformations of consciousness, creative cognition, meditation and therapeutic hypnosis. Alternating classical-to-quantum and quantum-to-classical transitions on all levels from mind to genes, the natural 90-120 minute 4-Stage Basic Rest-Activity Cycle of biology and the 4-Stage Creative Cycle of psychology, are integrated with the wave nature of the  $zx$ -calculus of quantum physics. Surprising tendencies toward cognitive dissonance, conflict, negativity and psychological regression during Stage Two (incubation/conflict) of the 4-Stage creative cycle were uncovered during dreams when parsed with Dirac's bra-ket quantum notation. We propose how the highly sensitive quantum qualia of

problematic dissociations during Stage Two of the 4-Stage creative cycle have their source at quantum level uncertainty. We propose that such psychosocial conflicts have their source in non-commutation pathologies, which could be resolved in Stages Three and Four of therapeutic consciousness and cognition. Quantum Bayesian concepts of the novel observer/operator are documented with insightful applications for counseling, psychotherapy, medicine and all the mind/body therapies. Freud's concept of the so-called "unconscious" is no longer entirely unconscious; it can be updated with new explorations of the basic quantum non-commutation equation  $\mathbf{pq} - \mathbf{qp} = \mathbf{lh} / 2\pi i$  and the new  $zx$ -calculus. Integrated quantum field theory research on how *the quantum qualia of the human observer/operator during subjective experience* can be a causal agent in facilitating health and problem solving *on the objective molecular/genomic level* now needs to be replicated for facilitating the living experience of the quantum evolution of psychotherapy, health and well-being.

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# THE BIO-PSYCHOLOGICAL IMPLICATION OF HAPPINESS IMPLICATED IN NEUROLOGICAL DISORDERS' MINISTRATIONS

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## Abstract

Happiness is a mental or emotional state of well-being characterized by positive or pleasant emotions ranging from contentment to intense joy. Psychologists have used several models including biopsychosocial and PERMA models to explain happiness suggesting that happiness is attained when our biological, psychological and sociological needs are met in a balance way attaining pleasure, engagement, relationships, and accomplishments. Studies with humans have shown that high levels of some neurotransmitters can increase feelings of elation (happiness) and euphoria while their low levels have been linked to feelings of depression or unhappiness. Yoga, Chanting, Kirtan & Meditation involves higher but controlled secretions of the neurotransmitters resulting intense happiness. In addition to the neurotransmitters, certain hormones also have the role in the mechanics of happiness.

## Introduction

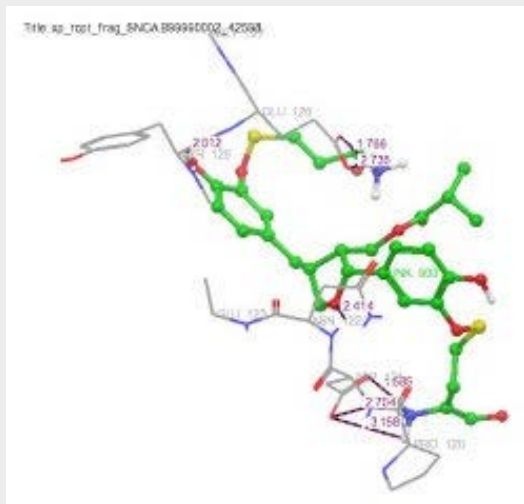
Stressful life (by product of modern society) and several stress related complications disturb normal physiological equilibrium and undermine normal homeostasis prevailing in human systems mainly in the central nervous system. Chronic stress implicates pathophysiology of anxiety related disorders leading to depression and different neurodegenerative disorders. The neurotransmitter, dopamine is responsible for the feeling of pleasure and satisfaction. Uncontrolled or unavoidable exposure to chronic stress could weaken dopamine release. Serotonin is another neurotransmitter, which controls the regulations of mood, behavior, appetite and cerebral circulation. Studies have shown that induced stress affects the proper functioning of dopaminergic and serotonergic neurons. Changes in adrenocorticotropin hormone could effect autonomic function and behavioral changes.

Presently there is a global awareness in exploring the potential of indigenous medication of herbal origin – thereby minimizing or avoiding possible side effects of synthetic chemical drugs. We have studied extensively the role of various phytochemicals in the management of different neurodegenerative disorders.

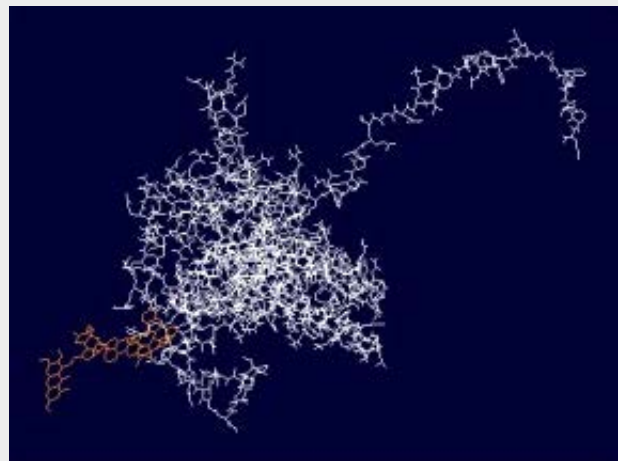
## Experimental studies

In our *in-silico* studies it is seen that *Canscora decussate* (Bagchi *et. al.*, 2015), *Valeriana jatamansi* (Bagchi & Hopper 2011), *Withania somnifera*, *Bacopa monnieri* and *Panax ginseng* have rejuvenating effect on CNS (Bagchi, *et. al.* 2015) as seen by interaction studies below (Fig. 1).

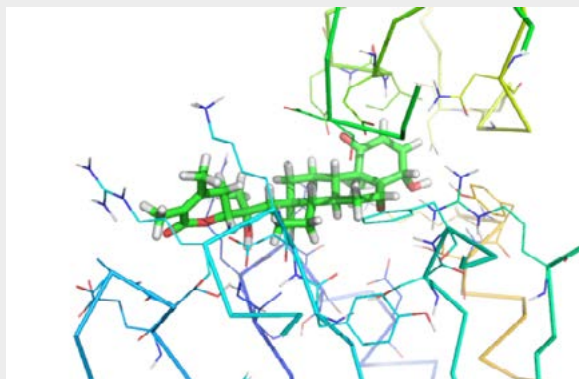
Philosophical studies suggest that neurological disorders cannot just be a chemical imbalance in the brain, rather, it is a disharmony of body, mind-brain, and spirit within the whole person. This disharmony includes a chemical imbalance in the brain as one of its elements. For mental illness & neurological disorders, what goes on at the level of the brain can never fully be accountable for the illness since it is being experienced at the individual level of the person (Frattaroli 2002, Wayne 2013, Pandya 2011, Loftus 1993, Speyrer 1995, McNally 2007 & Bremner 2002). Even though medication is often quite helpful, it is never an adequate treatment for an inner crisis of the inner being (self) (Bagchi 2015, Kandel 1998, Son and Kirchner 2000, Biederman *et. al.*, 1995, Bettelheim 1982, Teape 1932, Arnold 1990, Aristotle 2009, Bloom 2004, Santoro *et al* 2009, Krishnamoorthy 2009, Rolando 1998, Blumer & Benson 1975). The healing of neurological disorders or mental illness cannot be bottled into pills, or bestowed by applying information acquired through university degrees (Roberts, 2001). Established beliefs unfortunately tend to be inflexible to logic that we call "blind cultural faith" on the basis scientific materialism so much that we are willing



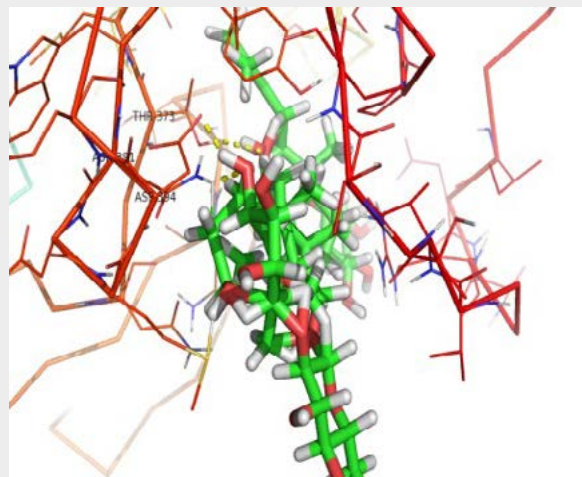
Interaction of SNCA receptor with Jatamin 11 from *Valeriana jatamansi* (Bagchi & Hopper 2011)



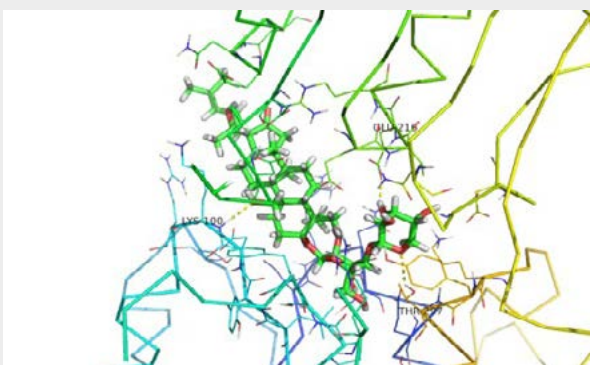
Interaction of APOE receptor with xanthone from *Canscora decussate* (in combination with ergotamine & nardal) (Bagchi et. al., 2015).



Interaction of AMPA receptor with withanolide from *Withania somnifera* (Bagchi, et. al.2015)



Interaction of AMPA receptor with ginsenoside from *Panax ginseng* (Bagchi, et. al.2015)



Interaction of AMPA receptor with bacoside from *Bacopa monnieri* (Bagchi, et. al.2015)

Fig. 1: Interaction studies of phytocompunds from ayurvedic herbs with CNS receptors (in-silico)



to accept profligate and potentially dangerous uses of medication that could never be acceptable on the basis of scientific evidence alone (Bagchi 2015, Frattaroli 2002, Wayne 2013 & Pandya 2011).

### Happiness, a blessing

Happiness is a psychological/emotional condition of well-being characterized by affirmative or pleasant sensations ranging from satisfaction to intense joy (Bagchi et. al., 2014, Averill et. al. 1990, Bradburn 1969). Happiness is the mysterious pursuit behind every human venture (Bagchi et. al., 2014, Psychology of Happiness). According to the famous businessman, Lester Levenson, happiness is the circumstances of mind where there is no hint of mourning and is not something exclusively chased by human beings, but something desired by all attentive individuals (Bagchi et. al., 2014, Bradburn 1969, Farran 1995 et. al., Franken 1994, Goleman 1995). Happiness is one of the most prejudiced mental conditions and several factors could play a role when a person is really happy (Bagchi et. al., 2014, Kringelbach and Berridge

PERMA models to elucidate happiness suggesting that happiness is attained when our biological, psychological and sociological needs are met or when there is pleasure, engagement, rapport, and triumphs (Bagchi et. al., 2014, Psychology of Happiness, Seligman 1975, Cornelius 1996, Dearden 1925) (Fig. 2).

Modern science has got limitation in delving into the knowledge of inner self. Whereas 'yoga' aims at self-knowledge and enlightenment-freedom from desire, compulsion, fear and unhappiness, attaining a higher state of union with the divine. Paramahansa Yogananda mentioned in his renowned book "Autobiography of a yogi" that the cosmic life energy is not less fundamental than the four fundamental forces of nature recognized in physical science. However, the 'chakras' (yogic terminology) are regarded as nerve plexes major ganglia along the spine. Major 'chakras' along the cerebrospinal column (eg. muladhara, swadishthana, manipura, anahata, wishuddha, ajna and sahasra) with the relevant physiological energy system of the body being

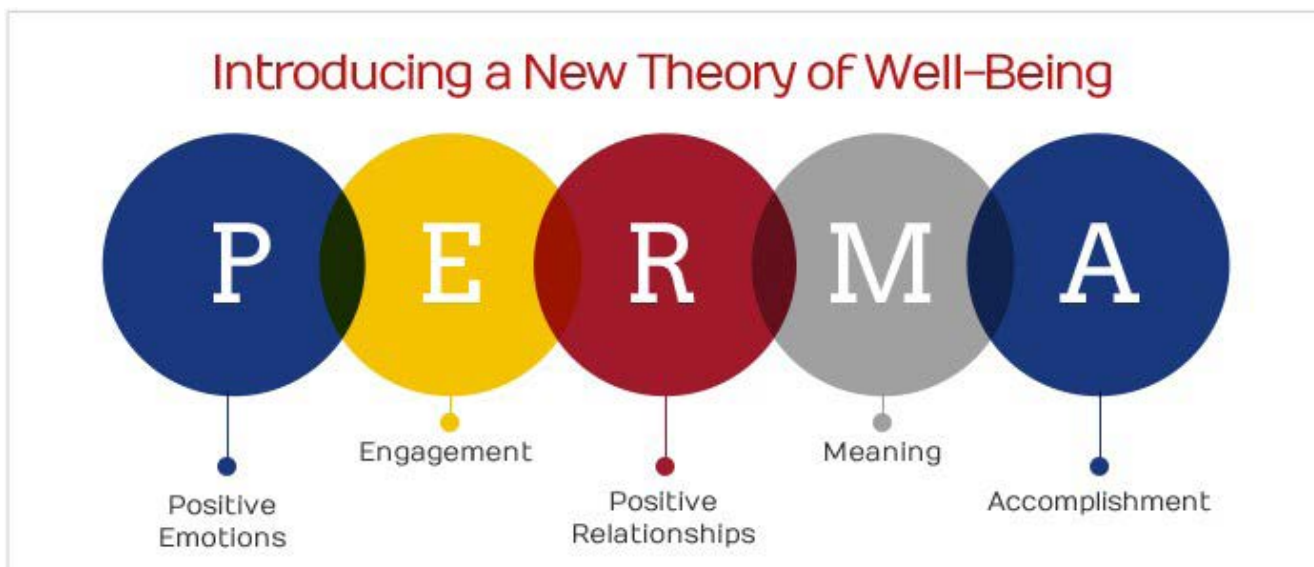


Fig. 2: PERMA model (fig. source: <https://www.authentic happiness.sas.upenn.edu/learn>)

2010). Happiness is connected with some sort of gain or accomplishment (Maslow 1943, 1964, 1987, 1999, Hoffman 1999). Usually when one completes or accomplishes something, they feel pleased and triggering happiness (Maslow 1943, 1964, 1987, 1999, Hoffman 1999, Hutschnecker 1981, Madsen 1968, Myers 1992, Parducci 1995, Seligman 1990, Snyder 1994). This accomplishment can be material as well as spiritual (Maslow 1943, 1964, 1987, 1999, Hoffman 1999). It could even be physical and corporal, just as a dementia person would feel happy & relaxed after a good night's sleep (Bagchi et. al., 2014, Psychology of Happiness). Psychologists have used numerous models including bio-psychosocial and

shown pictorially below (Fig. 3, 4). Happiness has consequence on body's psychological and spiritual states, which raise the level of alertness in the energy centers called Chakra in yogic physiology (especially Sahasrara, which refers to the seventh chakra behind the pituitary, pineal-gland and the entire brain have auto stimulation of different nerve centres in the cerebrum) (Bagchi et. al. 2014).

