

The Deep Psychobiology of Psychotherapy: Towards a Quantum Psychology of Mindbody Healing (2001-2008)¹

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PERSPECTIVE AND DEFINITION

The Deep Psychobiology of Psychotherapy may be defined as the exploration of mindbody experience, communication and healing all levels from the cultural and psychosocial to the cellular-genetic-molecular and the quantum. It is a highly integrative approach that greatly expands the traditional domains of phenomenological, analytical and cognitive-behavioral psychology to include new insights into creativity, consciousness and the human condition as they are continually updated by research in biology, physics and mathematics. It seeks to break through the Cartesian dualism between mind and body by exploring questions such as these. How is it possible for thoughts, emotions, imagination and personal experience to influence physical health and vica versa? We know that our genes are expressed in our behavior, for example, but to what extent can we have a “psychobiological dialogue” with our genes to modulate how their information is expressed in self-creation and the process of physical healing? How do we facilitate our daily work of synthesizing the organic structure of our

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brain to optimize relationships with ourselves and our neighbors in harmony with the evolutionary informational dynamics of consciousness and cosmos?

HISTORY

The history of The Deep Psychobiology of Psychotherapy began with the author's exploration of the implications of early research in the 1960's and 1970's that documented how the psychological experience of novelty and enriched environments was encoded as new memory and learning in the organic structure of the brain on a molecular level (Rossi 1972/1985/2000). This led to the formulation of the dream-protein hypothesis: "Dreaming is a process of psychophysiological growth that involves the synthesis and modification of protein structures in the brain that serves as the organic basis for new developments in personality."

Within this perspective the essence of psychotherapy becomes a process of facilitating "creative moments" that are encoded in new proteins and neural networks in the brain. But what is a creative moment? Such moments have been celebrated as the exciting 'hunch' by scientific workers and inspiration by people in the arts. The creative moment occurs when a habitual pattern of association is interrupted. There may be a spontaneous lapse or relaxation of one's associative process. There may be a psychological shock, an overwhelming sensory or emotional experience; a psychedelic drug, a toxic condition or sensory deprivation. Yoga, Zen, spiritual and meditative exercises may likewise interrupt habitual associations and introduce a momentary void in awareness. In that fraction of a second when the habitual contents of awareness are knocked out there is a chance for pure awareness and an experience of new awareness or heightened consciousness. This fraction of a second may be experienced as a mystic state, satori, a peak experience or an altered state of consciousness. It may be experienced as a moment of fascination—or falling in love— when the gap in one's awareness is suddenly filled with the new that has been created in a semi-autonomous manner within the deep psychobiology of our being.

From this perspective the new that appears in creative moments is the basic unit of original thought and insight as well as personality transformation. Experiencing creative moments is the phenomenological correlate of a critical change in the molecular structure of proteins within the brain associated with the creation of new cell assemblies, memory and learning. Molecular transformations in the brain in response to psychological shock, arousal and novelty was now recognized by the author as the deep psychobiological basis of psychopathology as well as the educational, constructive and synthetic approach to healing and psychotherapy that had its roots in the early work of

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pioneers such as James Braid in Scotland, Pierre Janet in France, Maurice Bucke in Canada, Carl Jung in Switzerland, Rolando Assagioli in Italy and Milton Erickson in America. James Braid, one of the fathers of hypnosis, for example, attributed the therapeutic effects of trance induction to the “psychophysiology of fascination” which we now regard as a special state of psychobiological arousal and focused attention. Maurice Bucke described the most heightened state of psychobiological arousal as “cosmic consciousness.” He attributed mental illness to a breakdown in the natural process of evolving consciousness. Borrowing from the work of the religious scholar, Rudolph Otto, Carl Jung described heightened states of consciousness in the creative breakthroughs of spiritual innovators, artists and scientists as an experience of the “*numinosum*” (an overwhelming experience of *fascination* with the *mysteriousness* and *tremendousness* of life and the universe).

Some of the most intriguing, innovative approaches to hypnosis and psychotherapy based upon psychological shock, emotional arousal and creative moments were pioneered by the late Milton Erickson and described as follows. “The induction and maintenance of a trance serve to provide a special psychological state in which the patient can reassociate and reorganize his inner psychological complexities and utilize his own capacities in a manner in accord with his own experiential life...therapy results from an inner resynthesis of the patient’s behavior achieved by the patient himself. It is true that direct suggestion can effect an alteration in the patient’s behavior and result in a symptomatic cure, at least temporarily. However, such a “cure” is simply a response to suggestion and does not entail that reassociation and reorganization of ideas, understandings and memories so essential for actual cure. It is this experience of reassociating and reorganizing his own experiential life that eventuates in a cure, not the manifestation or response behaviors [to hypnotic suggestion] which can, at best, satisfy only the observer [and stage hypnotist]” (Erickson, 1948).

CURRENT STATUS

The fundamental question for a deep psychobiology of psychotherapy this, “How do we integrate the many levels of mindbody communication and healing from the psychosocial to the cellular-genetic?” Is it possible to use the concept of “information” and the “transformations of information” to do this? Is it possible to create a new science of “information transduction” that explores how information experienced as human cognitive behavior (thoughts, words, images, emotions, meaning etc.) is transformed into other forms of information expressed as the physical structure of our genes and proteins and visa versa? A major mission of this new science of information transduction is to trace the pathways by which human cognition and emotional

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experience modulates biological processes in health, sickness and the dynamics of mindbody healing.

An interesting step in the creation of this new science of information transduction was pioneered the biologist, Thomas Stonier (1990). A visual summary of his ideas was illustrated by the author (Rossi, 1986/1993) in Figure One. From the broadest perspective the informational dynamics of the evolution of the physical universe as well as living systems is currently described as “getting its from bits” (Wilczek, 1999). That is, how can “its” (the apparently physical, molecular and biological structures of the universe) evolve out of “bits” (binary information) from the quantum flux of the Big

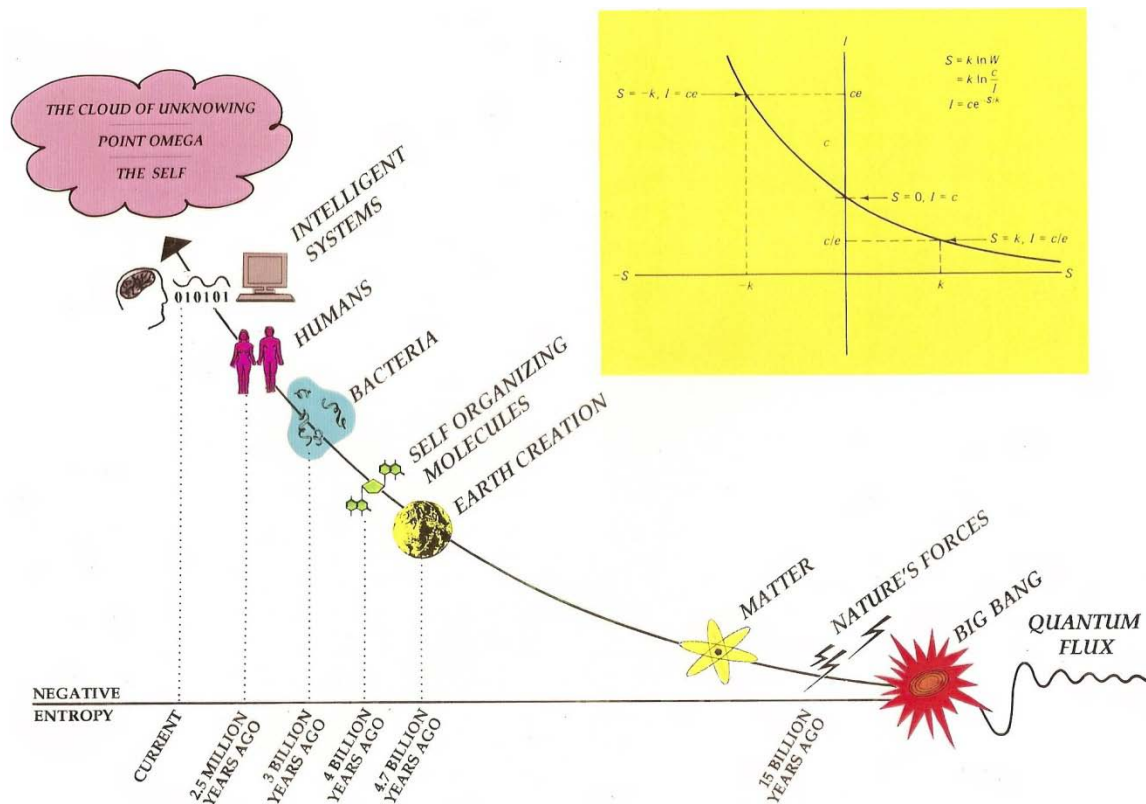


Fig. 1a: The evolution of information transduction from the big bang to consciousness and the psychological self. Notice the natural wave profile at the quantum level (i.e. light waves) that apparently gave rise to the self-similar fractal dynamics of life processes illustrated later in the different time domains of figures five, six, seven, and eight.

Fig. 1b:

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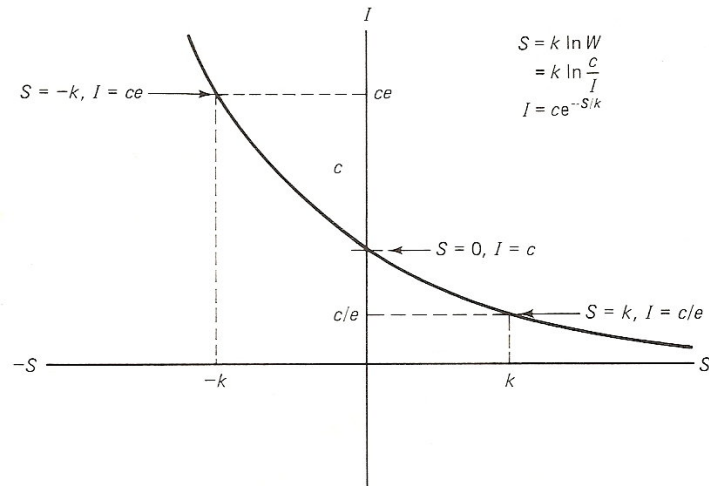
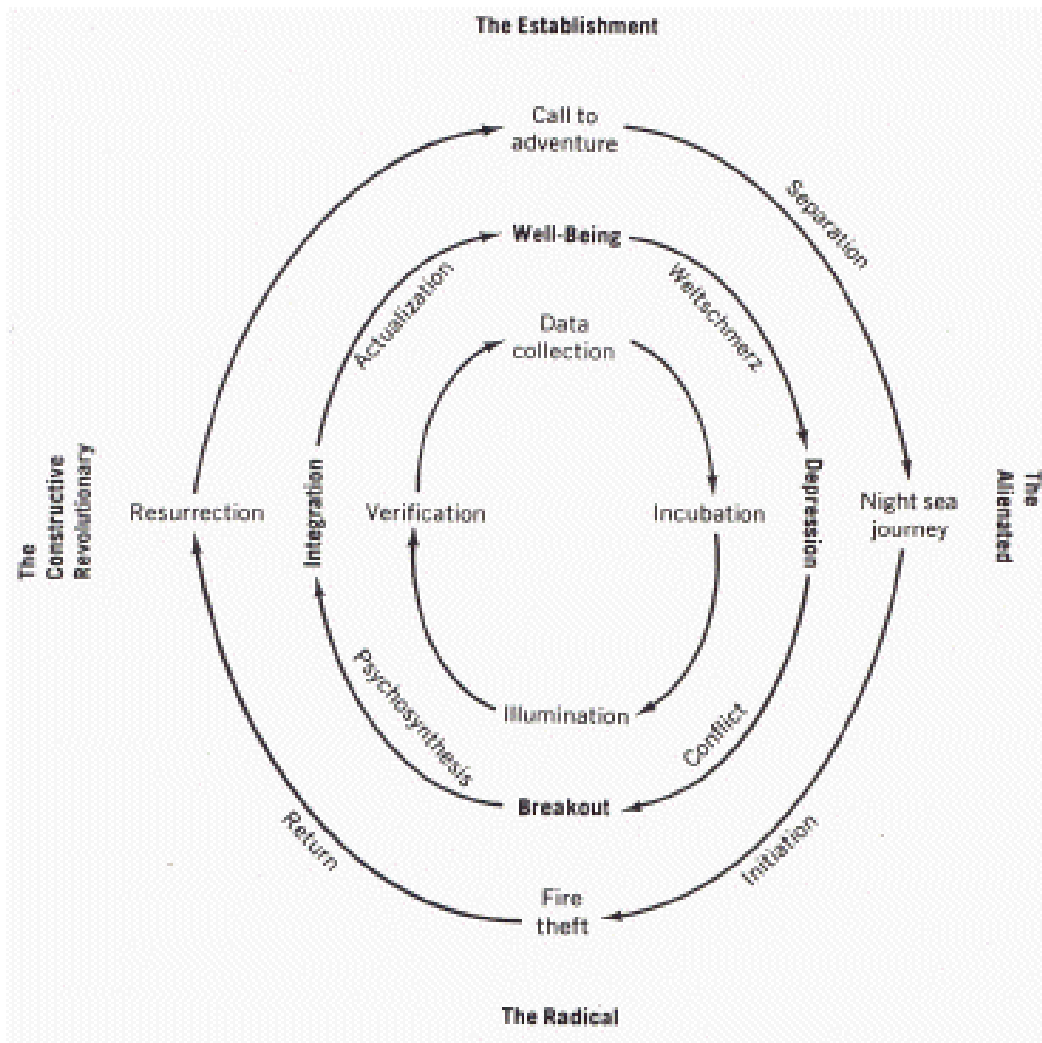


Fig. 2: The Breakout Heuristic in Psychotherapy.