Scientists have long known "pleasure center" or "reward center" in the brain and studies with humans have shown that high levels of some neurotransmitters can increase feelings of elation (happiness) and euphoria while their low levels have been linked to feelings of depression or unhappiness

# THE CHAKRAS

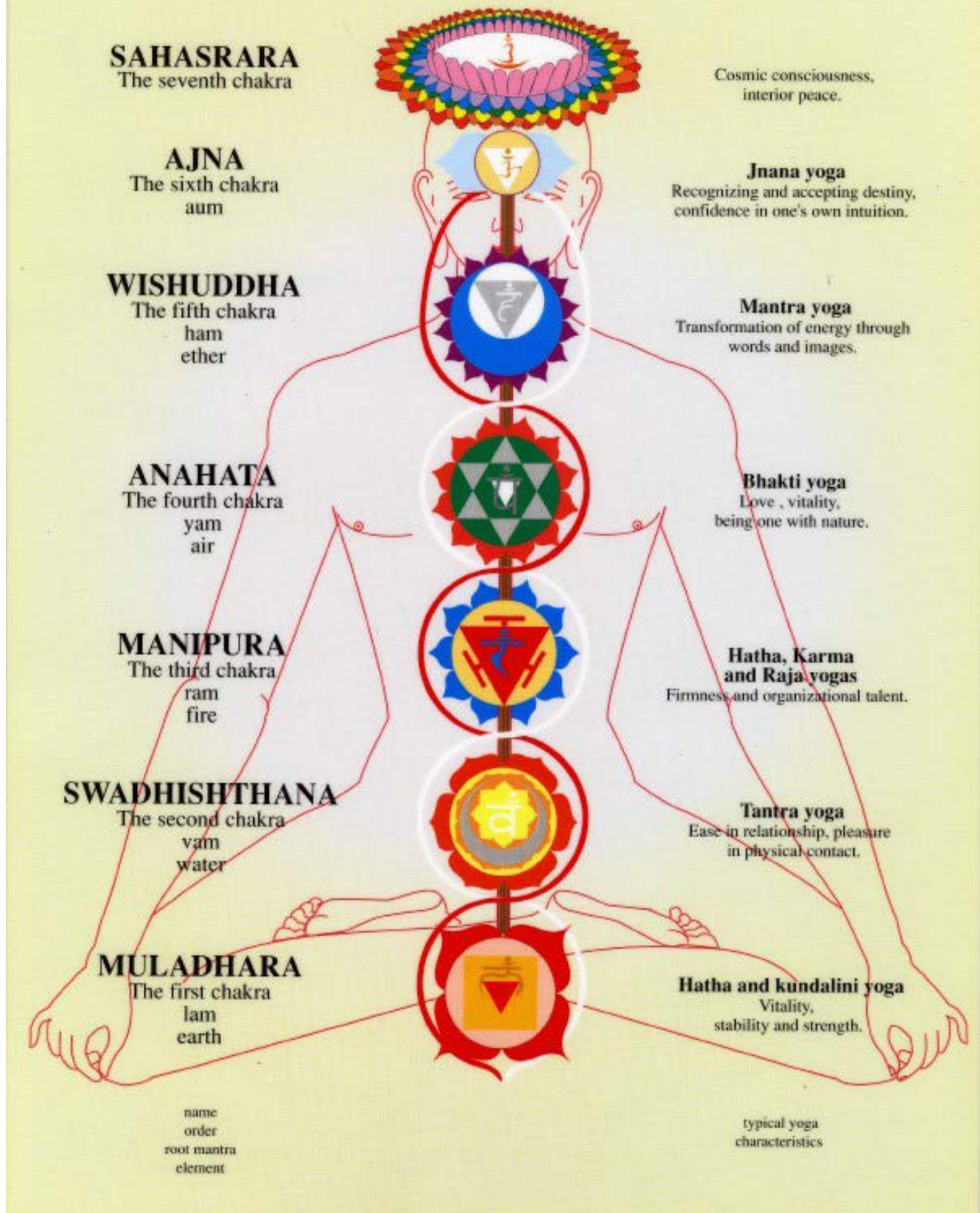


Fig. 3: The Chakras (fig. source: <http://www.yogawithayda.com/exploring-the-chakras/>)



Figure 13

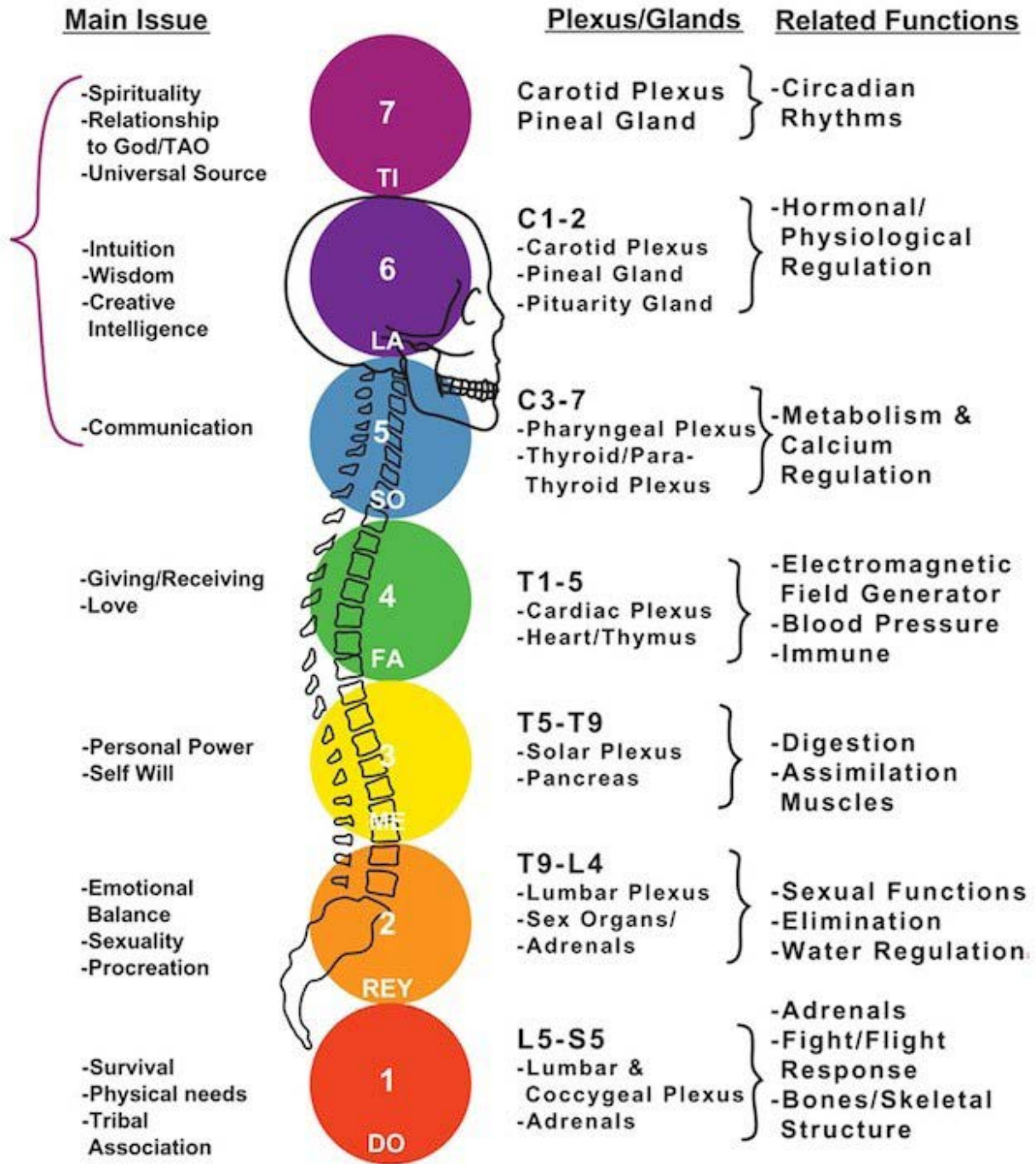


Fig. 4: The Energy System of the Body (fig. source: <https://www.paulcheksblog.com/chakra-balancing-made-easy/>)



(Dunavold 1997, Franken, 1994, Bagchi et. al., 2014, Psychology of Happiness). Strong euphoria results in deep, peace sleep with strong REM sleep (Bagchi and Somashekar 2014, Rossi & Rossi, 2015). Any complications or abnormal sleep may result in sleep disorders like migraine (Chiu et. al. 2005, Ohayon 2005, Roizenblatt et. al. 2012, McMahon 2004, Schlesinger 1964, Baetz and Toews 2009, Carr 2004, Steptoe et. al. 2005, Hölzel 2010). Thus it can be said that there is a biological component to happiness (Bagchi et. al. 2014, Somashekar, Bagchi et. al. 2014).

### **Kirtan**

Chanting and Kirtan is a unique way to be happy (Chant & Be Happy by Ac Bhaktivedanta Swami Prabhupada, 2006). Kirtan and chanting mantra in the Vedic sacrifice (yajna) is presented as a kind of drama, with its actors, its dialogues, its portion to be set to music, its interludes, and its climaxes which includes dancing with direct expression of bhavas (emotive states) by the singer (Varadpande 1990, Lal 2009, Brown 2012, Kaivalya 2014, Beck 1998, Luhrmann 2000). Many Kirtan performers are structured to hold the audience where they repeat the chant. Kirtan is the call and retort chanting of the sacred names (God & forms), drawn from the tradition Indian devotion. It is a part of the yoga of sound (naad yoga) in which through practice sound wave and energy is generated to attain absolute consciousness (Bagchi et. al. 2014). Kirtan is form of Yoga known as Bhakti (Bhakti yoga), or the Yoga of Devotion. It is great way to free & feel our own voice! Chanting mantras is widely accepted & performed in the West among people seeking grounded, inspiring and effective self-awareness practices. It is often noticed that, even when we are not experts in this particular language, culture or tradition, somehow chanting just works! Without even trying, we simply feel better when we chant together & feel more connected with each other and the world (satsang) (Uttal 2009, Bauer 2017, Belovin 2012).

Satsang (meaning, gathering as truth seekers in community), cultivates a remembrance of spirit and devotion as we all steer our paths through this feral world. A typical satsang involves singing, storytelling or readings from inspiring devotional books, usually just diving deep into silence or dialogues that explore and enliven our connection with Life and all its radiance (Liselotte 2002, Bauer 2017, Krishnamurti and Needleman 1971).

Kirtan and satsang are foundational practices on the path of Bhakti Yoga, the yoga of love and devotion. Often kirtan and satsang are impulsively united, each complementing and nourishing the other. Kirtan is a very simple, effortless, joyful & powerful way to meditate & gets connected the soul to the world of happiness. Sri Chaitanya Mahaprabhu appeared in India in 1486 and through his short span of life of only 48 years he distributed divine love and created practically a sensation through his "San-Kirtan" and revelation of spiritual consciousness. His movement

of spiritual (Krishna) consciousness has profoundly influenced the lives of millions even today. Sri Chaitanya preached his philosophy through the chanting of the holy name of the Lord, representing his sound incarnation and divine consciousness of Godhead. The ancient chants contain powerful renewing & transformative potential & energy that helps us reconnect with the Divinity that resides within all of us (the joy of reconnecting). Singing is the heart of kirtan, and no one cares what you sound like; and at a kirtan concert all voices merge together to become One Voice (Uttal 2009, Bauer 2017, Belovin 2012). True expression of realization of God or Supreme consciousness is again revealed here in India in the holy life of Sri Ramakrishna Paramahansa (1836-1886). He often remained in the exalted form of trance (Samadhi) for a long time. Also, it is recorded that trance known as "Nirvikalpa-Samadhi" being completely identified with the Absolute consciousness, when no sign of external consciousness was noticed in his physical body. Immediately after the demise of Sri Ramakrishna humanity at large is very blessed with the advent of Sri Anukul Chandra (1888-1969), popularly known as Sri Sri Thakur. In his early twenties overwhelmed with spontaneous divine love and sympathy for all, Sri Sri Thakur started propagation of holy name and love through "Kirtana". The elating power and impact of the divine atmosphere generated through group 'Kirtana' began to swell so much that a new sense of divine consciousness took hold of the whole environment, the intensity of the vibrations produced by the group dancing and singing was so tremendous that sometimes local animals would rush into the 'Kirtana' and even flying insects would knock into the exalted bodies as if they were light sources (Kar 2007).

[Kirtan at Satsang Ashram, Deoghar, Jharkhand, India: <https://youtu.be/eKG2Rh0D4qw>]

Unique Kirtan movement was followed by His Holiness Sri Sri Thakur Anukul Chandra where often he began to experience a unique kind of 'Nirvikalpa samadhi' and used to utter messages in that state of trance. As a sample, a portion of his holy message is quoted below:

"Sound is the expression of life. Without sound, everything is lifeless" – 63

"Name and love can own everyone! Love can gain everything in this world! Love can gain I and love can gain you and everyone will be loved! Love and name can conquer I, can own I, therefore, love and name can conquer the universe! Because universe is I. declare name and love give heart to heart and own heart. Love is heaven and heaven is love.. Leave everything and come to me, I will give you everything!"


"Your heart is the store of uncommon power, because you are God, because I am God. There is a great similarity in God of every religion."

(Punya-Punthi 1917).


# DOPAMINE

Dopamine motivates you to take action toward your goals, desires, and needs, and gives you a surge of reinforcing pleasure when achieving them.


Procrastination, self-doubt, and lack of enthusiasm are linked with low levels of dopamine.



Break big goals down into little pieces so you can create a series of little finish-lines which releases dopamine.



Create new goals before achieving your current one. That ensures a consistent pattern for experiencing dopamine.



# OXYTOCIN

The release of oxytocin creates intimacy, trust, and strengthens relationships.

It's released by men and women during orgasm, and by mothers during childbirth and breastfeeding.



Often referred to as "the cuddle hormone," a simple way to keep oxytocin flowing is to give someone a hug.



Giving someone a gift will also cause their oxytocin levels rise.



# SEROTONIN

Serotonin flows when you feel significant or important.

Loneliness and depression are present when serotonin is absent.



Gratitude practices can help you remind that you're valued and significant.




Although too much ultraviolet light isn't good, some daily sun exposure is healthy for boosting your serotonin levels.




# ENDORPHINS

Endorphins are released in response to acute pain and stress, to help alleviate anxiety and depression.

The surging "second wind" and euphoric "runners high" when running are a result of endorphins.



Along with exercise, laughter is one of the easiest ways to induce endorphin release.



Keep some scented oils and dark chocolate at your desk for a quick endorphin boost.




Fig. 5: The Neurotransmitters of Happiness  
 (source: <http://theutopianlife.com/2014/10/14/hacking-into-your-happy-chemicals-dopamine-serotonin-endorphins-oxytocin/>)



Buddhism too embraced Kirtan. Buddhism version of Kirtan is monastic chanting of the canonical literature, particularly in the ritualistic Vajrayana and other Mahayana traditions. Chants, kirtan and plays about the Lord Buddha's life by the Buddhists of Bengal and adjacent parts were called Buddha-samkirtan (Beck 1998, Chaudhuri 1982). Out Back Yoga, Chanting & Meditation invites us to come and relax, rejuvenate and find harmony within ourself and the world by experiencing the joy and serenity.

Yoga and meditation techniques are now widely accepted globally for the management of different mental stress related ailments (psychosomatic diseases) including anxiety neurosis, hypertension and developing positive mental attitude controlling negative emotions obsessed with various complexes (Rossi and Rossi, 2015). Decades of researchers have established that meditation (transcendental) brings about a unique 'hypo metabolic physiological wakeful state' with overall signs of psycho physiological relaxation. 'Vipasana' type of meditation taught by Gautam Buddha purified mind overcoming different negative attitudes, anger, hatred, greed, selfishness largely through self-observation (identifying causes), introspection and generative love and compassion (Kar 2007).

The most widely studied neurotransmitters involved in happiness are serotonin, dopamine glutamate and norepinephrine (Kringelbach and Berridge 2010, Bergland 2012) (Fig. 5). However, the production of serotonin & dopamine has a genetic determinant and their mutations leads to neurological disorders like schizophrenia and migraine. In addition to the neurotransmitters, certain **hormones** also have the role in the mechanics of happiness. Among them, endorphin is a molecule secreted into the brain, blocking the transmission of painful stimuli (Tilan and Kitlinska 2010, Carter et. al. 2009, Bergland, 2012, Steptoe et. al. 2005, Hölzel et. al. 2010, Dfarhud et. al. 2014, Kringelbach and Berridge 2010).

### Happiness: Buddhism and Ayurvedic system of medicine

His Holiness Gautam Buddha (563-483 BC) earlier known as Prince Siddhartha, renounced all comforts and worldly pleasures of princely life (at the age of 29) for the extreme love of suffering humanity- to find the cause and remedies of their unbearable burden of sorrows and sufferings. After six years of strenuous spiritual practices and finally adopting middle path, he entered into deep meditation sitting alone under the 'Bodhi Tree' at Budh Gaya (currently in Bihar, India). Here he awoke into highest spiritual enlightenment and hence was regarded as 'Buddha' – enjoying the bliss of emancipation identifying with the source of eternal peace and bliss (Kar 2016).

Buddhism, a religion that has its origin in India and was founded in the sixth century BC, is a religion of Nature. It is a way of living nature. It suggests living a healthy life, by utilizing the natural resources. Buddhism insists the natural way of healthy life.

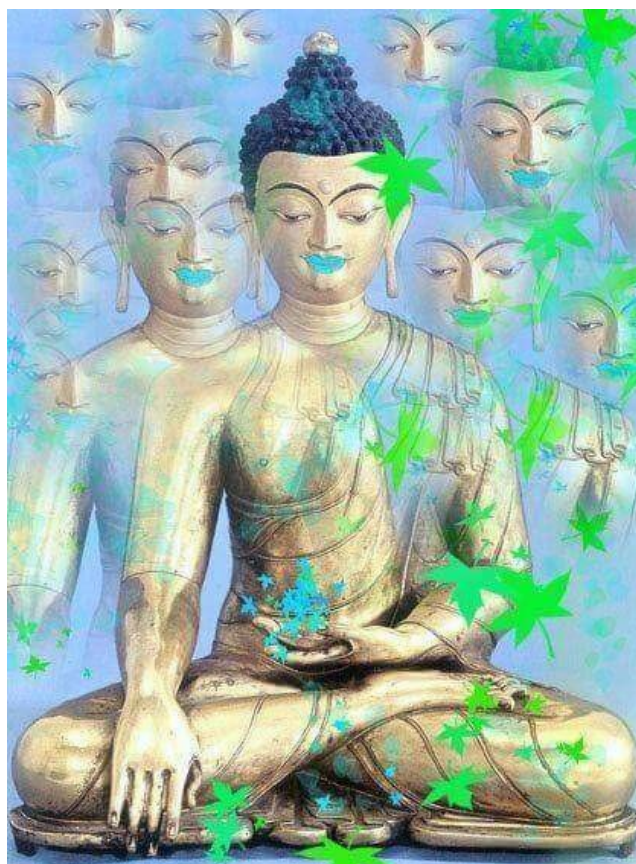


Fig. 6: Lord Buddha as Ayur-physician



Ayurveda, an ancient medicinal science of India which has its origin thousands of years ago, also teaches the way of life. In fact, the word "Ayurveda" literally means "the science of life" (Rossi, *et.al*, 2015). Buddhism had much interest in Ayurveda and was practised by the Buddhist monks to treat diseases. Lord Buddha and Buddhists treat Ayurveda as an enormous science of health & happiness that help to lead a healthy life (Fig. 6).