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The French mathematician Henri Poincaré, the originator of *non-linear dynamics* (currently called “chaos theory” and “adaptive complexity theory”), first described the four stage creative process about 100 years ago at the same time that Sigmund Freud and Carl Jung were originating *psycho-dynamics*. This four stage creative process is illustrated in the inner circle of Figure Two. The middle circle of Figure 2 illustrates the Breakout Heuristic as a model of psychotherapy (Rossi, 1972/1985/2000) that corresponds to Poincaré’s creative cycle. The outer circle is a condensation of Joseph Campbell’s monomyth of the cultural dynamics of the hero that corresponds to the same four stage creative process. The outer labels of Figure 2 illustrate how socio-political identity follows the same 4 stage paradigm. Let us now focus on the dynamics of mindbody communication (also called “information transduction”) in this four stage creative process as it is manifest in current theory of the deep psychobiology of psychotherapy.

THEORY

Figure Three illustrates a four stage outline of the complex field of mindbody communication and healing that corresponds to the creative cycle of Figure Two. Let us review these four stages as a foundation for a new understanding of what is actually going on between patient and therapist at the deepest levels of “mind-gene communication” (Rossi, 1972/1985/2000,1986/1993, 1996).

Stage One: MindBrain Information Transduction

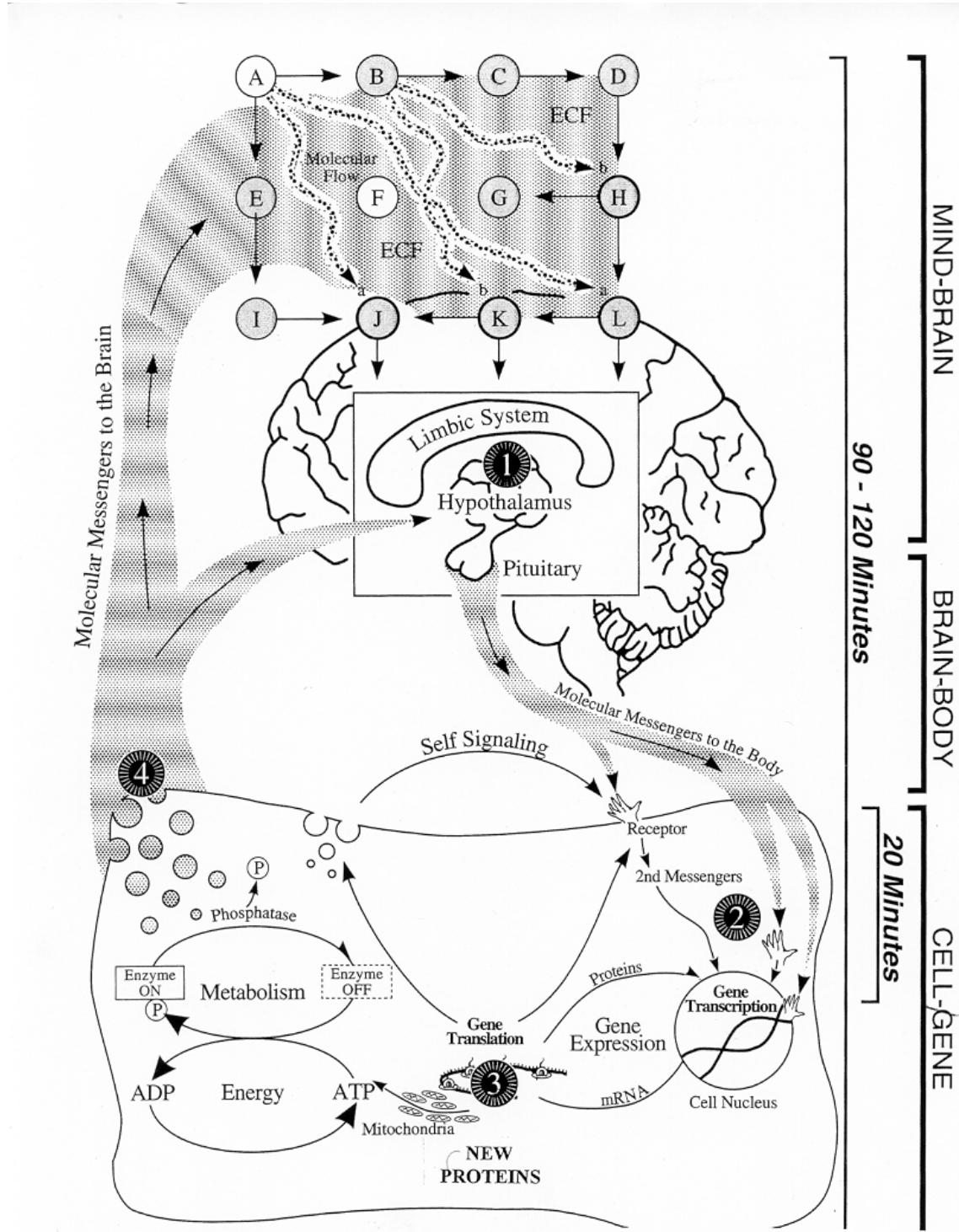
The Limbic-Hypothalamic-Pituitary System is currently recognized as a major information transducer between the brain and the body. Cells within the hypothalamus transduce (transformation information from one form into another) the essentially electrochemical neural impulses of the brain that encode the phenomenological experience of “mind” and emotions into the hormonal “messenger molecules” of the endocrine system. These messenger molecules then travel through the blood stream in a cybernetic loop of information transduction in Figure Three where the four major stages of interest for psychotherapy are numbered.

The complex loop of mindbody communication illustrated in Figure 3 modulates the action of neurons and cells of the body at all levels from the basic pathways of sensation and perception in the brain to the intracellular dynamics of gene transcription and translation. It has been proposed that the molecular messengers (also called “informational substances”) of the endocrine, autonomic and immune systems mediate stress, emotions, memory, learning, personality, behavior and symptoms (Rossi, 1986/1993, 1996). This communication loop is a two way street by which (1) mind can

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modulate physiology of the brain and body and (2) biology can modulate mind, emotions, learning and behavior.

Fig. 3: The Mindbody Communication Loop.