Early Ayurvedacharyas like Charaka, Sushruta defined diseases as disequilibrium of normal body functions (of the three Doshas- Vata, Pitta, and Kapha) and restoration of that equilibrium (homeostasis) as the prime objective of treatment. In Charaka Samhita (chapter IV, sharira sthana) it is surprising to note that a detailed account of the varieties of body-mind relations has been given, which not only tally with the modern psychology (psychosomatic factors) even it elaborates further. Charaka described, imbalance related to provoked 'Vata', 'Pita' and 'Kapha' invites complex pathogenic factors leading to disease in the physical body, which further aggravates the mental state and adverse conditions arising out of different passions and delusion. Charaka further emphasized: 'the wise man should control the evil impulses of the mind like greed, anger, vanity, grief, fear, jealousy, unusual attachment to material things (Kar 2007).

In one of the communications known as Girimananda Sutta, Lord Buddha talks about the causes of sickness and disorders as originating from an imbalance of bile, phlegm, wind, from conflict of the humours, from changes of weather, from adverse condition, from devices (practiced by others such as black magic, poisoning and so on), from the result of kamma (kamma-vipaka); cold, heat, hunger, thirst, excrement, and urine.

The Buddhist monks and scholars developed and spread the medical system of Ayurveda and propagated the system of medicine wherever the teaching of Lord Buddha flourished. It is not an embellishment to say that it is Buddhism that has enlightened the whole world along with the traditional knowledge of Ayurveda. Nagarjuna is regarded as a great luminary of this ancient medical system. He made several researches in the ancient system and could adapt them in his practice successfully. The research of Nagarjuna laid the practical foundation to introduce mineral-based medication, which are still followed in the medical world. As a great philosopher and psychologist, his psychological and philosophical contributions influence Ayurveda a lot and this enrichment is found in Ayurvedic Materia Medica (Chinese Buddhist Encyclopedia, easyayurveda, Buddhism and Medicine, vpaulose 2014)

Lord Buddha's main concern was human suffering ("Dukkha" in Pali) and how it could be eliminated to bring happiness. As per Lord Buddha, Dukkha means suffering, pain, sickness, unsatisfactoriness, imperfection and so on including all ills of the mind, the mental disorders and the body, the physical

disorders. Buddhism emphasizes the Noble Eightfold Path as preached by Lord Buddha. They are, Right understanding, Right thought, Right speech, Right action, Right livelihood, Right effort, Right mindfulness and Right concentration. In Buddhist countries one part of the Buddha's teaching has been cultivated with great devotion and used for remedial purpose by the followers which is the chanting of "Paritta". Paritta means conversations for protection and are certainly part of teaching of the Buddha himself. Most chants not only have high philosophical value, but also have a direct psychological effect. This Paritta chanting purifies the mental & physical state of the addressees especially of those who are suffering from physical and mental ailments. Paritta recitation and chant produces mental well-being in those who listen to them with surrendering confidence in the Dharma which is truth. Such a mental well being help patients to recover from their mental illness. Lord Buddha himself had paritta recited for him and had requested others to recite it for his disciples when they were ailing. Unless the ailment is caused as a result of one's own unskillful acts, it is possible to transform these mental states bringing about mental and physical healing. (Chinese Buddhist Encyclopedia, easyayurveda, Buddhism and Medicine, vpaulose 2014).

One day Ven. Angulimala came upon a woman in labour and was so moved by compassion for her that he asked the Buddha's advice. The Buddha told him to recite some Paritta verses for the woman to hear. When he did so, the woman immediately and painlessly delivered her child. Since then this verse has always been chanted near the time of labour. The Buddha exhorted his disciples to cultivate loving kindness (metta) towards listeners while reciting these sermons.

Some selected discourses of the Buddha are chanted for diverse reasons such as to recover from mental ailment, to avert danger, to ward off the influence of malignant beings, to obtain protection and deliverance from fear and evil and to promote welfare and well-being.

Buddhist meditation acts directly on the mind and has a considerable role to play in improving the mental states. Meditation is of two kinds, calming (samatha) and insight (vipassana). The samatha meditation calm the emotions, worries, tensions, anxieties and all which upset the balance of our mind. The Insight Meditation gives one the ability to see things objectively as they really are since it is a universal method of healing, transcending all boundaries of race, creed, colour and religion.

Buddhism maintains a "holistic" approach to life, the happiness. For Lord Buddha, the course to happiness begins from an understanding of the root causes of suffering (dukkha; abnormal regulations of neurotransmitters result in neurological disorders, dukkha). Buddhism pursues happiness by using knowledge and practice to achieve mental self-

control where mental self-control or peace of mind, is achieved by detaching oneself from the cycle of craving that produces dukkha. So by achieving a mental state where one can detach from all the passions, needs and wants of life, you free yourself and achieve a state of "moksha" (transcendent bliss and well-being) (Agid O et al., 2012).

All that we are is the result of what we have thought. It is founded on our thoughts. It is made up of our thoughts. If one speaks or acts with an evil thought, pain follows one, as the wheel follows the foot of the ox that draws the wagon.

All that we are is the result of what we have thought. It is founded on our thoughts. It is made up of our thoughts. If one speaks or acts with a pure thought, happiness follows one, like a shadow that never leaves. (Dhammapada 1-2 / Müller & Maguire, 2002.)

If by leaving a small pleasure one sees a great pleasure, let a wise person leave the small pleasure and look to the great. (Dhammapada 290 / Müller & Maguire, 2002.)

The disciples of Gautama are always well awake, and their minds day and night always delight in compassion. (Dhammapada 300 / Müller & Maguire, 2002.)

Never sink into weak pleasures and lust. Never surrender to carelessness; those who are watchful in deep contemplation reach in the end, the joy supreme (Dhammapada 27).

There is no fire like lust. There is no evil like hate. There is no pain like disharmony.... The hunger of passions is the greatest disease. Disharmony is the greatest sorrow. Health is the greatest possession. Contentment is the greatest treasure (Dhammapada 202-204).

But he whose mind is calm, self-control is free from lust of desires; who has risen above good and evil, he is awake and has no fear (Dhammapada 39).

## Conclusion

Happiness is a state of mental or emotional well-being which is characterized by positive or pleasant emotions oscillating from contentment to intense joy. Several present-day stress related complications disturb normal physiological equilibrium including normal homeostasis prevailing in human biological & central nervous system. The role of neurotransmitters like dopamine & serotonin etc. and certain hormones also have been explained in connection with the mechanism of happiness. Here also discussed our experimental studies using some ayurvedic medicinal plants and their effectiveness in the management of different neurodegenerative disorders leading to anxiety, depression and gross unhappiness. Further we have explained that neurological disorders cannot just be a chemical imbalance in the brain, rather, it is a disharmony of body, mind-brain, and spirit within the whole person and this disharmony includes a chemical imbalance in the brain as one of its elements. Here lies the importance of yoga, meditation, kirtan along with leading a regulatory life free from unusual desire, sensual pleasure (cause of dukkha) - as preached by ancient seers, ayurvedacharyas especially by Lord Buddha. Proper practice of Kirtan, Yoga and Ayurvedic system of medicine may ministerate or heal all neurological disorders and leads & guides the person from the illusionary world of dukkha to happiness.

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# BEYOND DIRAC: EXPLORING THE ROLE OF QUANTUM ELECTRODYNAMICS (QED) AND QUANTUM CHROMODYNAMICS (QCD) IN THE CONTINUING INTEGRATION OF QUANTUM PHYSICS AND MIND-BODY HYPNOTHERAPY IN THE TRANSFORMATION OF CONSCIOUSNESS WITHIN THE PROFESSIONAL IN THE TREATMENT OF RESISTANCE

BRUCE GREGORY

*Key words: Dirac, electron, photon, gluon, quark, yes sets, implied directive, creativity, opposites, uncertainty, frame of reference, Feynman, Gell-Mann, Consciousness.*

## **Abstract**

The roles of Quantum Electrodynamics (QED) and Quantum Chromodynamics (QCD) are explored in the context of the continuing integration of quantum physics with mind-body hypnotherapy in order to facilitate the expansion of consciousness, the expansion of trust and the feeling of empowerment within professionals treating resistance. The consciousness of the professional is considered the primary factor in focusing attention, as reflected by Erickson's interventions in the Erickson Resistance Protocol. The hypnotherapeutic concepts of yes sets, truisms, and indirect associative focusing are proposed as the core mechanisms for facilitating this integration. Frame of reference, creativity, and appreciation are discussed in terms of how the variables and concepts of quantum physics can be utilized in shifting the focus of attention. Overlaps with the Taoist practice of Tai Chi, and Tibetan Buddhist meditation processes are explored in the context of appreciating the variables of time, space, and momentum, and their effects on anxiety and trust.

## **Introduction**

When Quantum Mechanics was introduced almost a century ago, the wave function, introduced in the Schrodinger equation (see Figure 1 below), was one of its primary components (Crease, 2008, Gregory, 1988). As quantum mechanics evolved, the measurement problem surfaced. The measurement problem concerned how or whether the wave function collapsed (Penrose and Hameroff, 2011). According to the Copenhagen Interpretation, developed by Bohr and Heisenberg, the predominant perspective in quantum mechanics, it is the process of measurement that collapses the wave function. Until the act of measurement, which includes the consciousness of the observer, an electron could be in many positions at once (superposition), and the wave function represented the probability of the electron being in any one particular position (Crease, 2008, Greene, 1999, Gregory, 1988, Penrose and Hameroff, 2011). The implications of the measurement problem would surface as a core factor in the integration of quantum physics with mind-body hypnotherapy.





# Schrödinger Wave Equation

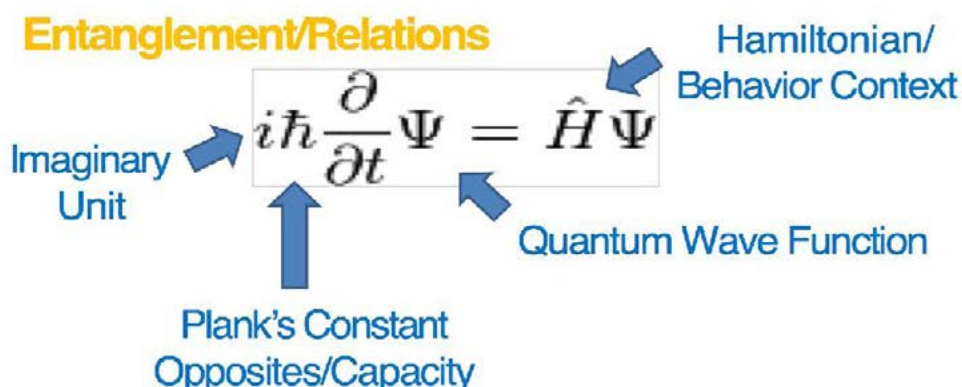


Figure 1. Schrodinger Equation en.wikipedia.org/wiki/Schrodinger\_equation, additions by Bruce Gregory.

The Integration of quantum physics with psychology has been explicitly evolving since the collaboration of Jung and Pauli (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
- Opposites regarding motion
- Yes sets
- Implied directive
- Sources of comfort
- Role of position

All of the above could be considered in terms of scale, subsets of consciousness, focus of attention, and activity dependent gene expression.

On an implicit level, however, the roots of the integration can be found a decade prior to Jung's theory of opposites (Jung, 1916), in the work of Poincare, the French physicist and mathematician responsible for the mathematical corrections to the Lorentz transformation, the cornerstone of Einstein's special relativity, and the Dirac Equation. Poincare identified the four stage creative process (Poincare,

1905, Rossi, 1996). The four stages were; data collection/ preparation, incubation, illumination, verification/ integration. The data collection/ preparation stage involved the permission to explore possibilities, utilizing mathematical reasoning processes of equivalence, correspondence, and substitution, complemented by creative visualization. The valuing of permission included the cognitive processes of reasoning, wondering, and experimenting. The utilization of possibilities was a core aspect of Erickson's indirect suggestion arsenal (Erickson, 1964, Erickson and Rossi, 1979). The second stage, incubation, involved a trust of the unconscious to explore creative problem solving strategies, predating Kandel and Squire's work, which would identify the resources within the hippocampus responsible for facilitating the Krebs cycle which initiated activity dependent gene expression (Kandel and Squire, 1999, Rossi, 2002).

Regarding the dynamics of unconscious work, Poincare in a chapter entitled "Mathematical Creation" from his book, *The Foundations of Science: Science and Hypothesis*, wrote:

"There is another remark to be made about the conditions of this unconscious work; it is possible, and of a certainty it is only fruitful, if it is on the one hand preceded and on the other hand followed by a period of conscious work (stages one and four). These sudden inspirations (stage 3) never happen except after some days of voluntary effort which has appeared absolutely fruitless, and whence nothing good seems to have come, where the way taken seems totally astray. These efforts then have not been as sterile as one thinks, they have set agoing the unconscious machinery (stage 2/incubation) and without them it would not have moved and would have produced nothing.

The subliminal self is in no way inferior to the conscious self; it is not purely automatic; it is capable of discernment; it has tact, delicacy; it knows how to choose, to divine. What do I say? It knows better how to divine than the conscious self, since it succeeds where that has failed." (Poincare, 1905, p. 390).

The parallels with this quote from Erickson's Resistance Protocol are striking;

"Now I don't really care if you listen to me with your conscious mind, because it doesn't understand your problem anyway, or you wouldn't be here, so I just want to talk to your unconscious mind because it's here and close enough to hear me, so you can let your conscious mind listen to the street noises or the plane's overhead or the typing in the next room. Or you can think about any thought that comes into your conscious mind, systematic thoughts, random thought because all I want to do is talk to your unconscious mind, and it will listen to me, because it is within hearing distance even if your conscious mind does get bored. Just be comfortable while I am talking to your unconscious mind, since I don't care what your conscious mind does (Erickson, 1958/1980, p. 302)."

In this quote Erickson demonstrated an appreciation of trust and dependency on the unconscious, the utilization of polarities, creative utilizations of permutations around the quantum theme of possibilities (superposition) to hold and contain attention, appreciation of the role of failure, and appreciation of the need for time through pacing. Not only was Erickson's intervention mirroring/ reflecting Poincare's main points, the quality of Erickson's consciousness dictated which variables he focused attention on. This may suggest that the quality of a professional's consciousness may correspond to the act of measurement which collapses the possibilities of the wave function. This occurs in the context of the abundant possibilities around which a professional will focus attention while treating resistance.

**Capra (Capra, 1975)** explored the parallels between 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)** implicitly 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 implicitly applied the Dirac equation on a psychological level and was also consistent with Tibetan Buddhist concepts (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 the appreciation of 'dreaming', which is synonymous with unconscious processing. His utilization of mathematics was consistent with Erickson's learning set inductions and Tulku's truisms regarding space and time which facilitated unconscious processes for problem solving and healing (Erickson, Rossi, and Rossi, 1976, Erickson and Rossi, 1979, Tulku, 1979). This 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). Mindell utilized the process of counting to illustrate the power and implications of choices, highlighting how choice valued one direction of focus while minimizing or shifting other possibilities of focus to the background. 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 nonlocality which reflected quantum states of interconnectedness. The dynamic of nonlocality was a consistent theme in other work exploring the integration of quantum physics and Tibetan Buddhism (Mansfield, 2008, Richard and Thuan, 2004) and is reflected by Kafatos' et. al. statement: 'the interconnectedness of everything is particularly evident in the non-local interactions of the quantum universe' (Kafatos, et. al., 2011, p.1120). Goswamy's efforts were consistent with the work of Erickson and Rossi, which focused on the exploration, accessing, connecting and trusting of resources (Erickson and Rossi, 1979).

**Rossi (Rossi, 1986, 1996, 2002)**, highlighted an integrated top down/ bottoms up approach, integrating molecular biology, chronobiology and neuroscience with psychology, that laid the foundation for further integration of psychology and quantum physics. This approach identified the unconscious physiological processes that processed signals and experiences through vast networks of resources that served as sources of comfort, strategies for creative problem solving and activity dependent gene expression, which ultimately reflected a transformation of consciousness. The hypothalamus, hippocampus, messenger molecules, the various RNAs, and mirror neurons are examples of some of these vast resources (Clayton, 2013, Culler, et. al.,

2010, Rizzolatti & Sinigaglia, 2008, Rossi, 1986, 2002). The capacities of these resources are accompanied by significant implications in the treatment of safety abandonment and connection issues, which are all components of the containment and transformation of resistance. The primary implications in this area are the need for depth, capacity for depth, and need for connections or bridges for the facilitation of depth, all components of the enhancement of safety and trust. These implications may support curiosity and exploration around what resources support this depth, and what resources symbolize the capacity for depth. Trusting and utilizing these resources to creatively focus attention can function as a bridge to connecting to and utilizing the quantum perspective in treatment when yes sets are established for electrons, and other fundamental particles, like photons, gluons, and quarks. Subsets of resources for connection are valuable, given that one of the primary areas for the convergence of psychology and quantum physics is the implication and applicability of the quantum dynamic of entanglement (Goswamy, 2015, Gregory, 2015, Mindell, 2000).

Rossi's recognition of the vast physiological networks driving and sustaining unconscious processes included an appreciation of sensory-receptors at three major levels of depth: ears, eyes and skin, the lipid membrane on the cell wall, and RNA in the nucleus of the cell (Loewenstein, 1999, Rossi and Rossi, 2011).

These recognitions contained a series of implications (Erickson and Rossi, 1979), that when appreciated, and developed through the realization of yes sets with the various physiological resources, could be applied to creatively focus attention according to the novelty, numinosum, neurogenesis effect (Culler, et. al., 2011, Gregory, 2010, Matthews and Butler, 2011, Rank, 1941, Rossi, 2002). In addition, these recognitions provided the foundation for expanding trust within the professional once yes sets were established for the physiological resources, and symbolic metaphors of depth that contained further implications regarding safety and trust (Erickson and Rossi, 1979, Kroger, 2008). The appreciation of the need for novelty, and the resources for responding to it could be found in the integration of the implications of opposites, with set theory, and advances in neuroscience (Dunham, 1991, Erickson and Rossi, 1979, Gregory, 2015, Squire and Kandel, 1999). The implications of the network of physiological resources, which are consistent with Tai Chi and Tibetan Buddhist meditation practice (Gregory, 2012, Horwood, 2007, Tulku, 1979, Yang, 1981) included;

- *Capacity to receive*
- *Value of receiving*
- *Implications of receiving in terms of trust and safety*
- *Capacity and value of opening*
- *Being implications of opening*

- *Implications of center of being in terms of balance/harmony*
- *Connections to, and valuing of connection to the center*

**Rossi and Rossi (2015, 2016)** 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's valuing of probability, expectancy, the wave nature of quantum dynamics, and fields could be seen as the identification of additional subsets of sources of comfort, problem solving and gene expression that could provide new/novel frames of reference for creatively focusing attention, following the establishment of internal yes sets within the professional. These frames of references may correspond to or be analogous to the frames of reference used in Tai Chi or Tibetan Buddhist meditation practice (Dunham, 1991, Gregory, 2011, 2015, 2016).

### **Erickson Resistance Protocol**

The Erickson Resistance Protocol (Erickson, 1964) was designed to serve as a template for the treatment and transformation of resistance, which is a subset of human consciousness, an opposite of receptivity, and a reflection of being out of balance when unhealthy. The protocol recognized and appreciated nature's consciousness in developing mind-gene algorithms for the transformation of consciousness. Simultaneously the protocol validated the role of quantum variables, time, space, motion, position, and momentum, in the transformation of consciousness, similar to the Dirac and Heisenberg equations that provided validation of the role of momentum. Erickson's consciousness allowed him to treat 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. He did this through his mathematical appreciation of the need for validation and the role of failure (Poincare, 1905). This corresponded to the peng, lu, 'an' sequence in Tai Chi push hands, and the redirecting attention toward time and space in Tibetan Buddhist meditation exercises (Tulku, 1979, Yang, 1996). The peng component corresponded to validation, the 'lu' component to the redirecting of attention and the 'an' component to the holding of attention once redirected. The redirecting and holding of attention signified that the resistance had been transformed, which implicitly served as a foundation for deepening trust intrapersonally and interpersonally on multiple levels. Simultaneously, Erickson would appreciate the patient's needs for time. Sometimes he would utilize time explicitly



by commenting on the timing of insight, surprises, integration, and the pacing of possibilities, 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 different genes (Rossi, 1992, 1996, 2002). The practice of Tai Chi and Tibetan Buddhist meditation also incorporate a fundamental appreciation of time.

**The stages of the protocol are identified in Figure 2 below.**

In addition, the protocol implied the need for a sufficient level and type of therapeutic consciousness to appreciate the role of quantum variables (Gregory, 2011). The primary aspects of therapeutic consciousness employed were an appreciation of appreciation which determined what variables were utilized, an appreciation of creativity, trust, the role of opposites, the role and dynamics surrounding attention, needs of patients in the context of their uncertainties surrounding the transformation of their anxieties, and the quantum variables of momentum, position, time, space, and motion. Erickson's deep appreciation of the dynamics and variables in the getting, holding and redirecting of attention corresponded to the quantum processes of Tai Chi and classical music composition theory (Gregory, 2012, Levitin, 2007, Man Ch'ing, 1985).

Erickson demonstrated that the consciousness of the therapist could correspond to the measurement component in quantum mechanics that was responsible for collapsing the wave function. The wave function in the transformation of consciousness can be understood as the vast possibilities around which attention can be focused. In mathematical terms, Erickson's consciousness functioned as a vector, by providing the frame of reference for focusing attention (Einstein, 1955, Farmelo, 2009, Greene, 1999). His level of consciousness, which represented

a highly evolved consciousness of appreciation, allowed him to implicitly integrate quantum and mathematical consciousness in creatively permuting various aspects of trust, appreciation, creativity and validation in the focusing and directing of attention. The core guiding principles of this process were the trust and appreciation of opposites, and the appreciation of uncertainty, fundamental aspects of both the consciousness of group theory and quantum physics.

The two primary sets of opposites Erickson utilized were conscious/ unconscious and knowing/ not knowing. In his treatment of the containment and transformation of resistance, Erickson utilized validation, truisms, the appreciation of possibilities, yes sets, indirect associative focusing and multi-embedded metaphor to focus attention and facilitate unconscious processes. Once the validation had contained the momentum of the resistance, the patient naturally shifted to an open, receptive, being state that carried a series of implications, that could be utilized to focus attention from a variety of frames of reference related to openness, being, trust, and safety. (Abbott, 1885, Erickson, Rossi, and Rossi, 1976, Erickson and Rossi, 1979, Lankton and Lankton, 1983). These implications included;

- *Capacity for receiving*
- *Temporal component for receiving*
- *Connections/bridges for valuing receiving*
- *Receiving implies capacity for opening, trusting and allowing*
- *Abundance of resources supporting trusting and expanding trust*
- *Containment provided by professional's consciousness*
- *Bridges/connections for depth*
- *Utilization of opposites facilitates transformation*
- *Receiving implies being has value, and has a center*

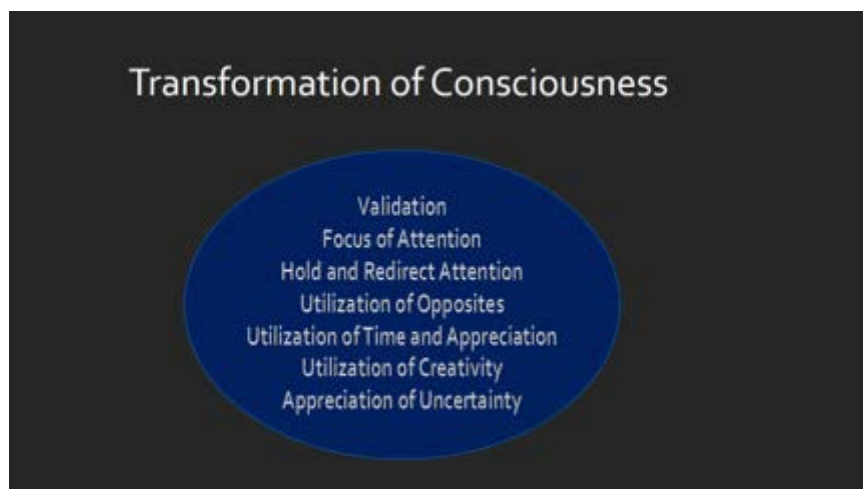


Figure 2. Summary Outline of the stages of the Erickson Resistance Protocol by Bruce Gregory. © 2017

The aspect of Erickson's evolved appreciation that most paralleled the principles of Tai Chi and Tibetan Buddhist meditation theory and practice was his appreciation of dependency. Tibetan Buddhist meditation theory and practice is oriented around the core principle of dependent origination, which advocates a fundamental reorganization spatially and temporally that ultimately shifts the self's experience out of the center, replacing it with an interplay of time, space and consciousness (Garfield, 1994, Han, T.N., 1999, Kafatos et. al, 2011, Tulku, 1979). The Taoist practice of Tai Chi utilizes the appreciation of dependencies with its focus on subsets of the centering process (Gregory, 2012, Horwood, 2002, Man Chi'ing, 1985, Yang, 1996).

The value of the integration of QED and QCD with mind-body hypnotherapy may be found in the application of set theory (Dunham, 1991), and the implied directive (Erickson and Rossi, 1979). When combined logically, they point like a vector, asking: what are the deeper sources, resources for strengthening the connections to the core? What are the deeper sources, resources supporting opening? What are the resources that support opening to being and the integrated valuing of being? What are the resources for receiving the comfort from being connected to being states as opposed to only valuing doing?. The above may occur in the context of manifesting the metaphorical promises of quantum entanglement, the capacity for connection, which is further reinforced by the Dirac equation which connects space and time (Farmelo, 2009, Rossi, 2002, Tulku, 1979).

### **Dirac Equation and its Applications**

The Dirac equation was discovered in 1928 by Paul Dirac (Farmelo, 2009, Wilzneck, 2004), one of the founders of quantum mechanics, along with Schrodinger, Heisenberg and Pauli. The equation, found below in Figure 3, integrated quantum mechanics with special relativity, and inaugurated quantum field theory and quantum electrodynamics.

In developing the equation, Dirac was looking for a description of the behaviour of the electron, one of the deeper sources of comfort and representative of the capacity for connection, that had more breathe and depth than the Schrodinger equation. Intuitively and inadvertently following Poincare's direction, Dirac noted: "A great deal of my work is just playing with equations and seeing what they give (Crease, R. & Mann, C, 1996, p. 76)." The equation predicted antimatter, which was proved in Anderson's discovery of the positron (Anderson, 1932, Gregory, 1988). It ended up describing a way for atoms to become bursts of light. This is represented by the equations for the creation and destruction operators regarding electrons and positrons, which are the mathematical validation for the capacity for creativity operating at the subatomic level. The equations are shown in Figure 4 below.

The Dirac equation further validated the work Pauli had done on spin, a core component of the electron, whose applications can be found in MRIs, lasers and PET scans (Wilzneck, 2004). This provided more implications that could be utilized for;

- *Introducing novelty*
- *A deeper exploration of capacity*
- *A deeper connection to the core self*
- *Deeper states of being*

Finally, the equation revealed the existence of the quantum field, from which electrons were created, thus providing another, deeper subset of the sources of comfort that could be utilized to introduce novelty and focus attention, facilitating unconscious processing and activity dependent gene expression.

Applications of Dirac's work include:

- *Validation of momentum, supporting trusting of validation of resistance.*
- *Mathematical validation of creation/destruction capacity, supporting utilization of creativity and recognition of destructive/transformational effectiveness.*
- *Further validation and valuing of connection of space/time, implicitly supporting exploration of subsets of connection, leading to safety, trust, and empowerment.*
- *Utilization of fields to introduce novelty, expanding possibilities for exploring subsets of sources of comfort.*
- *Further validation of value of frame of reference, supporting trust of reframing.*
- *Further appreciation of time, as potential sources of comfort.*
- *Deepening of valuing of opposites(electrons/positrons).*

### **Quantum Electrodynamics**

Founded by Dirac, it took almost forty years to be fully accepted, due to a number of lingering problems, the primary one being related to infinities, that were resolved by the process of renormalization. Feynman (Feynman, 1985, Gregory, 1988, Wilczek, 2004) played a key role in helping develop the concept of renormalization, which was basically a redefinition of mass and charge. Metaphorically adopting an approach consistent with Poincare's strategy in stage one of the four stage creative process (Poincare, 1905, Rossi, 1996), and Erickson's appreciation and utilization of possibilities (Erickson, 1964, Erickson and Rossi, 1979), Feynman considered the possible paths an electron could take. In addition, he recognized the value of considering probabilities, similar to the valuing of probabilities in the wave function (Crease, 2008) and Bayesian probabilities (Rossi and Rossi, 2016). Closely related to Hamilton's principle of least action, it implied consciousness on the part of the electron, like in the double slit



## Dirac Equation & Psychotherapy

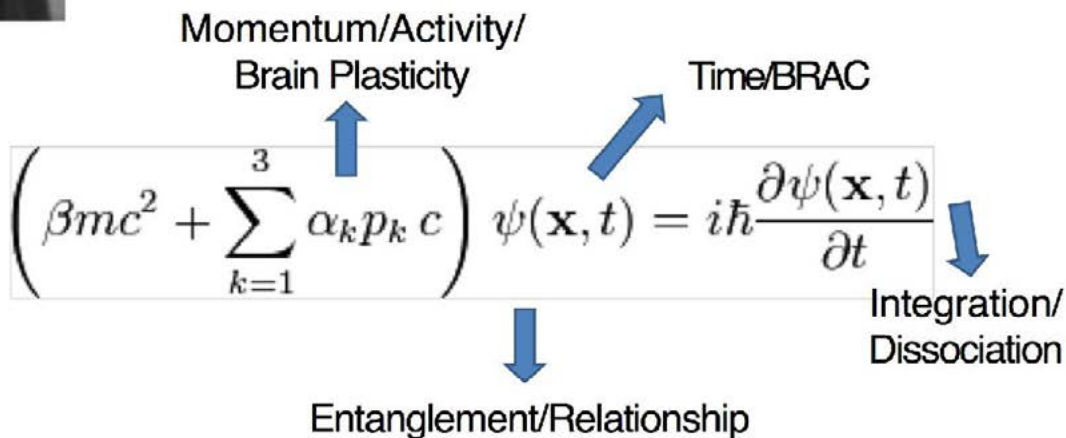


Figure 3. en.wikipedia.org/wiki/Dirac\_equation 8/12/14, additions by Bruce Gregory, Ph.D.



## Dirac Quantum Equation for Creation & Destruction

$$a_k = \frac{1}{\sqrt{2\hbar\omega_k}} (\omega_k \phi_k + i\pi_k), \quad a_k^\dagger = \frac{1}{\sqrt{2\hbar\omega_k}} (\omega_k \phi_k^\dagger - i\pi_k^\dagger),$$



Figure 4. Dirac Equation for Creation and Destruction Operators. en.wikipedia.org/wiki/Creation\_and\_annihilation\_operators

experiment, and lead to useful predictions of experimental results, that validated the theory of QED. These useful predictions contained further implications with regard to the value of continuing to develop yes sets for the electron that could be utilized to focus attention through the utilization of truisms (axioms), opposites, pacing, and indirect associative focusing.

Feynman went further in exploring the interactions between electrons and photons (matter and light). He reduced QED to three basic processes;

- A photon can go from one place to another.
  - An electron can go from one place to another.
  - An electron can emit or absorb a photon.
- (Feynman, 1985).

These actions occur in the context of the motion of an electron with respect to its orbit.

When an electron absorbs a photon it jumps to a higher orbit, and when it emits a photon, it drops to a lower orbit. All of which can support the facilitation of deeper connections to resources, subsets of sources



of comfort, in this case the field, which the photon is considered an excitation, and to light.

**Wilczek, (Wilczek, 2008)** a Nobel Prize winner for his work with aspects of the strong nuclear force concerning the influence of quarks at short distances, both appreciated the implications of the Dirac equation (Wilczek, 2004) and developed the connection between light and matter further. He explored the relationship between mass, and the fundamental particles which have no mass, by considering mass as the embodied energy of fundamental particles. This may be applied in ways similar to Rossi's identification of the mind-body connection (Rossi, 1986), Erickson's connecting of the conscious and unconscious minds (Erickson, 1964, Erickson and Rossi, 1979), Rossi's appreciation of novelty (Rossi, 2002), and the connections between space and time in the Lorentz transformation (Farmelo, 2009, Isaacson, 2006), and the dynamic of the connections of quantum entanglement (Goswamy, 2003, 2015, Gregory, 2015). These applications may be dependent on the appreciation of integrating set theory (Dunham, 1991), and yes sets (Erickson and Rossi, 1979) to develop subsets of connection.

These subsets of connection, which support the enhancement of deeper trust and capacity/empowerment, are representations of the resources of the unconscious, identified by Rossi (Rossi, 1986, 2002) as the physiological resources operating at different levels of depth. They were implicitly identified by Erickson in his discussion with Rossi about the need to build bridges for the patient in a deep trance, and expressed by the statement:

'That is why I build bridges' (Erickson and Rossi, 1979, p. 177).

A progression of these subsets is illustrated in Figure 5 and 6 below. These subsets are applications of the connections mathematically validated by the Dirac Equation that are;

- *Connection of quantum mechanics and special relativity.*
- *Connection of space and time through Lorentz transformation.*
- *Connection between space and time with light through the Lorentz transformation.*

### **Quantum Chromodynamics**

Additional subsets of connection and comfort can be found within Quantum Chromodynamics, the fundamental theory of the strong nuclear force, which was developed by Gell-Mann, Wilczek, Gross, Politzer and others. Quantum Chromodynamics is the study of the particles and the interactions that mediate the strong nuclear force within the nucleus of the atom, around which the electron orbits (Gell-Mann, 1994, Wilczek, 2004, 2008). The fundamental particles operating within the nucleus of the atom that support protons and neutrons, are the gluons and quarks, which can be considered from a set

theory perspective, along with protons and neutrons, as subsets of resources at the center or core.