Stage Two: Immediate-Early Genes in Creative Adaptation

A generation ago it was believed that genes were simply the units of physical heredity that were transmitted from one generation to another through sexual reproduction. Today we know that genes have a second major function: a major class of genes, sometimes called, “Immediate-Early Genes,” (also called “Primary Response Genes” or “Third Messengers”) are continuously active in responding to the hormonal messenger molecules signaling the need for creative adaptation to important changes in the environment. Everything from novelty, shock, surprise, touch, sexual stimuli, maternal behavior and psychosocial stress to temperature, food, physical trauma and toxins in the environment can be signaled to the genes via the hormonal messenger molecules that arrive from the limbic-hypothalamic-pituitary system (Merchant, 1965).

Immediate-early genes (IEGs) are the newly discovered mediators between nature and nurture. Immediate-early genes act as information transducers allowing signals from the external environment to regulate genes within the internal matrix of the nucleus of life itself. Many researchers now believe that memories along with new experiences are encoded in the central nervous system by changes in the structure and formation of new proteins within the synapses between neurons (Eriksson et al., 1998). IEGs function as transcription factors regulating the “housekeeping genes” that make the proteins within the neuron that encode new memory and learning (Tölle et al., 1995). More than 100 immediate-early genes have been reported at this time. While many of their functions still remain unknown, neuroscientists are exploring the interrelated biological and psychological functions that immediate-early genes such as *c-Fos* and *c-Jun* are already known to serve as illustrated in Figure Four. Most arousing psychosocial stimuli can induce immediate-early genes within minutes and their main effects are mediated within 20 minutes to an hour or two. A more detailed discussion and complete citation of all the references of Figure four have been published previously (Rossi, 1972/1985/2000).

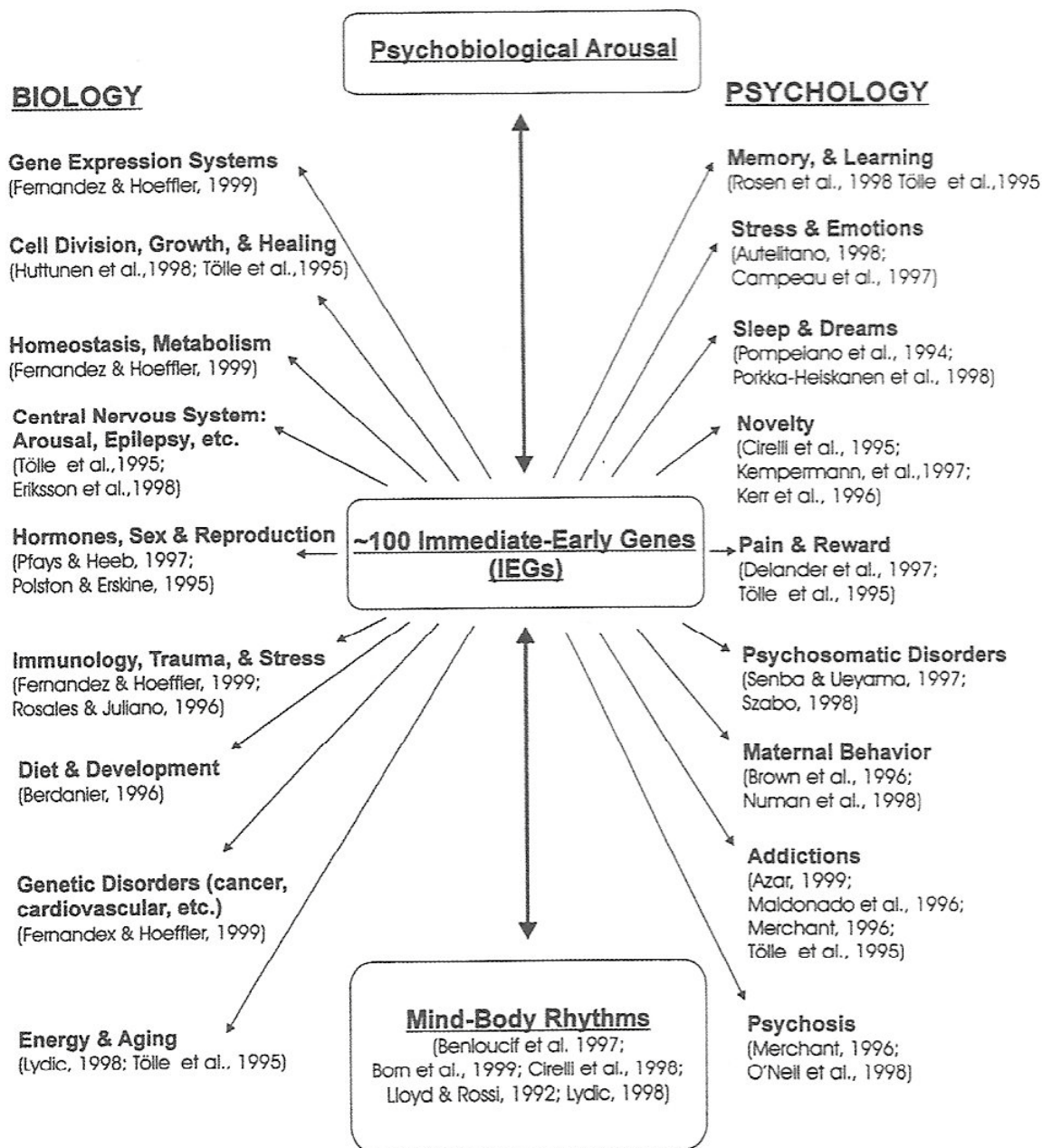
Stage Three: Protein Synthesis in Memory, Stress, and Healing

The third stage in the mind-gene communication loop is the process of gene translation leading to the production of new proteins in Figure Three. The time required to make new proteins in response to psychological arousal and physical stress as illustrated on the right side of Figure 3 provides an important window into the informational dynamics of new approaches to psychotherapy. The domain of psychological time in minutes and hours as illustrated in Figure 3 relates the Basic Rest-Activity Cycle of human behavior to the processes of mindbody communication. This is in sharp contrast to the more recent evolutionary form of more rapid mindbody communication mediated by the central

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nervous system in small fractions of a second that are briefer than the usual phenomenological span of consciousness.

Fig. 4: The central role of immediate-early genes (IEGs) in the deep psychobiology of psychotherapy.



Detailed research on the genetic, neuroendocrinal and psychosocial levels suggests that the 90-120 minute ultradian rhythm (Lloyd & Rossi, 1992, 2008), originally described as the Basic Rest-Activity Cycle by Kleitman, is a more fundamental “work cycle of life” than

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the circadian cycle (the 24 hour rhythm). *Ultradian* in this context means any rhythm faster than the 24 hour circadian cycle; in this chapter we emphasize only the major 90-120 ultradian rhythms on the genetic, endocrine and cognitive-behavioral levels during sleeping, dreaming and creative waking states that have important implications for psychotherapy.