There are six types of quarks, and eight types of gluons, Gluons are the exchange particles for the color force for quarks; they respond to 'color' charges, similar to how photons respond to electrical charges. The color force involves the exchange of gluons. Some gluons mediate transitions between one color and another. Gluons glue quarks together, quarks combine to form protons and neutrons. Quarks are the only fundamental particle to carry all four of the forces, which from a metaphorical perspective, place them in a unique position as a subset of connection, the basic premise behind the Ericksonian approach, which began with a connection to, and trust of the unconscious (Erickson and Rossi, 1979, 1982, Rosen, 1982). They, like electrons, photons, and gluons, represent levels of depth, which imply safety and the capacity to recognize and receive information sensitive to needs.

The potential psychological value in terms of mind-body hypnotherapy for these particles and interactions is that they represent a complement to electrons and photons, as subsets of the sources for comfort, and metaphors for depth and safety. They help support the development of yes sets for the atom, which can facilitate more connection to one's center, core components of both Tai Chi and Tibetan Buddhist meditation practice.

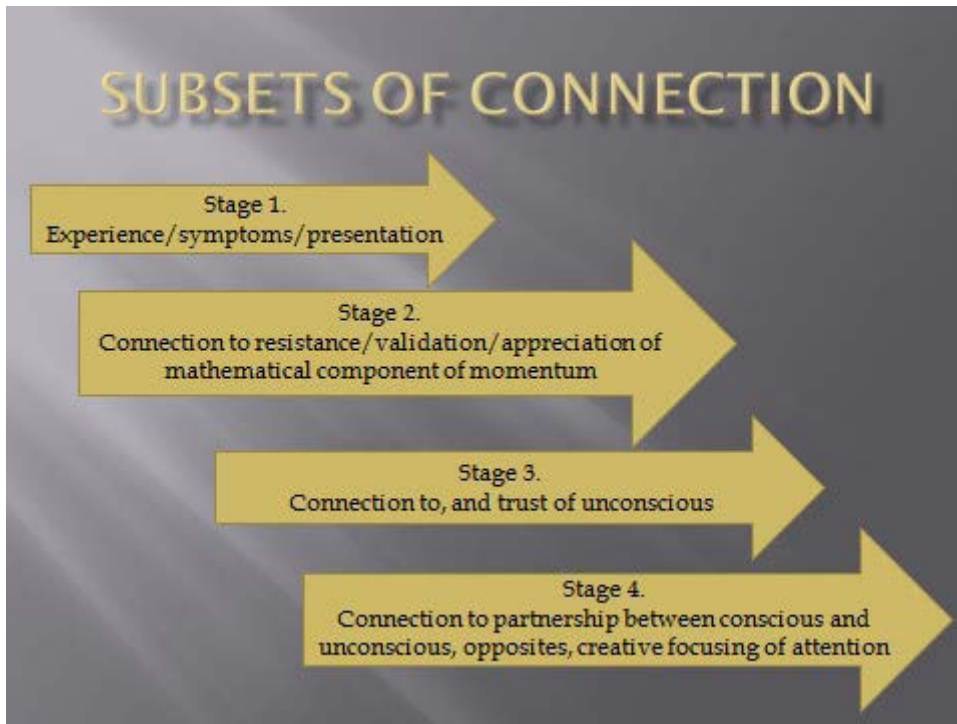
When the implied directive and set theory are combined, it can raise the question of: What kinds of comfort are available at this level of depth, below the molecular level?"

These particles are, in addition, representations and metaphors for:

- *Deeper resources*
- *Bridge to connect to one's center*
- *Subsets of centering*
- *Deeper level of being*
- *Additional bridge to the four forces*
- *Supporting the facilitation of yes sets for the forces*

By orienting attention to the resources of the center or core, which is consistent with the Ericksonian approach of orienting toward resources, the Tibetan Buddhist approach of deconstructing the focus of the subject/object dichotomy, and the Taoist approach of shifting attention from the hands to the feet, hips, and tantien, the sense of connection can be enhanced, while reducing anxiety. This may stimulate more possibilities about connection, which can reduce feelings of anxiety, isolation and alienation (Gregory, 2012, 2015).

Developing new connections with one's center, and thereby being more balanced, can be considered an example of activity dependent gene expression in the context of actualizing progressive states of harmony. This harmony, with the unconscious, time, space, and creativity, can facilitate deeper receptivity, which is an expression of being and opening,

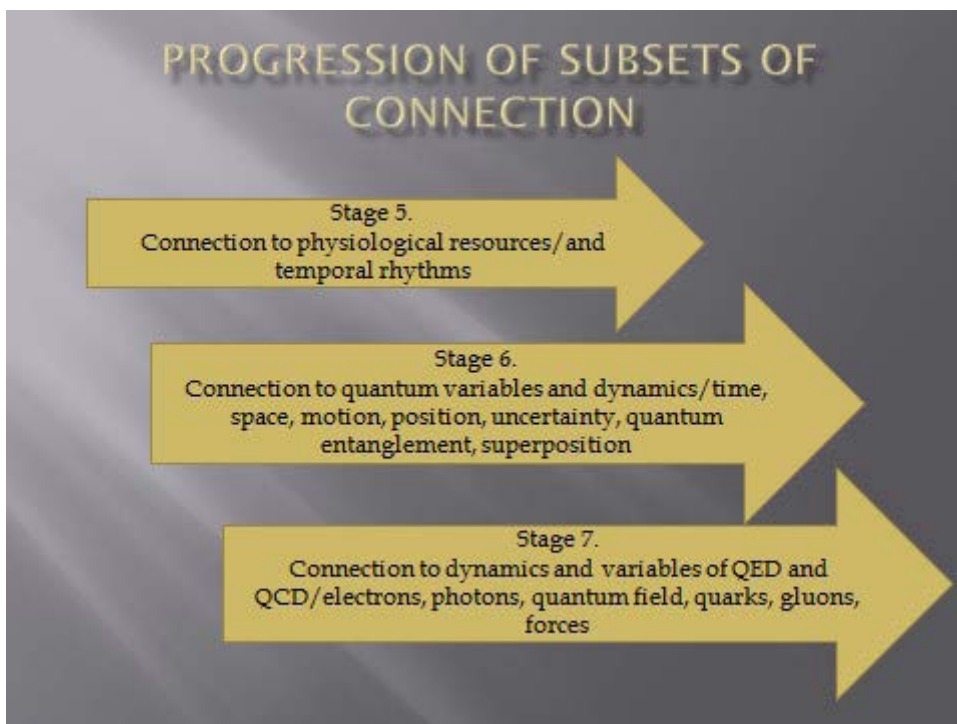


*Figure 5. Subset of Connection by Bruce Gregory, Ph.D. © 2017*

Receptivity implies more permission to be, and more safety with respect to opening. (Rossi, 1996, 2002, Tulku, 1979, Yang, 1996)

The six major stages in the evolution of quantum physics are summarized in Figure 7. They may be, from a mathematical perspective, compared to, and correspond to some of the stages of evolution,

that included the molecular biological advances in modular construction of proteins, the electron transfer sequence in the ATP cycle, and the sequences for long term memory potentiation in the hippocampus (Alberts, et. al, 2014, Loewenstein, 1999, Squire and Kandel, 1999). They can also be put into a correspondence with the evolution of mind-



*Figure 6. Progression of Subsets of Connection by Bruce Gregory, Ph.D. © 2017*

body hypnotherapy, the practice of Tai Chi, and Tibetan Buddhist meditation practice in terms of;

- *Expansion of depth*
- *Enhancement of trust*
- *Enhancement of connectivity*
- *Appreciation of time*
- *Appreciation of dependency*

Thinking and orienting in terms of stages, which are connections over time, and correspondences, which support a sense of structure, creative vision, and order, can reduce anxiety and pressure, enhancing trust in creatively focusing attention.

(Dunham, 1991, Rossi, 1986, 1992, 1996, 2002, Tulku, 1979, Yang, 1996).

Figure 7. Summary of Stages of Evolution of Quantum Physics

- *Stage 1: Exploration of light; black box radiation experiment, Planck's constant; Einstein's identification of light as a particle; work with the photoelectric effect and discrete values; Bohr's identification of some of the workings of the atom.*
- *Stages 2: Introduction of Quantum Mechanics; Schrodinger and Heisenberg equations with wave and particle/ matrix mechanics perspectives; Pauli exclusion principle.*
- *Stage 3: Dirac Equation integrating quantum mechanics and special relativity, utilizing Lorentz transformation; inauguration of quantum field theory, and quantum electrodynamics.*
- *Stage 4: Development of QED by Feynman, Dyson and others. Discovery of positron by Andersen; resolution of infinity problem with renormalization.*
- *Stage 5: Development of QCD by Gell-Mann and others.*
- *Stage 6: Consolidation of electroweak theory by Weinberg and Salam.*

(Farmelo, 2009, Feynman, 1985, Gell-Mann, 1994, Greene, 1999, TCM, 1996, Weinberg, 1992).

The discoveries of knowledge accumulated in these stages are reflected in mathematical equations that provide descriptions of processes of nature that are validated by experiments.

The equations themselves represent descriptions of axioms/truisms of healthy, harmonic dependency relationships that can be utilized through yes sets, an appreciation of truisms/axioms, pacing, creativity and indirect associative focusing, to facilitate unconscious processes leading to activity dependent gene expression and neurogenesis. These processes include deeper connections to inner resources and to nature. This deeper connection to resources, as the result of the transformation of resistance, facilitates expanded trust within the professional and the patient (Erickson and Rossi, 1979, Gregory, 2011, 2015, Rosen, 1982, Rossi, 1986, 1996, 2002).

The primary considerations of the overlaps between quantum physics, tai chi, Tibetan Buddhist mediation practice, and mind-body hypnotherapy are reflected by the consciousness of Erickson (Erickson and Rossi, 1979, 1982). These are the recognition of the value of yes sets, the utilization and appreciation of learning sets, the implied directive, pacing, utilization of opposites and indirect associative processes in the focusing of attention. It is the recognition of the value of receiving, an expression of being, and the consequence of receptivity, a subset of opening and openness. This supports the redirecting of the focus of attention toward the sources and depth of sources of what is being received. This includes the unconscious choices for the packaging and delivery of the contents of the flows of information and comfort (Erickson, 1964, Man Ch'ing, 1985, Rossi, 1986, 2002, Tulku, 1979). In the context of this article, the resources operating at greater depths, as subsets of the center of being within the unconscious, are the particles and principles of QED and QCD. By including QED and QCD, the professional's choices for creatively focusing attention can be expanded. This may correspond to the Tibetan Buddhist Meditation principle of opening the focal setting (Tulku, 1979).

### Summary

The roles of QED and QCD are explored in the context of expanding yes sets within professionals treating resistance and transforming consciousness with respect to expanding trust in containment, focusing attention and facilitating unconscious healing processes. Principles, processes, and variables of QED and QCD can be applied through an integration of set theory and the implied directive. Primary yes sets explored from QED and QCD were; the relationship between electrons and photons (light and matter), the subset of opposites/ electron and positron, QCD resources, and the validation of the time/space connection from Lorentz transformation. The appreciation and application of yes sets for receiving, opening, being, and dependency were discussed in terms of overlaps with Tai Chi and Tibetan Buddhist meditation practice.



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# BIODYNAMIC SELF-REGULATION DEMONSTRATED THROUGH CLINICAL BIOFEEDBACK

ERIKA CHOVANEC

**Abstract:** This article introduces an approach that utilizes natural body reactions and symptoms that occur during allostasis as the bases for identifying self-regulated processes during psychotherapy and achieving homeostasis. A connection is drawn between the ultradian rhythm as a profile of the 4-stage creative cycle and the self-organization processes at biochemical, physiological, and psychological levels. Examples of self-regulating physiological reactions observable with biofeedback during naturalistic therapeutic hypnosis are described. It is proposed that spontaneous body reactions (e.g., trembling, muscle contraction, tension) are associated with electrochemical activation, resulting in a natural “contrast state” during naturalistic therapeutic hypnosis. Measurements of the electrodynamic field correlates of Milton H. Erickson’s naturalistic therapeutic hypnosis are consistent with recent clinical recordings made with the biofeedback.

**Key words:** *ultradian rhythm, 4-stage creative cycle, biofeedback, psychophysiology*

## Introduction

This article introduces a systematic approach to understanding the self-regulating dynamics that occur within an individual during a psychotherapeutic intervention. The approach focuses on the relationships between the different levels of self-organization within a complex system, namely, the biological, chemical, physiological, and psychological domains. The central feature of the approach is to better understand self-organization and to apply this systematic thinking to interpreting the body’s spontaneous reactions, with regard to psychophysiology and symptoms, that may be utilized as healing mechanisms in psychotherapy.

The patient often comes to psychotherapy in a state of allostasis or disease, and their physiology has been altered in an attempt to achieve healing and inner homeostasis. The effort toward achieving inner homeostasis via activation of biochemical reactions is typically visible through a variety of temporary symptoms, such as sweating, trembling, increased temperature, and muscle tension. These symptoms are indicative of self-regulatory mechanisms and

are prerequisites for healing. If they are mentally suppressed, or suppressed through medication, the allostatic state may transform to a sustained disease state. Consequently, deeper understanding and acceptance of natural endogenous biochemical rhythms and oscillations are important in psychotherapeutic work.

Biofeedback as a means for monitoring therapy utilizes a relatively simple tool that allows for more systematic insight into the psychophysiological processes that occur during a psychotherapy session and reflects self-organization from the cell level to the entire body.

## Chronology of the 4-stage creative cycle mapped with the psychosocial genomics profile and psychophysiological reaction during naturalistic therapeutic hypnosis

The main goal in every self-organizing system is to achieve homeostasis. This self-regulatory mechanism has specific measurable rhythms, which have a wave character and are important prerequisites for inner biological balance. Every organism demonstrates oscillations of different psychophysiological mechanisms during the day (circadian rhythm) or in periods shorter than 24 hours (ultradian rhythms).

Environmental influences such as stress cause the body to be come out of balance, with disruptions to the inner ultradian and circadian rhythms. The functioning of the body changes, and a state of allostasis emerges in which physiological changes may occur because of altered biochemical processes in the body. If the ability to maintain homeostasis is lost, the state of allostasis may result in disease.

The ultradian rhythm, an essential biological pattern in maintaining homeostasis, includes the basic rest–activity cycle (BRAC), which corresponds to the 4-stage creative cycle. This cycle corresponds with protein synthesis and gene expression. Figure 1 shows the chronobiology of the 4-stage creative cycle mapped on the normal 4-stage BRAC. The proteomic profile shown in Figure 1 arises from the functional concordance of co-expressed genes illustrated by the genomic profile (Rossi & Rossi, 2015). Each stage of the 4-stage creative



cycle is observable during a psychotherapy session. During the first stage, initiation, information about the stressor or problem that led the patient to seek psychotherapy is collected. The second stage, incubation, encompasses the inner search connected with the negative experience or conflict; strong body reactions may occur, leading to an arousal state. During the third stage, illumination, the patient realizes the solution for the problem, and the body relaxes and the patient often feels surprisingly positive. The fourth stage is verification, during which reintegration and new adaptation occur.

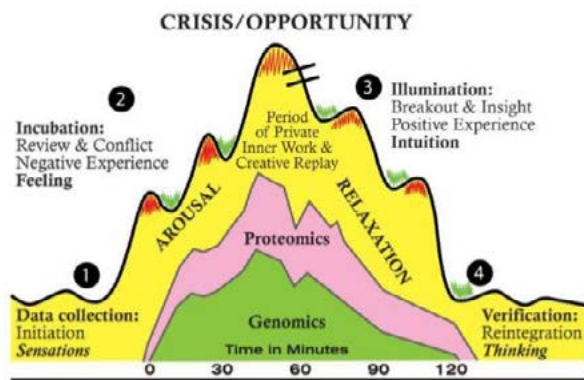


Figure 1. Psychosocial genomics (yellow) is depicted as the 4-stage creative cycle overlaid on the normal 90- to 120-minute 4-stage basic rest-activity cycle (BRAC). The proteomics (protein) profile in pink illustrates protein folding within neurons of the brain (adapted and redrawn from Cheung, Chavez, & Onuchic, 2004). The proteomic profile is supported by a co-expressed genomics profile (green) underlying it (Levsky, Shenoy, Pezo, & Singer, 2002). Image reproduced from Rossi (2016) with permission.

In the context of psychotherapeutic work, naturalistically oriented therapeutic hypnosis relies on the ultradian healing response (Rossi, 2007, 2012). The psychophysiological reactions during naturalistic therapeutic hypnosis can be described as high and low phases of hypnosis (Lloyd & Rossi, 1992, 2008; Rossi, 2002). The high phase is associated with arousal and stronger psychophysiological reactions; this phase correlates with stage two of the 4-stage creative cycle. The low phase of hypnosis is associated with increased relaxation. This overall process arises from the natural self-organization biodynamic and ultradian healing response in the body, and it correlates with naturalistic therapeutic hypnosis as proposed by Rossi.

As shown in Figures 1 and 2, a connection exists between the different phases of hypnosis and physiological reactions, protein synthesis, and gene expression. From the perspective of the psychotherapist, it is important to understand the ultradian oscillations that occur in the body, especially protein synthesis, during a stress reaction. Stress is a condition that disrupts the physiological (or psychological) homeostasis of an organism. The activation of a stress mechanism involves the autonomous nervous system and the hypothalamic-

pituitary-adrenal (HPA) axis, both of which are important in dynamic process of regulating homeostasis (Jänig, 2006). The sympathetic part of the autonomous nervous system is a rapidly mobilized arousal system characterized by actions such as the release of norepinephrine and epinephrine. In contrast, the parasympathetic nervous system supports a restful state, and it is characterized by release of the neurotransmitter acetylcholine.

The HPA axis also involves the release of chemical messengers, including corticotrophin-releasing

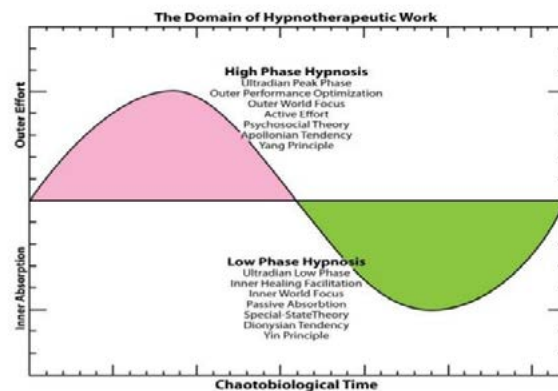


Figure 2. High and low phases of therapeutic hypnosis depicted as manifestations of the 4-stage creative cycle mapped onto the 90- to 120-minute basic rest-activity cycle (BRAC) (Lloyd & Rossi, 1992, 2008; Rossi, 2002). Image reproduced from Rossi (2002) with permission.

hormone (CRH), adrenocorticotropic hormone, and glucocorticoids (mainly cortisol). HPA activity is regulated by release of CRH from the hypothalamus, which stimulates corticotrophs in the pituitary gland to release corticotrophin (ACTH). Upon reaching the adrenal gland, the ACTH promotes the synthesis and secretion of glucocorticoids (CORT).

Figure 3 (Russell, Kalafatakis, & Lightman, 2015) illustrates the glucocorticoid pulsatility of the ultradian rhythm, which occurs as a consequence of a feedforward- feedback system with a relationship of built-in delays between the actions of ACTH on the adrenal cortex and those of endogenous glucocorticoids (CORT) on the pituitary corticotrophs (Figure 3, picture 1). Picture 2 of Figure 3 shows how the glucocorticoids gradually increase during the active parts of the day, and picture 3 shows how an acute stressor increases the CORT levels. This increase can destabilize the oscillatory profile and may reset the phase of the ultradian rhythm. In human studies, the basal ultradian HPA activity was documented as having a pulsatile pattern of secretion, which was produced at a frequency of approximately 60-90 minutes (Veldhuis, Iranmanesh, Lizzaralde, & Johnson, 1989).

Conway-Campbell et al. (2010) have proposed that the interaction of the glucocorticoids between the blood and the brain induces "gene pulsing."

In this process, a CORT pulse is followed by the glucocorticoid receptor (GR) binding to the corresponding DNA 15 minutes later. Transcription of the CORT-sensitive genes follows 15 minutes later, and after another 30 minutes (60 minutes after the initial CORT pulse), the corresponding mRNA peaks. According to Russell et al. (2015), the circadian variation of CORT pairs with other biological oscillations, including activity, body temperature (Bailey & Heitkemper, 2001), and expression of many glucocorticoid-responsive genes. One of these genes codes for tryptophan hydroxylase, and it has a role in the regulation of affect, activity, and temperature.

As previously mentioned, the circadian and ultradian rhythms of different proteins (i.e., glucocorticoids) and their associated genes during naturalistic therapeutic hypnosis and psychotherapy underlie the biological oscillations that result from the natural biodynamic of self-organization. The self-regulating pulsatility of the HPA axis and its related proteins and genes are connected to the ultradian rhythms of the 4-stage creative cycle. This self-organizational biodynamic during naturalistic therapeutic hypnosis is the result of various biochemical reactions that increase electrochemical activation, which are in turn observable via

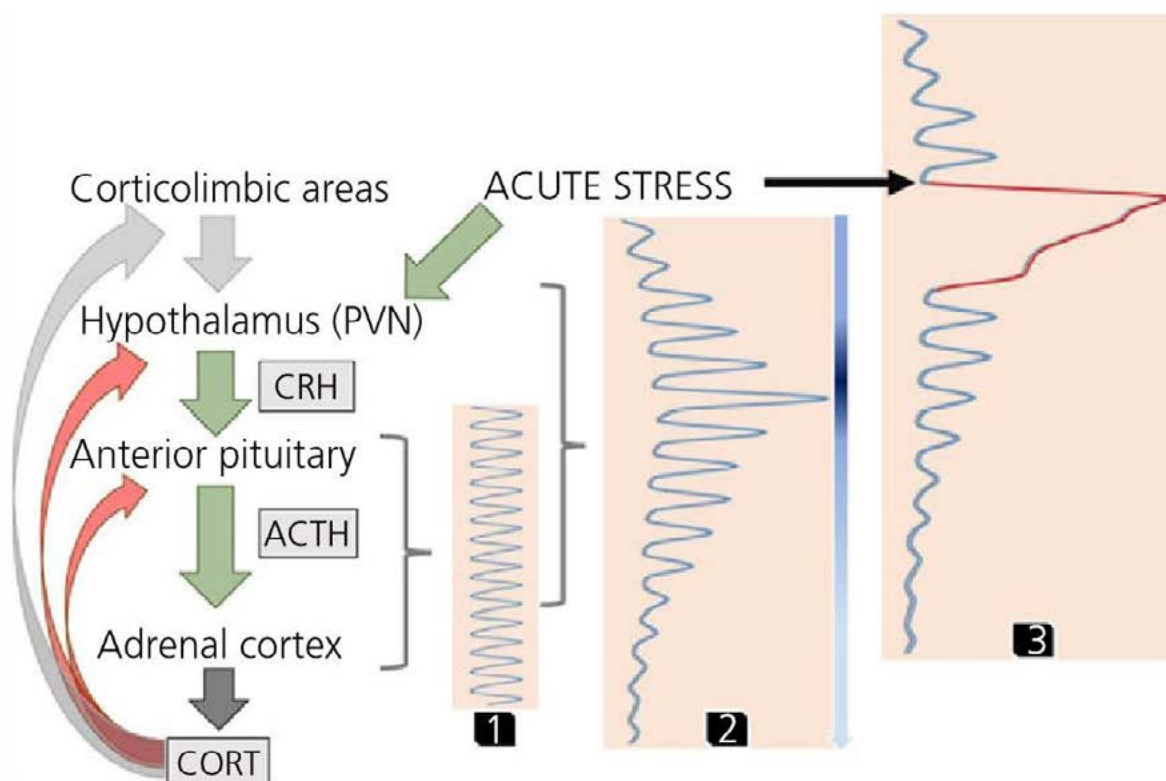


Figure 3. Hypothalamic-pituitary-adrenal (HPA) activity is controlled by regulatory mechanisms. Corticotrophin-releasing hormone (CRH) from the hypothalamus stimulates corticotrophs in the pituitary to release corticotrophin (ACTH). In the adrenal gland, ACTH promotes synthesis and secretion of glucocorticoids (CORT). CORT has an auto-inhibitory effect on production of the hormones at each step. CORT also affects corticolimbic regions of the brain, which in turn affect HPA axis activity. Image reproduced from Russel (2015) with permission.

Concerning oscillations of gene expression and therapeutic hypnosis, research by Cozzolino et al. (2014) suggests an association between therapeutic hypnosis, using the Creative Psychosocial Genomic Healing Experience Protocol described by Rossi (2004), and gene expression patterns typical of immediate-early gene and enhanced stem cell activity as well as reductions in cellular stress and inflammation. Cozzolino et al. (2014) reported that stem cell gene activation continued to develop for at least 24 hours after a therapeutic hypnosis session; however, the expression of genes related to reductions in cellular stress and inflammation peaked within hours and then declined.

physiological parameters such as blood pressure, temperature, and electrodermal activity.

Based on the research described above, the activation of the self-regulating pulsatility of HPA axis and pulsatility of proteins that induce gene pulsing are important biological processes that harmonize the stressor-disrupted oscillatory profile of an organism during stage two of the 4-stage creative process. These biochemical reactions underlie the reflux of energy connected with increased electrical oscillations. We hypothesize that the automatic body movements (vibration, trembling of fingers, or other body parts) during the arousal phase (stage two of the 4-stage creative

cycle) and increased psychophysiological reactions (high temperature, blood pressure, electrodermal activity) result from these regulatory processes. They may also concurrently promote important physio-and biochemical self-organization processes resulting in increased electrochemical reaction and increased trafficking of neurotransmitters and thus electrodermal activity.

a generation earlier by Max Planck, Erwin Schrödinger, and others. This early quantum research became the basis of what we now call "quantum field theory" (QFT) (see reviews by Rossi & Rossi, 2014, 2016). Erickson often used the "field" to describe his naturalistic approach to hypnosis, but it is not known whether he believed it was related to the quantum field theory that Ravitz (2002) believed

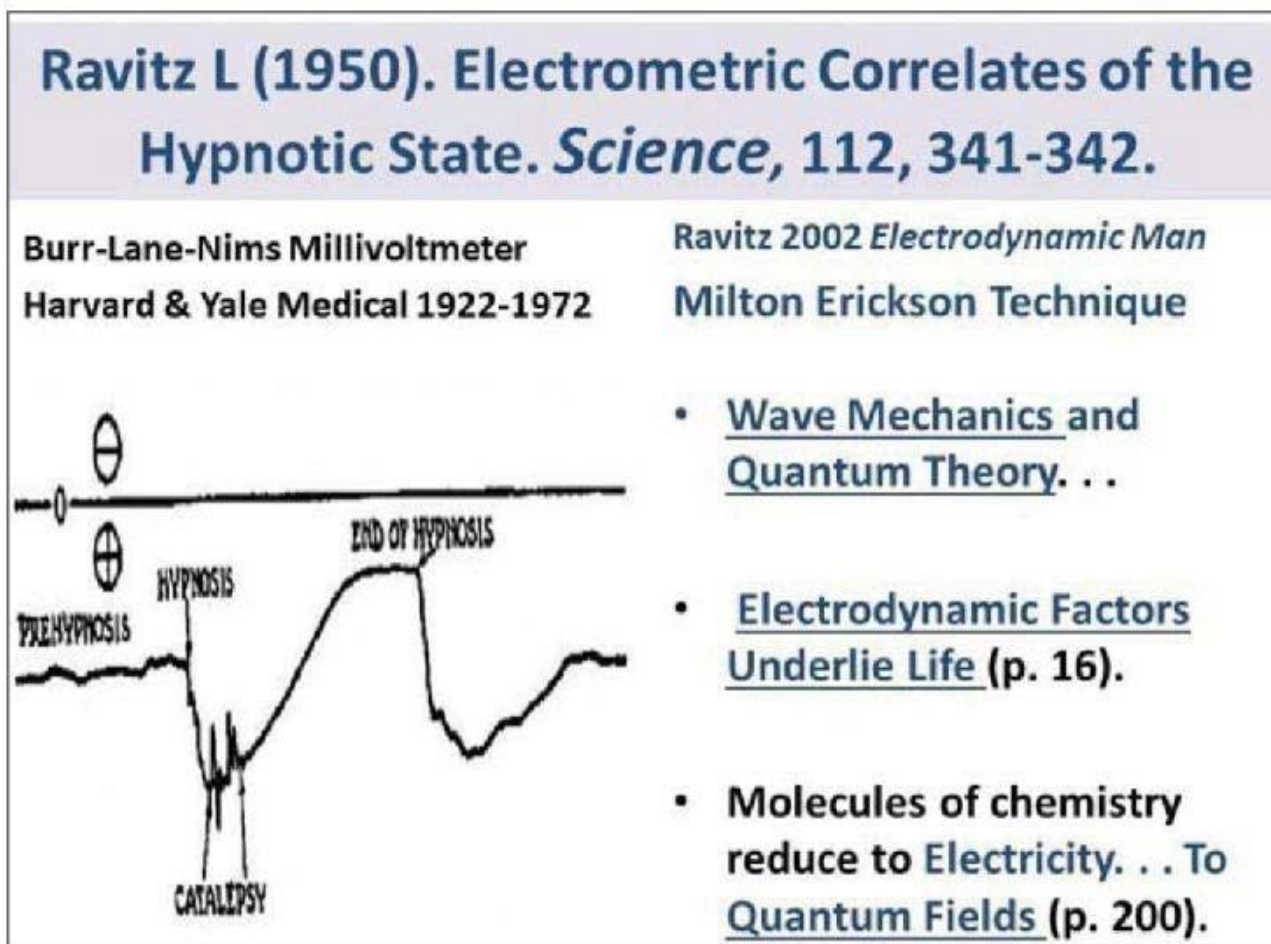


Figure 4. The measurement of the electrodynamic field correlates of Milton H. Erickson's naturalistic therapeutic hypnosis, originally published by Ravitz in *Science* (1950) was initially conceptualized and explored as an early version of quantum field theory (QFT). (Rossi & Rossi, 2016).

**Analysis of electrometric correlates of Milton H. Erickson's Naturalistic Therapeutic Hypnosis**

The Measurement of the Electrodynamic Field Correlates of Milton H. Erickson's Naturalistic Therapeutic Hypnosis was originally published by Ravitz in *Science*. (Rossi, Erickson-Klein, & Rossi, 2008-2015a,b). Figure 4 illustrates the relevant details of this first publication. The electronic measurements were made with a vacuum tube device (the Burr-Lane-Nims Millivoltmeter) invented by researchers at Harvard and Yale Universities. These researchers were pioneers in what they called the "Electromagnetic Field Measurements in Biology, Medicine, Hypnosis and Psychiatry" (Ravitz, 2002). Ravitz studied with some of these pioneers who believed they were exploring the quantum mechanics described

he was measuring. As a result of the high and low phases of hypnosis (Figure 2), the patient alternates between active effort (high phase) and passive absorption (low phase) during psychotherapy sessions. The electrodermal activity shown in Figure 5 becomes higher after achieving inner absorption during hypnosis. Rising electrodermal activity, after the eyes are closed, is visible in the upward trend of the line graph. Activity increases because of a physiological reaction in which bodily functions become activated after outside impulses are shut out through closing the eyes, which activates biochemical processes associated with self-regulating pulsativity of the HPA axis, protein synthesis and gene pulsing. This process serves as an example of the body working as an adaptive system in the



state of allostasis, through physiological change, with the purpose of integrating and synchronizing different physiological functions. For clients with trauma, anxiety, depression, or psychosomatic disorders, such activation of regulatory mechanisms leads to releasing sensations, which may initially be connected with a strong stress reaction and may be perceived as very unpleasant. In this case, gradual training of neutral observation of those sensations for only a very short time is important. However, the increased physiological reaction may also involve pleasant feelings or philosophical insights or the experiencing of artistic values (i.e., art, beauty, and truth).

the self-organizing processes on the biochemical level. Another reason for such low electrodermal activity may be natural relaxation after closing the eyes, allowing the inner focus of attention. In this case, decreasing activation for thoughts results in increased inner relaxation.

As visible from Figures 4 and 5, electrodermal activity has some peaks and waves, and the increasing values alternate with phases of low electrodermal activity in wave-like patterns. This activity reflects the natural rhythmic changes of self-regulatory systems and correlates with the oscillating activity and fluctuating dynamic state of the autonomous nervous system and the

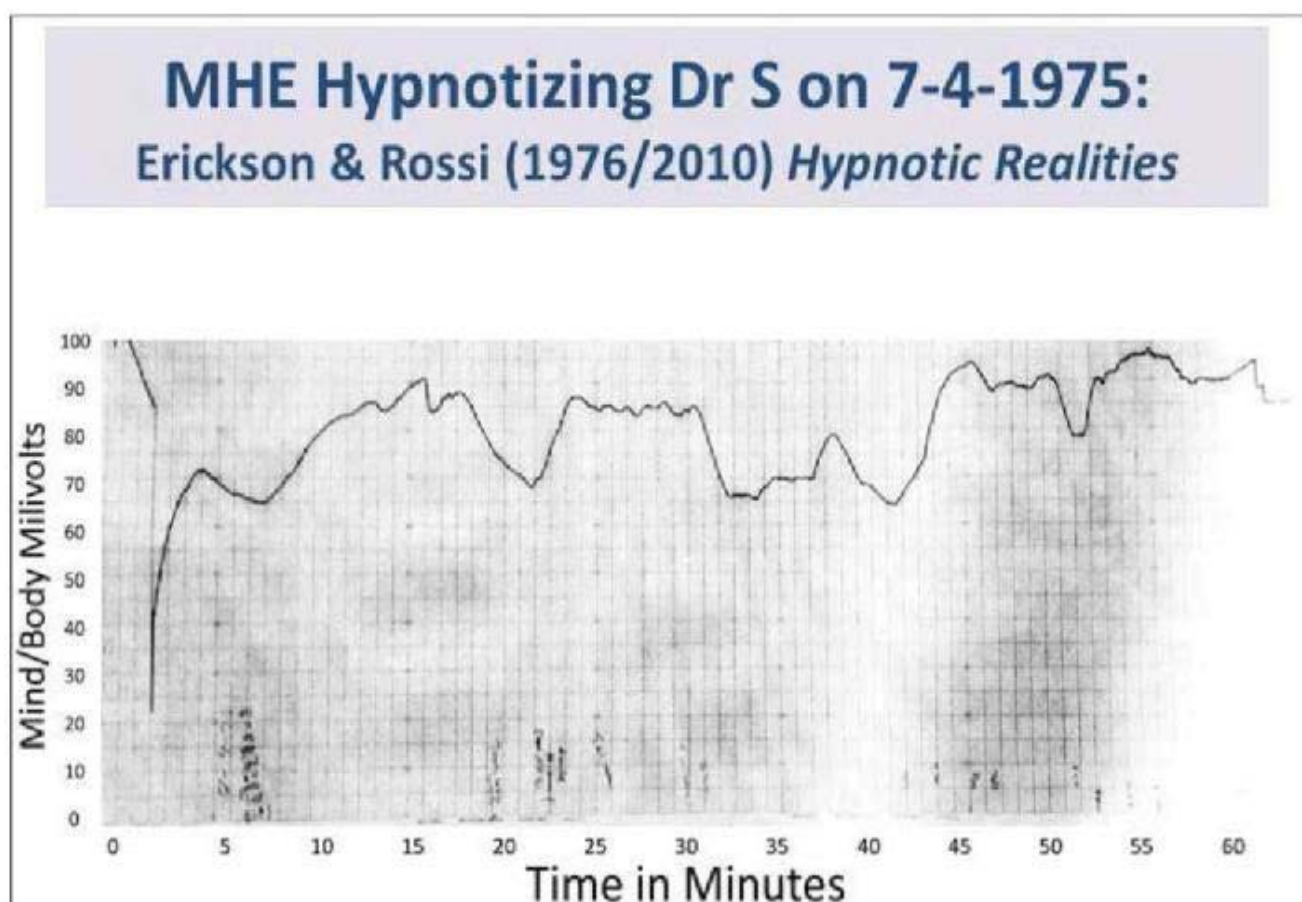


Figure 5. This recording was made by Milton H. Erickson M.D. during a hypnosis session of a subject identified as Dr. S. It is the only existing image of Erickson's electrodynamic amplitude while at work. (Rossi & Rossi, 2016).