Stage Four: Messenger Molecules and State Dependent Memory

Stage four of Figure 3 illustrates how messenger molecules (such as hormones, neurotransmitters, growth factors, etc.) that have their origin in the processing of the larger protein “mother-molecules” in stage three may be stored within the cells of the brain and body as a kind of “molecular memory.” These molecular messengers are released into the blood stream where they can complete the complex cybernetic loop of information transduction by passing through the “blood-brain barrier” to modulate the brain’s neural networks and psychological experience as illustrated by the block of letters A through L at the top of Figure 3. Such localized neuronal networks of the brain are modulated by a complex field of messenger molecules that can reach the limbic-hypothalamic-pituitary system as well as certain areas of the cerebral cortex. This is a new model of how the sexual hormones, stress hormones, immune system cytokines (messenger molecules like IL-1 and IL-2) and growth factors of the body can modulate mind and emotions and *visa versa*.

If we are willing to grant that communication within the neuronal networks of the brain is modulated changes in the strengths of synaptic connections, then we could say that *meaning* is to be found in the complex dynamic field of messenger molecules that continually bath and contextualize the information of the neuronal networks in ever changing patterns. It is truly amazing to learn, for example, that most of the sexual and stress hormones that have been adequately tested have state dependent effects on our mental and emotional states as well as memory and learning.

Recent research indicates that most forms of learning (Pavlovian, Skinnerian, imprinting, sensitization, etc.) are now known to involve these hormonal messenger molecules from the body that can reach the brain to modulate the neural networks that encode mind, memory, learning and behavior. Insofar as these classical forms of learning use messenger molecules, they *ipso facto* have a “state-dependent component” (Rossi, 1986/1993, 1996).

METHODOLOGY

The methodology of the deep psychobiology of psychotherapy expands traditional psychological research to include all the new approaches of neuroscience. Current research on state-dependent memory, learning and behavior is a clear example. When subjects are given memory and learning tasks while under the influence of stress hormones such as adrenocorticotrophic hormone (ACTH), epinephrine or sex hormones (or even psychoactive drugs that mimic these natural hormonal messenger molecules) there is a varying degree of amnesia when the stress hormone or drug has been metabolized out of the system. That is, when memory is encoded under conditions of high emotional arousal, novelty, sex, stress or trauma, it tends to become state-dependent or statebound to that psychobiological condition. Memory and learning is state dependent on the original psychobiological conditions when it was first encoded. This state-dependent memory becomes dissociated or apparently "lost" after the person apparently recovers when the stress or sexual hormones are metabolized and return to normal levels. Reactivating stress or sex in another context, however, has a tendency to reestablishes the original encoding condition with varying degrees of emotion and memory of the trauma. This is the psychobiological basis of much psychopathology related to early sexual and stressful life events as uncovered by classical psychoanalysis. This illustrates how state-dependent memory, learning, and behavior (SDMLB) bridges the Cartesian dichotomy between mind and body.

From a psychotherapeutic perspective, what is most interesting about these experiments is that they enable us to study the parameters of "reversible amnesia," which have been important criteria in understanding the phenomenology of psychoanalysis and therapeutic hypnosis (Rossi, 1986/1993, 1996). Most experiments in state-dependent memory and learning demonstrate that this "reversible amnesia" is only partial. That is, there is usually some memory and learning available even in the dissociated condition after the stress hormones return to normal levels) so most of the hypnotic literature documents that hypnotic amnesia is usually fragile and partial in character. A full amnesia that is completely reversible is relatively rare in state-dependent memory and learning experiments as well as in psychoanalysis and therapeutic hypnosis. In the historical literature of hypnosis and psychoanalysis this same fragile and partial character of reversible amnesia may have been responsible for many of the puzzling and paradoxical features of memory that remain the source of continuing controversy that challenges the validity of the various theories of depth psychology. Since the earliest days of psychoanalysis it has been noted that a sudden fright, shock, trauma and stress could evoke "hypnoidal states" that were somehow related to amnesia, dissociated and neurotic behavior. We now know they can activate the dynamics of mind-gene

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communication and state-dependent memory, learning and behavior (Rossi and Cheek, 1988).

Psychoimmunology and the Mindbody Connection

The most comprehensive demonstration of how psychosocial stress can modulate gene transcription was demonstrated by the research team of Ronald Glaser (1990, 1993) at Ohio State Medical School. His research traces the effects of psychological stress (experienced by medical students during academic examinations) on the transcription of the Interleukin-2 receptor gene and interleukin-2 production. These researchers documented the path of information transduction illustrated in Figure 3 from (1) the limbic-hypothalamic-pituitary system's hormones (primary messengers) that trigger (2) cell receptors to initiate (3) a cascade of secondary messengers (cAMP) that mediate gene transcription which leads to messenger ribonucleic acid (the mRNA "blueprint" of the gene) production and the synthesis of new proteins that leads to the formation of (4) other hormonal messenger molecules that in turn flow back to the brain to modulate mind, memory, emotions and behavior in a state dependent manner.

A major challenge for fundamental research in psychobiologically oriented psychotherapy is to document how a positive psychotherapeutic intervention designed to reduce psychosocial stress could lead to a facilitation of the transcription of the interleukin-2 receptor gene and its translation into the interleukin-2 protein that functions as a messenger molecule in the immune system. This research would become a new paradigm of mindbody healing. It has profound significance for a general theory of mindbody communication and healing when we realize that other medical researchers (Rosenberg and Barry, 1992) have found that interleukin-2 is a messenger molecule of the immune system that signals white blood cells (cytotoxic T-cells) to attack pathogens and cancer cells. Thus, the traditional medical model of research represented by Rosenberg finds the same foundation of mindbody communication at the level of gene expression as the new field of psychoimmunology represented by Glaser. I propose that this will become the new criterion for evaluating all forms of mindbody healing in the future –biofeedback, body therapies, message, meditation, imagery, active imagination, hypnosis, prayer, ritual or whatever. Whatever the holistic method of mindbody healing, we can test whether it really facilitated mindbody communication and healing simply by taking a blood sample to determine whether a healing gene transcription actually took place with the very easy and reliable tests to determine whether immediate-early genes and mRNA is made so that new proteins and hormones could be synthesized for growth, healing and new phenomenological experiences of consciousness (Rossi, 1972/1985/2000).

APPLICATIONS

When the 90-120 ultradian cycle of mindbody communication of Figure 3 is unfolded over time we get graphs of the alternating ultradian rhythms of activity and rest on the genetic, endocrine and cognitive-behavioral levels as illustrated on the lower part of Figure Five. This coordination of the diverse systems of traditional psychobiology via their time parameters has been called the “Unification Hypothesis of Chronobiology” (Lloyd & Rossi, 1992). This new understanding of the chronobiology from the molecular-genetic to the cognitive-behavioral levels may be taken as a new data base for understanding the dynamics of mindbody communication and healing in psychotherapy.

The lower part of Figure Five summarizes the alternating 90-120 minute ultradian rhythms of the awake and sleep states that have their ultimate foundation in gene expression in a simplified manner. The ascending peaks of Rapid Eye Movement (REM) sleep characteristic of nightly dreams every 90-120 minutes or so are illustrated along with the more variable ultradian rhythms of activity, adaptation and rest in the daytime. Figure 5 also illustrates how many hormonal messenger molecules of the endocrine system such as *growth hormone*, the activating and stress hormone *cortisol* and the sexual hormone *testosterone* have a typical circadian peak at different times of the 24 hour cycle. Because the non-linear chronobiological release of many of these hormones are recognized as having profound state dependent effects on memory, learning, emotions and behavior throughout the day, it is important to consider their relevance for psychotherapy.

An interesting example of the theoretical and practical implications of such chronobiological relationships between hormones and behavior is the so-called “human alarm clock” effect. It has been found that people who are able to awaken in the morning at a specific time experience a greater release of cortisol and adrenocorticotropin in their blood stream just before their alarm clock rings (Born et al., 1999). As illustrated in Figure 5, however, there is a normal peak in cortisol just before awakening in the morning. This implies that the *conscious intentionality* to awaken at a specific time in the morning is able to utilize a normally *involuntary circadian hormonal rhythm* to control the desired behavior of awakening at a certain time. We have long known that body processes can modulate conscious experience and behavior; the human alarm clock effect clearly documents the reverse—a conscious intentionality can modulate a normally involuntary circadian hormonal rhythm of messenger molecules throughout the body. It is precisely this reciprocal relationship between mind and body that is the deep psychobiological basis of information transduction, mindbody communication and healing in psychotherapy.

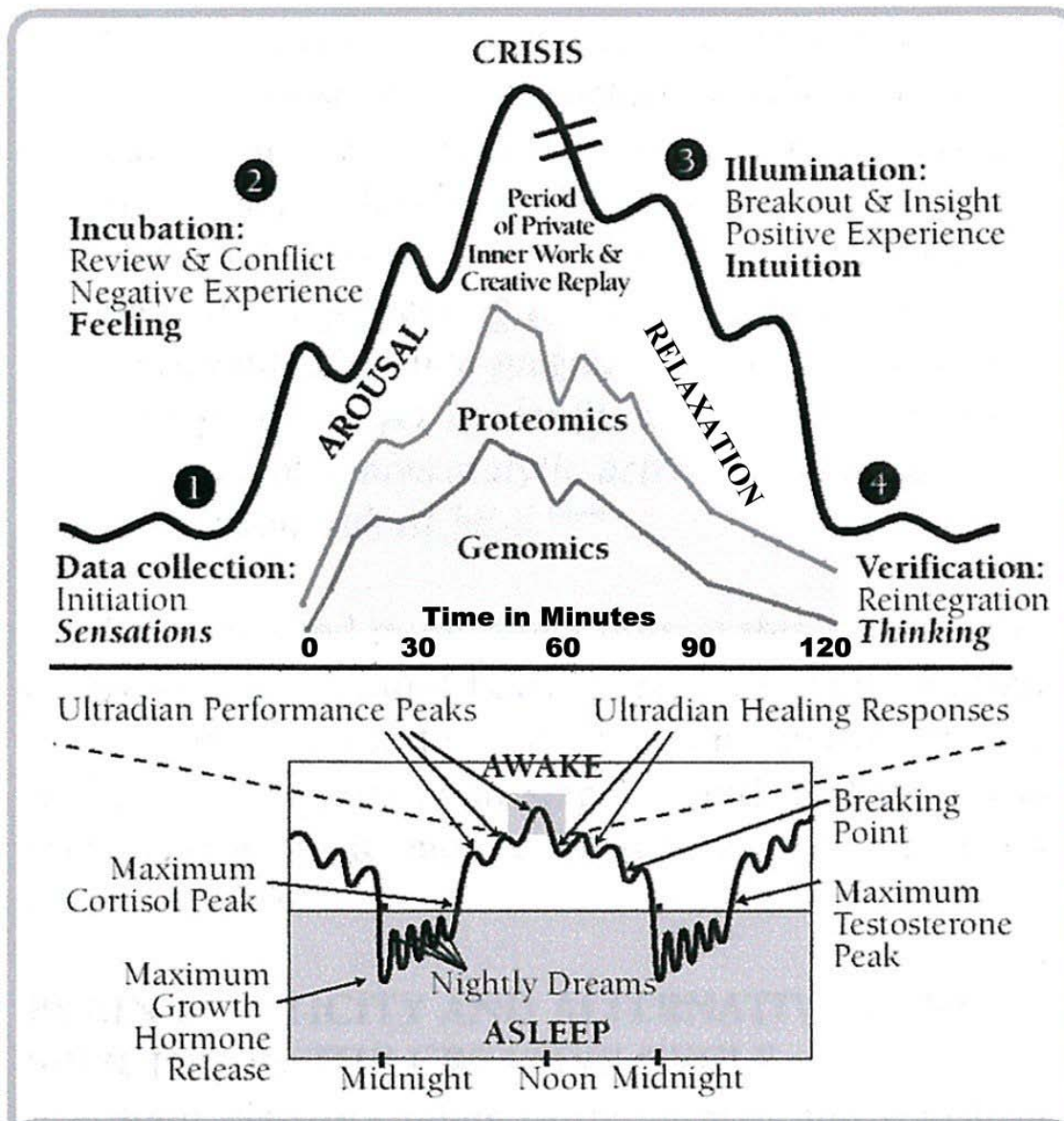


Fig. 5: The natural 90-120 minute pyramidal wave profile of the basic-rest-activity cycle of consciousness, sleep, and dreaming. Notice how this profile also illustrates the four stages of the creative process in everyday life and the deep psychobiology of psychotherapy on all levels from mind to gene (genomics) and protein folding (proteomics). The lower diagram summarizes the alternating 90-120 minute rhythms of waking consciousness, sleep, and dreaming over a 24 hour day. The upper part of the diagram illustrates the four stage creative process of psychotherapy as the utilization of one of the natural 90-120 minute basic rest-activity cycle experienced throughout the daily circadian cycle illustrated in the lower diagram.

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The upper part of Figure 5 illustrates my conjecture that the natural unit of psychobiologically oriented psychotherapy may be a utilization of one natural 90-120 ultradian cycle of activity and rest. Research has documented how the ultradian peaks of cortisol secretion that lead to psychophysiological states of arousal every 90-120 minutes or so throughout the day (that I label as "Ultradian Performance Peaks" in Figure 5) are typically followed after about 20 minutes by ultradian peaks of beta-endorphin that lead to rest and relaxation that I label as "Ultradian Healing Responses" (Rossi & Nimmons, 1991). It appears as if nature has built in a natural but flexible and highly adaptive ultradian rhythm of activity, rest and healing, the "work cycle of life" mentioned above, every 90-120 minutes.