An opposite reaction during hypnosis is seen in Figure 4, where the electrodermal activity of the client decreases after the eyes are closed. In this measurement, recorded during hypnotic catalepsy, low electrodermal activity is visible after hypnotic induction. In this recording, it is questionable whether the law of electrodermal activity is a natural reaction of the body. It is possible that the experience is induced after hypnotic suggestion. An induced experience of catalepsy may not be healing if the body needs the state of allostasis and arousal for

neuroendocrine stress axis, which are important for establishing homeostatic equilibrium. Reactions of electrodermal activity are unique to the individual and by interpretation must be in a relationship with other physiological functions along with the psychological state of the client.

A comparison of Figures 4 and 5 reveals that the physiological activation increases after the hypnosis session when the client opens their eyes. It is evident that the therapeutic hypnosis psychotherapy session activates both the body

and mind of the client because the biofeedback electrodermal activity at the end of the session is higher than at the beginning.

Biofeedback is a tool for monitoring electromagnetic activity, and it reveals that the body is a system in which different transitions of energy occur. During the biochemical process, the electrons can move into an excited state (higher energy levels) after energy absorption has taken place. This excited state of electrons is only momentary. After a short while the whole self-organized biosystem returns to a lower energy state. In this process, a spontaneous emission of energy usually takes place. Clients may subjectively experience light (electromagnetic radiation in the visible spectrum), which is visible with closed or opened eyes, or heat (electromagnetic radiation in the infrared spectrum). These processes of energy transitions may be seen in the electrodermal activity after a hypnotherapeutic session (Figures 4 and 5). This may reflect a direct connection between therapeutic hypnosis and the QFT of neuropsychotherapy (Rossi & Rossi, 2016).

### Monitoring of the self-organizational processes and the 4-stage creative process through SCHUHFRIED Biofeedback 2000x-pert equipment

Typical physiological body responses occur during a hypnosis psychotherapy session from the point of view of physiology, as well as psychobiology, and instruments can be used for monitoring the self-organizational biodynamics, 4-stage creative cycle, and protein synthesis. A biofeedback instrument, such as Biofeedback 2000x-pert (SCHUHFRIED), may be useful as a tool for monitoring a client's mind-body interaction. Individual physiological parameters including electrodermal activity, electromyography, skin temperature, blood volume pulse (the average flow of blood near the surface of the skin), motility (physical movement) can be monitored during a psychotherapy session. Sensors record the signals noninvasively from the skin surface, and signals are filtered, amplified, digitized, and transmitted via a cordless Bluetooth connection to a computer.

The Biofeedback 2000x-pert (Schuhfried, 2011) consists of four modules (Figure 6): MULTI module, EMG electromyography module, EEG electroencephalogram module, and RESP respiration module. The MULTI module and the EMG module are focused on in the current report. With the MULTI module (Figure 7), the following four parameters can be measured simultaneously: skin conductance level (SCL), temperature (TEMP), blood volume pulse (BVP), and motility (MOT).

Skin conductance is measured by recording the electrical potential. A square wave signal with a frequency of 20 Hz and an amplitude of  $\pm 1.42$  V is applied to the skin. The electrical current flowing over the skin is recorded by the MULTI module, and from this the skin conductance level (SCL, tonic skin conductance level) is calculated. The skin surface



Figure 6. Four modules (EMG electromyography module, EEG electroencephalogram Module, RESP respiration module, MULTI Module) of SCHUHFRIED – Biofeedback x-pert 2000, © Schuhfried.

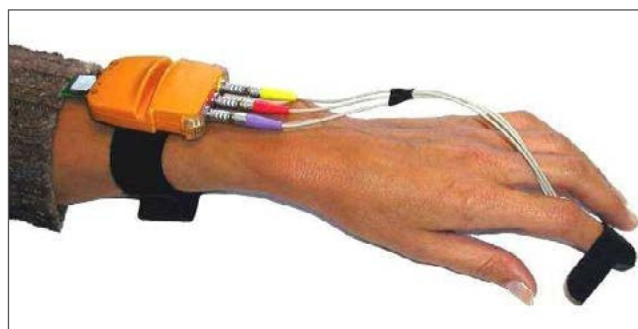


Figure 7. Example of biofeedback: MULTI module of SCHUHFRIED-Biofeedback x-pert 2000 for electrodermal activity, skin temperature, blood volume flow, and motility, © Schuhfried.

temperature (TEMP) data are processed through the sensor and transmitted to the MULTI module in digital form. Within a range of 10°C to 40°C, the temperature is measured at a resolution of 0.01°C and with an accuracy of 0.5°C. The blood volume pulse (BVP) measures the average flow of blood near the surface of the skin by photoplethysmography relative to the maximum recordable range. The pulse rate (PULSE) is characterized as the number of heart beats per minute and is calculated from the BVP. Another parameter, motility (MOT), is used to record the client's motor movement via a sensor attached to a finger. The EMG module enables measurement of the muscle tone. When signals are recorded from the skin surface, the action potentials of all the muscles under the electrode are measured. Physiological parameters of EMG are recorded in microvolts, and average values for muscles in a relatively relaxed state range from 2 to 4 microvolts. Tension and relaxation of muscles through the average means of EMG. (Schuhfried, 2011)

Various reactions in a client's physiology are observable from monitoring biofeedback during psychotherapy. The measurement of either increased

sympathetic or sympathoadrenal activation (physiological stress reaction or activation) can be associated with increased pulse rate, increased SCL, increased muscle tension, and lower temperature. Parasympathetic (cholinergic, vagal) impulses reduce the heart beat frequency (pulse frequency) and thereby increase the pulse volume amplitude.

### A representative session using Biofeedback 2000 x-pert

A representative example was chosen to describe some characteristics of monitoring psychophysiology via biofeedback and to highlight its connection to different levels of self-organization processes. These observations are qualitative examples of different psychophysiological reactions of a patient during psychotherapy, especially during naturalistic hypnosis. They offer examples of self-regulatory mechanisms at different levels.

A 69-year-old man volunteered for a therapeutic hypnosis session with biofeedback monitoring. His aim was to increase the quality of life after a stroke and to improve body awareness of the affected parts. Biofeedback 2000 x-pert was used to monitor this therapy session, and the MULTI module was used. A sensor was placed on the index finger of the man's right hand. An EMG module was also used, and those sensors were placed on the muscles of the two hands (at the extensor *capri radialis brevis*, extensor *capri radialis longus*, and *brachioradialis* of the right and left hands).

Within the framework of this therapeutic hypnotherapy session, we utilized the method of implicit processing heuristic, which is an indirect permissive suggestion (Rossi, 2007) to facilitate the 4-stage creative cycle.

time, the patient experienced his body sensations more intensely. This activation phase matches stages one and two of the 4-stage creative cycle, characterized by the rising electrodermal activity (SCL) in Figure 8, minutes 1–28, and it is identical to high phase of hypnosis from Figure 2 and to the ultradian healing response. This arousal phase is an important inner activating mechanism for physical and biochemical metabolic processes with increasing electrochemical properties and thereby initiation of gene expression and protein synthesis. Stage two is made visible through biofeedback between minutes 23 and 29. The electrodermal activity increases and the client feels excitement and tension, which is associated with physio- and biochemical mechanisms in the body.

As already mentioned, it is important in stage two to use a value-free perception including mindful oriented being-perception (Maslow, 1993) to accept sensations and symptoms and utilize them for healing processes. A nonjudgmental perception of body sensations in the therapeutic process is very helpful and may lead to expression of repressed feelings, which then may promote unconscious processes along with the potential confusion and chaos characteristic of stage two.

The transition between stages two and three is a pivotal moment in the psychotherapeutic process. Nature's healing through gene expression and protein synthesis are stimulated, resulting in psychophysiological changes. This process can be seen in Figure 8 at minutes 28, 37, and 47, occurring in waves at approximately 9- minute intervals. In stage three, the client was increasingly relaxed, as indicated by his elevated temperature and increased blood volume pulse. This wave form is

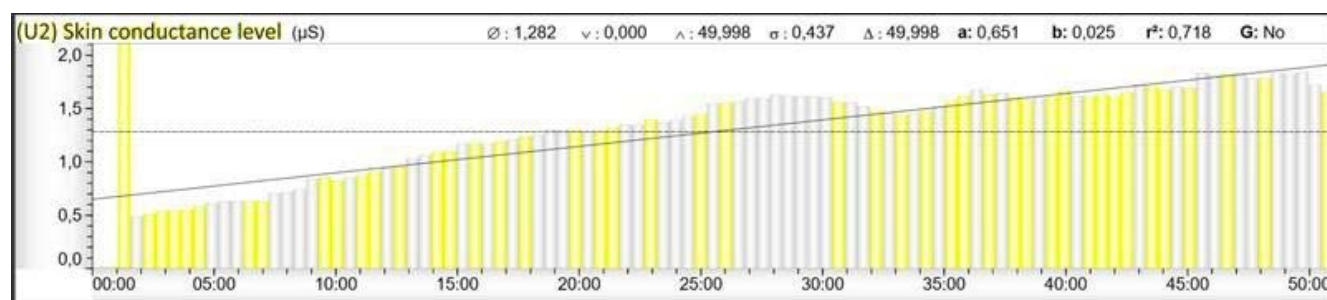


Figure 8. The 4-stage creative cycle and the 4-stage basic rest-activity cycle visible in electro-dermal activity (x-axis: time in minutes, y-axis: skin conductance level SCL in microsiemens).

As shown in Figure 8, physiological activation visible as electrodermal activity could be measured in visible biofeedback waves, which were associated with the 4-stage creative cycle. The inner activation in the first phase after the patient closed his eyes (stage one of the 4-stage creative cycle: initiation) can be explained as external stimuli being reduced, allowing the inner focus of attention to activate internal processes within the body. During this

similar to the recording depicted in Figure 5. The client described here felt increasingly comfortable and relaxed at minutes 29–34 and minutes 38–44 as shown by his increased temperature. At the end of the therapy session, the physical transitions into stage four are related to reorientation and reintegration of thoughts and actions. In this phase, the electrodermal activity becomes higher at minutes 45–49 (Figure 8).



The physiological reaction noticed in this session was an overall increase in activation tendency (Figure 8) exemplified by the skin conduction value (SCL). In Figure 8 the initial position of the electrothermal activity (SCL) is relatively low (0.5 microsiemens). The SCL and temperature increase through the entire therapy period. Such reactions experienced by this patient may be explained as a need for increased activation of throughout his body. This increased activation may be seen as the state of allostasis in which the necessary balancing processes are being applied to harmonize the oscillatory profile and activate the biochemical processes.

The internal stimulation (inner absorption, value-free perception) may naturally promote ultradian and circadian oscillations. This activation has an effect at the biochemical level (e.g., regulating pulsativity of HPA), which resets the destabilized oscillatory profile and promotes gene pulsing. The body is in the process of adaptive homeostasis and the important high energy processes in cells influence electrochemical reaction and thereby the physiological parameters (electrodermal activity) and psychological state of the patient (arousal state in this stage and later relaxation).

As Figure 9 indicates, the patient experienced a changed physiological state in contrast with normal daily state of temperature. His temperature rose during the whole therapy hour in visible waves. Thermodynamically, the increased temperature was related to increased molecular vibrations and thereby the electrochemical reactions which increased the energy level in the body.

A descending temperature line is associated with stage two and the arousal phase at minutes 23–29. This phase can be connected with stress mechanisms in the body, activation of the sympathetic nervous system, and regulation of the pulsativity of stress hormones. This phase with descending temperature is regarded as an important contrast phenomenon, in which the natural functioning of a self-organized system is promoted.

The blood volume pulse (the average flow of blood near the surface of the skin) in Figure 10 is a good sign of parasympathetic activation. As can be seen from the graph, the BVP (blood volume pulse), similar to the SCL, has a wavelike shape as the blood vessels alternate between becoming narrower (sympathetic activation, higher SCL, narrow parts of the turquoise color on the graph below) and

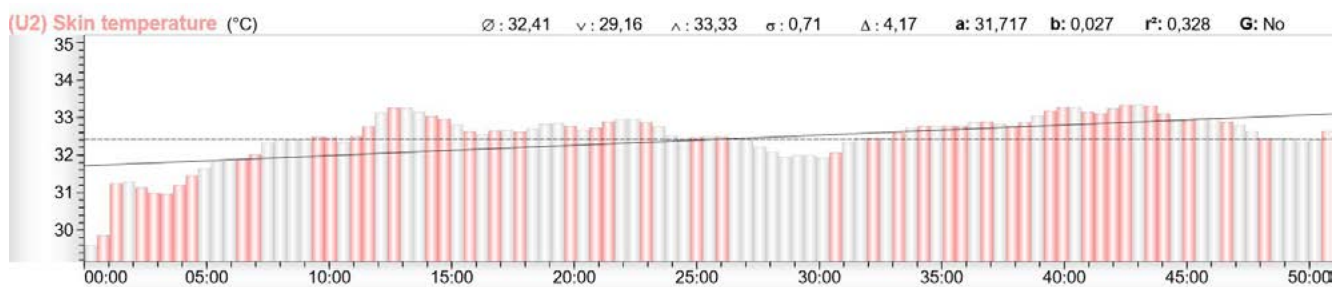


Figure 9. The 4-stage creative cycle and 4-stage basic rest–activity cycle visible in temperature (x-axis: time in minutes, y-axis: skin surface temperature in degrees Celsius).

Concerning the length of particular stages of 4-stage creative cycle, the length of this cycle during naturalistic therapeutic hypnosis may take 90–120 minutes and it matches the length of the BRAC. However, the length observed via biofeedback in this case was only 50–60 minutes, which matches the gene pulsing sequences (Conway-Campbell et al., 2010) and with HPA activity pulsatile pattern of secretion (Veldhuis et al., 1989). Biofeedback monitoring makes visible during the therapeutic session that this wave of 50–60 minutes consists of shorter waves, which usually last between 15 and 30 minutes. The length of the stage two or three of 4-stage creative cycle is often approximately 15–30 minutes, which also matches with the length of gene pulsing sequences (Conway-Campbell et al., 2010). Rossi (1991, 2004) proposed that the length of one ultradian cycle in the 4-stage creative process is 20 minutes, which again matches with the observation via biofeedback.

becoming wider (parasympathetic activation, lower SCL, broad turquoise segments of the graphs). The SCLs occur in large waves, which contain smaller waves. These smaller increases of waves are more easily seen in BVP graphs, which illustrate sympathetic and parasympathetic activation and give biochemical reactions and physiological functions a rhythmical appearance. This wave-like progression in rhythm movement has been suggested to be an expression of the ultradian oscillations in organism and to promote electrochemical activation of the body and thus adaptive homeostasis.