What, exactly, is the "work" that is done in each 90-120 minute ultradian cycle? I propose that the essence of such work is the formation of new proteins for a creative response to changing environmental conditions, stress and healing. The basic implication of the deep psychobiological dynamics of new protein formation and healing in psychotherapy is that *what has been traditionally called "counseling" or "therapeutic suggestion" may be, in essence, the accessing, entrainment and utilization of ultradian/circadian processes that respond to psychosocial cues.* Within this framework, the classical phenomena of hypnosis may be conceptualized as extreme manifestations and/or perseverations of time-dependent psychobiological processes that are responsive to psychosocial cues (Rossi, 1996). *What the biologist calls the "entrainment of ultradian and circadian rhythms on all levels from the cognitive-behavioral to the cellular-genetic by physical and psychosocial stimuli" is the deep psychobiological basis of what psychotherapists call "suggestion to facilitate creativity and mindbody healing."* This leads us to the formulation of new mathematical models of therapeutic hypnosis and psychotherapy (Rossi, 1972/1985/2000, 1996).

Figure five outlines the four stages of the creative process as it is typically experienced every hour and a half or two in everyday life (Rossi and Nimmons, 1991). Throughout the day, particularly during the low phase of the ultradian rhythm, we all have a choice as to how we shall proceed with our natural psychobiological phases of consciousness, creativity, performance and healing. We can heed nature's call to take a healing break to experience what I call the "Ultradian Healing Response." This is often the best time to practice a natural form of self-hypnosis, meditation, deep self-reflection and holistic healing. If we persistently choose to ignore nature's call for rest and restoration at such times, however, we will fall into the "Ultradian Stress Syndrome" where we are prone to experience the genesis of psychosomatic symptoms and the typical dynamics of Freud's psychopathology of everyday life. Table One shows how to recognize the differences

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between the Ultradian Healing Response and the Ultradian Stress Response in everyday life for both our clients and ourselves.

Table 1: The Ultradian Healing Response and the Ultradian Stress syndrome as they are experienced in everyday life.

THE ULTRADIAN HEALING RESPONSE	THE ULTRADIAN STRESS SYNDROME
<p>1. <i>Recognition Signals</i> An acceptance of nature's call for your need to rest and recover your strength and well-being leads you into an experience of comfort and thankfulness</p>	<p>1. <i>Take-a-Break Signals</i> A rejection of nature's call for your need to rest and recover your strength and well-being leads you into an experience of stress and fatigue.</p>
<p>2. <i>Accessing A Deeper Breath</i> A spontaneous deeper breath comes all by itself after a few moments of rest as a signal that you are slipping into a deeper state of relaxation and healing. Explore the deepening feelings of comfort that comes spontaneously. Wonder about the possibilities of mind-gene communication and healing with an attitude of "dispassionate compassion."</p>	<p>2. <i>High On Your Hormones</i> Continuing effort in the face of fatigue leads to the release of stress hormones that short-circuits the need for ultradian rest. Performance goes up briefly at the expense of hidden wear and tear so that you fall into further stress and a need for artificial stimulants (caffeine, nicotine, alcohol, cocaine, etc</p>
<p>3. <i>Mindbody Healing</i> Spontaneous fantasy, memory, feeling-toned complexes, active imagination, and numinous states of being are orchestrated for healing and life reframing.</p>	<p>3. <i>Malfunction Junction</i> Mistakes in performance, memory and learning; emotional problems become manifest. You may become depressed or irritable and abusive to self and others.</p>
<p>4. <i>Rejuvenation & Awakening</i> A natural awakening with feelings of serenity, clarity and healing together with a sense of how you will enhance your performance and well-being in the world.</p>	<p>4. <i>The Rebellious Body</i> Classical psychosomatic symptoms now intrude so that you finally have to stop and rest. You are left with a nagging sense of failure, depression and illness.</p>

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CASE EXAMPLE

Examples of how a deep psychobiological model of the four stage creative process may be utilized in practical psychotherapy have been described in detail (Rossi, 1972/1985/2000, 1985/1993, 1996, 1996). In the case example presented here I propose a *highly speculative outline* of how the four stages of mindbody information transduction and healing illustrated in Figures 2, 3, and 5 may be experienced in the four stages of “the deep psychobiology of psychotherapy.” It will probably require a millennium of research to clarify the facts and fallacies of this view of mindbody communication and healing in a scientifically acceptable manner.

Stage One: Initiation

A woman in her thirties experiencing a period of emotional transition and stress suddenly begins to experience unusual and uncomfortable sensations of heat in her vagina. Medical examination indicates that she is having an outbreak of vaginal herpes for the first time in her life. She claims she has had no new sexual partners for over three years and her current partner has apparently been faithful. She is emotionally overwhelmed by this unexpected symptom that has the numinous effect of focusing her consciousness inward in an entirely natural manner. Recognizing this, the therapist initiates her into *The Symptom Path to Enlightenment* (Rossi, 1996) by introducing her to symptom scaling, “On a scale of one to ten where ten is the worst you have ever experienced that heat and five is average, just how strong is your sense of heat in your vagina right now?” She replies that the heat is “Seven right now,” and crosses her legs with a facial grimace of distaste. The therapist asks her, “Do you have the courage to really receive honestly just what you are feeling right now so you can fully experience what it leads to next?” This seemingly simple but *numinous* question focuses her attention on her symptoms as mindbody signals that will eventually be transduced into healing and emotional insights as we shall soon see.

Stage Two: Incubation and Arousal

She responds with her impression that the symptom of herpes is the source of the heat she is feeling and it seems to be getting worst by the minute as she focuses on it with growing *fascination*. The therapist supports this development by slowly and quietly murmuring an incomplete sentence, “I wonder if you can allow that to continue until...?” Her eyes close as she apparently focuses inward. Her body tenses and she leans forward slightly over the next twenty minutes, or so, as she hesitantly becomes engaged in an “active imagination” wherein she whispers the following series of apparently spontaneous symptomatic transformations (that is, mindbody information transduction) and free associations with many pauses, “Now the heat is shifting around a little to my

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butt on the left cheek.....now heat is moving through my body everywhere...it's like a burning allergy.....my head hurts.....feels like an outbreak of psoriasis on my scalp.....I feel like I should confess it all to my mother like I did as a kid.....my right shoulder aches.....Why is my right side trembling?.....Why am I starting to cry?.....Why do I still try to get approval from my mother even when she never gave it but only punished me instead?.....I'm burning up with heat all over!"