Figure 11 shows electromyography of the right and left hands during the same hypnosis psychotherapy session. The sensor is placed at the *m. extensor carpi radialis brevis*, *m. extensor carpi radialis longus*, and *m. brachioradialis*. The left hand (EMG 1, nondominant hand) began with higher values (average of 25 microvolts in first 10 minutes), lowering the values of the EMG 1 (10 microvolts

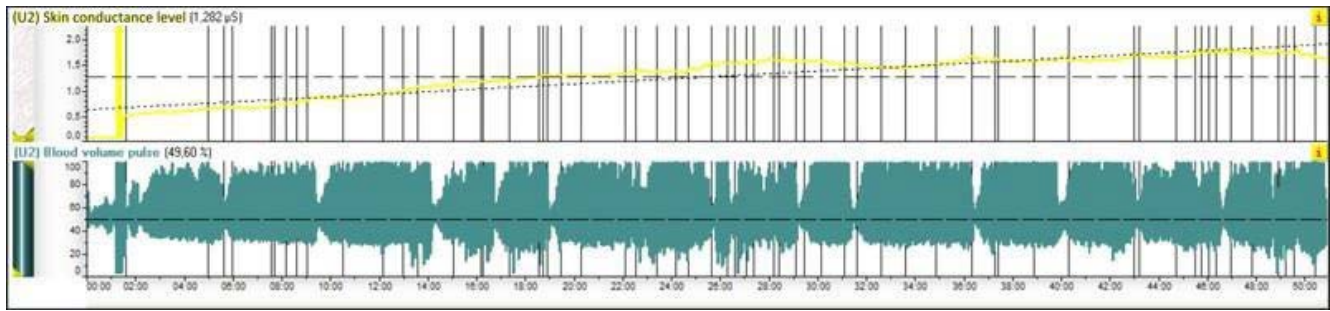


Figure 10. The 4-stage basic rest-activity cycle visible in blood volume pulse (upper graph, x-axis: time in minutes, y-axis: blood volume pulse in %, SCL in microsiemens; lower graph).

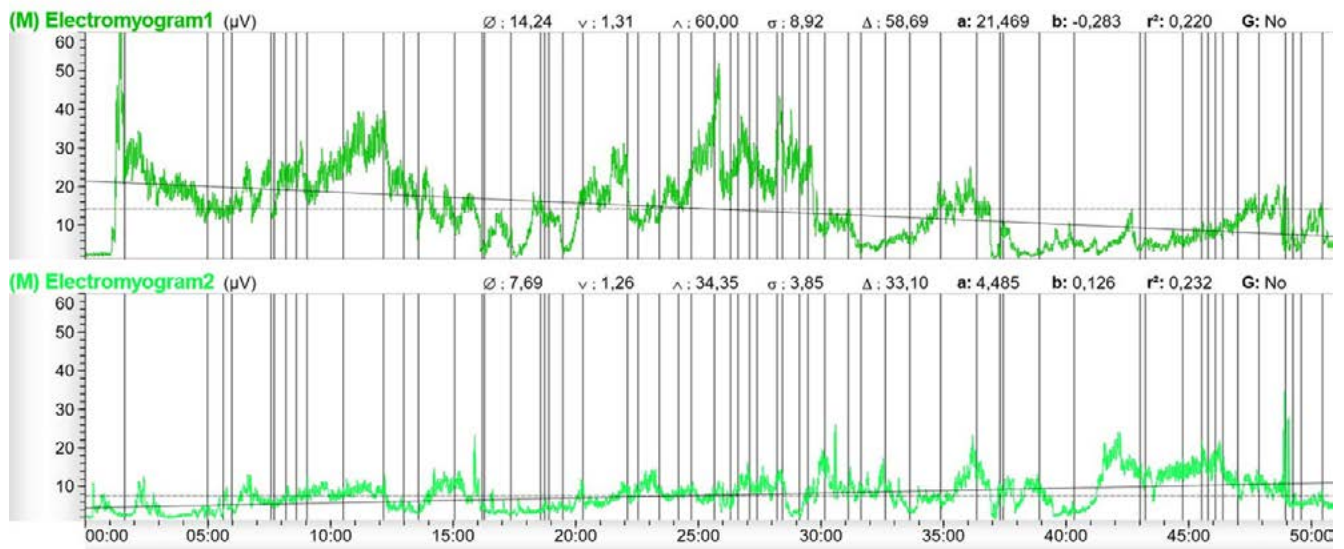


Figure 11. The 4-stage creative cycle and 4-stage basic rest-activity cycle visible in electromyography EMG (x-axis: time in minutes, y-axis: EMG1 and EMG2 in microvolts, average of EMG1 14.24 microvolt; average of EMG2 7.69 microvolt).

in minutes 13– 22 minutes) in wave patterns throughout the entire psychotherapy session. The left hand (EMG1) seemed to have higher internal muscle tension (average of 14.24 microvolt in 50 minutes), which was resolved during the therapy session. Conversely, the right hand (EMG 2) showed lower values at the beginning of the therapy session (average of 4 microvolts in first 10 minutes) that increased in wave form during the session (average of 15 microvolts in last 10 minutes). This may have been a self- synchronizing process occurring between the right and left brain hemispheres after the client's stroke. If so, it may be explained as a spontaneous self-organization process within the body, promoting neurogenesis, synaptogenesis, and neuroplasticity.

In EMG, there is typically a visible process of adaptive homeostasis seen as dynamic oscillating activity in rhythmic wave patterns, which self-organize and support homeostasis between the right and left sides of the body. This oscillation characteristic of muscle contractions seems to be an important self-organization mechanism for mobilization of inner processes in the body, through

increasing muscle contractions or tension and temperature and thereby increasing biochemical processes. Better understanding of these processes may lead to more acceptance of sensations such as muscle tension and spontaneous regular or irregular muscle contractions, which increase the electrochemical processes, promote the ultradian oscillations in the body, and thereby may also be utilized for healing.

Motility was observable as a very gentle ideomotor finger signal movement. On average, finger movement was higher in conjunction with higher SCL (minutes 15, 20, 25, 30, 35), which is visible in Figure 12. Interestingly, increased finger vibrations happened regularly at an almost exactly 5-minute interval, which may be related to the ultradian rhythm of protein synthesis during psychotherapy. This increased motility can be regarded as an important phase for inner physiological excitation, which is the result of and has important effects on self-regulatory processes, and activation of different biochemical reactions. The understanding of such processes may lead to better acceptance of such symptoms as twitching, trembling, or

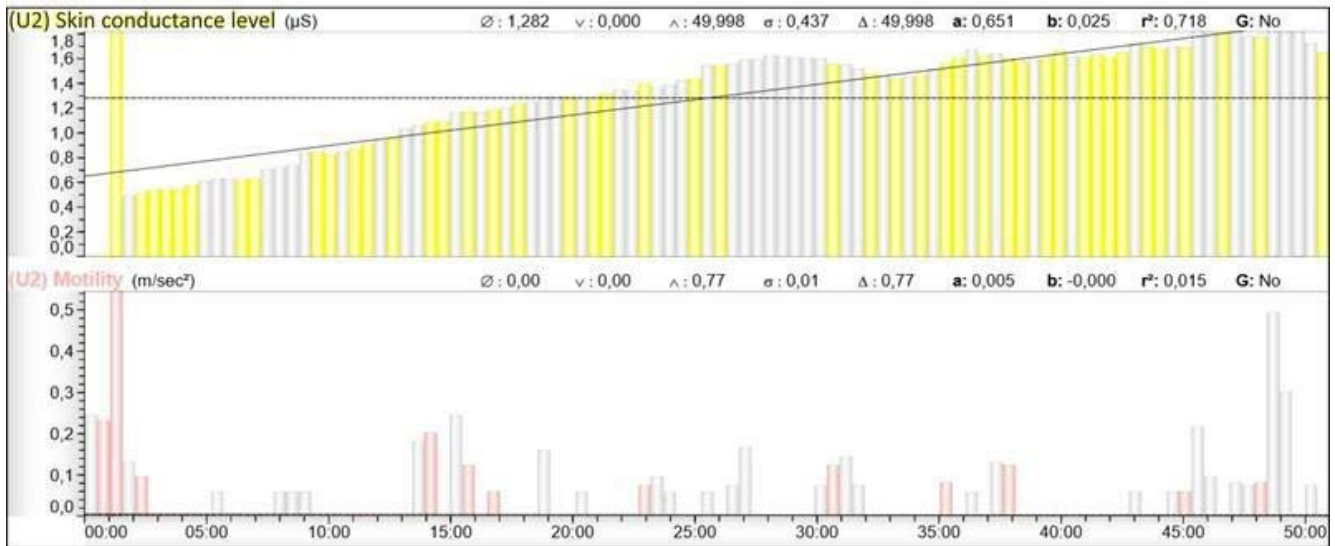


Figure 12. The 4-stage creative cycle and 4-stage basic rest–activity cycle visible in connection between skin conductance level SCL schemes (up) und motility (down); average SCL 1,282 microsiemens.

other rhythmic movement reactions of the body during the inner absorption. This spontaneous, unconscious movement may be a result of the inner electrochemical activation and vice versa important unconscious effortless mechanism for activating electrochemical processes in the body.

### Discussion

Using biofeedback as a psychoeducation tool can help to explain mind–body interactions to a patient and strengthen their confidence in their internal healing mechanisms and acceptance of important healing sensations or symptoms. Using biofeedback as a monitoring tool during psychotherapy may help the therapist as a feedback mechanism not only with regard to different physiological functions but also about ultradian oscillations of the 4-stage creative cycle connected to important physio- and biochemical processes in the body.

Psychophysiological reactions during hypnotherapeutic sessions have an oscillation character observable on the physical level through the interplay of physiological reactions between the mind and body. The increased electrodermal activity, rhythmic muscle activity, and motility are the result as well as the activation mechanism of important ultradian oscillations in the body that activate the electrochemical processes and thereby increase the electrodermal activity. This wave-shaped electromagnetic activation of the body corresponds to the 4-stage creative cycle and the 4-stage BRAC, promoting production of enzymes, hormones, proteins, and neurotransmitters and stimulating gene expression. This is the biological basis for the self-synchronized biodynamic of living organisms, in which important metabolic processes encourage inner homeostasis and healing.

From the theoretical outlines and observations of ultradian oscillations via biofeedback, the

components that promote a self-organized biodynamic during the psychotherapy process can be depicted as shown in Figure 13.

**Neutral nonjudgmental observation** promotes the oscillations of the 4-stage creative cycle. Nonjudgmental observation creates an environment for openness and thus for creating of new pathways in the system.

It is important to consider that diseases often develop when the wave-like ultradian cycle is “jammed” and unresolved. In this situation, the organism becomes mired in an allostatic state and is unable to achieve homeostasis.

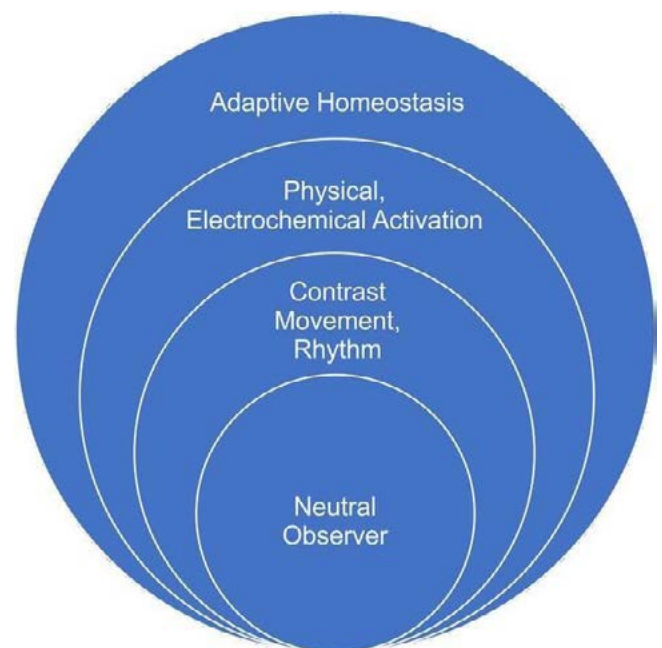


Figure 13. The impact of a neutral observer to promote the phenomena of contrast, movement and rhythm which lead to more physical, electrochemical activation and thereby to a state of more adaptive homeostasis.



Patients who suppress their symptoms using negative thoughts also likely delay the healing mechanisms. Appreciating the arousal in stage two is crucial for encouraging different physio- and biochemical processes in the body, which is the basis for neurogenesis.

**Contrast state:** As visible from biofeedback monitoring, it appears important for the body to create a contrast to the common everyday state (i.e., higher temperature, lower or higher electrodermal activity) in order to activate changes in the electrochemical activation that promotes important physiological processes. This contrast state promotes nonlinearity in self-organized biosystems, offering openness for changes.

The direct expressions of this contrast state include different unusual sensations or symptoms in the body (i.e., heat, muscle compression, pressure, tingling, trembling, dizziness, pain), which are important activation mechanisms of self-regulating and healing processes. The body uses these sensations as important signals for the nervous system to activate changes in contrast areas. As an extension of the ultradian rhythms, this systematic view is important for accepting the contrast stage two of the 4-stage creative cycle, which is often connected with unpleasant sensations and may be perceived as symptoms accompanied by stronger emotional reactions (anxiety, sadness).

The contrast state in psychotherapy can be supported by accepting these healing mechanisms and promoting them without direct suggestions for relaxation during the induction phase of hypnosis. The relaxation state happens automatically after the arousal state, which is an important contrast phase important for healing processes. This access opens up possibilities for the use of naturalistic therapeutic hypnosis techniques. The classic hypnotic techniques, in contrast, direct the patient to oppose positive feelings. However, such suggestions can interfere with stage two of the ultradian biochemical rhythms and thereby slow the healing process and possibly even prevent it.

**Movement and rhythm:** Movement and rhythm are important unconscious biological phenomena supporting effortless self-organized processes. Paired together with contrast state, it provides a basis for biochemical activation. Movement and rhythm are observable as psychophysiological phenomena in waves of electrodermal activity, temperature, and muscle contractions via biofeedback during a psychotherapy session. The wave function of these processes itself includes the contrast phenomena (i.e., waves of low and high temperature), and it is the basis for the activation of all levels of self-organization in biosystems.

Rhythm is an important phenomenon that promotes the natural oscillation at different levels of organization, such as protein synthesis and gene pulsing. This activated state of inner oscillation is hypothesized to be visible in regular waves in

biofeedback but also in changed physiology of a patient such as rhythmical muscle contractions, trembling, and shaking. These physiological changes have the purpose of healing in an organism as well as promoting physio- and biochemical processes and allowing the ultradian rhythm to naturally change to relaxation. Regular muscle contractions and other rhythmical phenomena in the body, which are observable via biofeedback during psychotherapy, seem to be important for rhythmical stimulation of self-regulating pulsativity of the HPA axis, protein pulsativity, gene pulsing, and the rhythmical changes in sympathetic and parasympathetic activation. Thus, they are important mechanisms in the process of adaptive homeostasis.

Neutral observation promotes three important factors of a self-regulating biodynamic: contrast, movement, and rhythm. These are prerequisites for activation of important biochemical processes in the body and activation of cell structures and thus for psychophysiological activation. The self-synchronized biodynamic processes with important arousal in stage two of 4-stage creative process, in connection with contrast in physiology, can be assumed to activate movement and rhythm in psychophysiology and to promote electrochemical activation visible in changed physiology. These processes may be crucial for biochemical activation and gene pulsing leading to synaptogenesis, neurogenesis, brain/mind plasticity, and new consciousness, and thus, they are a foundation for successful psychotherapeutic work.

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# THE PRACTITIONER'S GUIDE TO MIRRORING HANDS: A CLIENT-RESPONSIVE THERAPY THAT FACILITATES NATURAL PROBLEM SOLVING AND MIND-BODY HEALING

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Ernest L. Rossi, Ph.D., Diplomate in Clinical Psychology, Jungian Analyst, the Science Editor of Psychological, polymath, and a gifted psychotherapist. In his rich career, Ernest L. Rossi received three Lifetime Achievement Awards for Outstanding Contributions to the Field of Psychotherapy, and collected more than 50 professional books and more than 170 peer reviewed scientific papers in the areas of neuroscience, psychotherapy, dreams, and therapeutic hypnosis that have been translated into a dozen languages.

## **About the Book:**

This book, as result of their rich cooperation, is the first one dedicated to Mirroring Hands therapeutic process. Mirroring Hands is a technique that emerged from Ernest L. Rossi's studies and experiences with Milton H. Erickson. Rossi himself has described this technique as hypnosis without hypnosis.

Mirror Hands is an effective process for a wide range of mental health professionals, starting from established therapists to those new to psychotherapy and hypnotherapy. Those who practice mindfulness and meditation, like some martial artists or yoga practitioners, will find it easy and comfortable to enter the beginning stage of Mirroring Hands.

Someone said that only those ones that have deeper understood something, later can explain to the others what they learned in a simple way. Well, this book is directed to all kind of practitioners: it is a practitioner's guide.

Mirroring Hands seeks to connect the client and the therapist to the natural flow, cycles and self-organizing emergence that shift the client toward beneficial change. The authors show how the technique enables clients to unlock their problem solving and mind body healing capacities and arrive at resolution in ways that many other therapies might not. The overall effect is to create an engaged connection and integration with the client's natural, best self.

The process begins with a state of focused attention, which is established by the client observing their hands. This is not to produce a deep hypnotic trance, but to create a "General Waking Trance" as Milton H. Erickson described it. This form of focus and attention is similar to the state created during meditation and mindfulness.

This is only the first step of the technique, in the following steps the clients are taken beyond the calm and comfort and activates curiosity and self-organizing processes. Clients can explore their issue in a number of ways, for example, one hand may be asked to hold the problem, difficulty or disturbance, then the other hand becomes the natural container for the opposite reflections resolution, ease and comfort.

Through this simple technique, the clients learn to open connections within that engage their natural problem solving and mind body healing processes to their deeper therapeutic self, thereby facilitating his or her shift into a therapeutic consciousness.