From a psychobiological point of view the heat she is experiencing indicates that she is going through a rather intense state of sympathetic system arousal as she experiences what has been traditionally called an "emotional catharsis or crisis." This is the state of "arousal" illustrated as stage 2 in Figures 2, 3, and 5 above. The hormonal stress messenger molecules of the limbic-hypothalamic-pituitary-adrenal system are being released into the blood stream where they travel to cells of the brain and body where they trigger receptors and initiate cascades of secondary messengers to signal the activation of immediate-early genes (IEGs). These IEGs turn on certain target genes to send their mRNA blueprints the cell's protein factories where stress and healing proteins are made. Many of the stress proteins and hormones produced at this time are the same as those that were released during previous real life trauma when they were responsible for encoding memories in a state-bound form. This new release of these stress hormones in the context of psychotherapy reactivates her original traumatic state just enough to reawaken the apparently lost state-bound memories with tears and the potential for a *creative moment* with a fresh perspective on her life.

Stage Three: Illumination and Insight

For a few tense minutes she continues with, "*Burning! Burning! I know.....I know I have to leave [her current boyfriend]. I always knew it was only temporary, really, but now I really do have to leave.....He punishes me too, even when he doesn't know it.....my left knee is twitching uncontrollably.....Can't you make it stop?.....Oh, I'm tired of all this.....I will leave.....I'm getting sleepy.....I feel warm.....just warm now.....I really have to leave [boyfriend]."* Her body sags back and she remains silent for about three or four minutes as her face gradually becomes calm, smooth and relaxed.

A profound psychobiological transition is now taking place which is indicated with the two line break just past the crisis peak in the upper diagram of Figure Five. At this time no one really knows what is happening in this *Period of Private Creative Inner Work* at the moment of a creative cognitive-emotional breakthrough (as verbalized above when she realizes that she must leave her boyfriend). The author originally proposed "*The neuropeptide hypothesis of consciousness and catharsis*" to describe the dynamics of such creative moments. From the psychobiological perspective, the arousal and

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relaxation phases of inner work are mediated by the release of messenger molecules such as ACTH and B-endorphin. The implication of more recent research suggests that immediate-early genes such as *c-fos* and *c-jun* are turned on in brain cells during emotional pain and arousal during the crisis of transition between stress and the release of relaxation hormones (Lydic, 1998). This arousal may lead to the synthesis of new proteins that will connect synapses bridging neural networks that will become the cellular-molecular basis of a new psychological insight and healing as illustrated in stage three of Figures 2, 3 and 5.

Stage Four: Verification and Reintegration:

The therapist looks at the clock and with a mild sense of concern notices there is only ten minutes left to the session. He clears his throat and murmurs, *“Yes, and is that still going well?”* After a moment she shifts her feet, nods her head yes, adjusts her posture to a more normal sitting position, blinks a bit and finally opens her eyes as if awakening from a trance. The therapist then asks, *“And I wonder what number describes what your level of comfort is now?”* Somewhat surprised she acknowledges that her symptoms are now at a level of “one or two or maybe zero”, that is, very close to complete comfort. She explains it is no longer a feeling of heat in her vagina, but rather a feeling of warmth, or is it a slight pressure, or a knowing somehow? From a psychobiological point of view she has moved past her state of arousal and catharsis in stage two and emotional insight in stage three to a state of comfort and parasympathetic relaxation in stage four that is so characteristic of what people typically feel when “a job is well done.”

The therapist asks if she now knows what she has to do and she nods yes. She makes a few remarks about how she experiences a sense of relief in knowing that she now can make up her own mind with confidence about the important things in her life. She will leave her boyfriend and later she will tell others about it. By the next session a week later she reports that she has navigated the separation well. The herpes and burning sensations are apparently gone. At this time we can only speculate about how the shifts in the hormonal and immune system messenger molecules may have modulated the psychobiological state of her vaginal mucosa so that her symptoms and the virus go into remission. A year later she remains symptom free and all available evidence indicates that her life was effectively “turned around” in this single psychotherapeutic session.

A 2008 Update

The Wave Nature of Consciousness and Protein Dynamics: Toward a Quantum Psychology

Since this chapter was first published about a decade ago its integrative concepts have received increasing investigation. In figure six, for example, Balch et al (2008) have illustrated the natural pyramidal wave profile of protein dynamics on the millisecond time domain that is consistent with a similar pyramidal wave profile of the basic-rest-activity cycle of consciousness, sleep, and dreaming of figure five that was originally formulated and published a generation ago (Rossi, 1986/1993; Rossi & Nimmons, 1991).

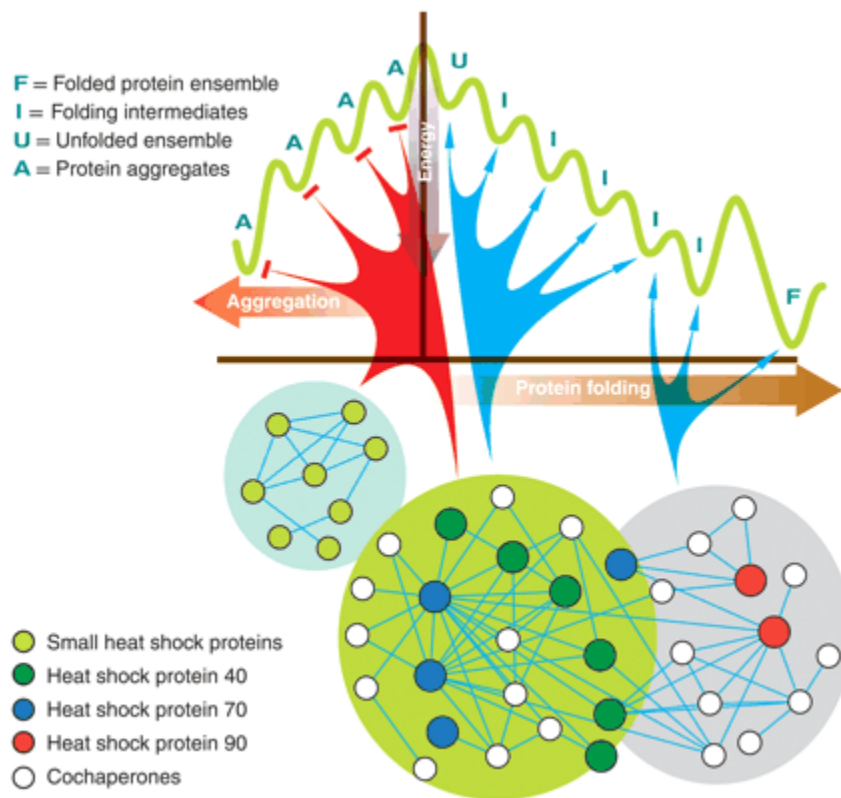


Fig. 6. A profile of the natural dynamics of the chaperone/cochaperone-assisted folding and aggregation prevention pathways (red arrow) that creates the three dimensional structure necessary to carry out the life functions of all living cells at the molecular level. Many chaperones and cochaperones interact with each other as illustrated by the circular maps in green, white & gray. (With permission from Science, Balch et al. 2008). Notice how the pyramidal wave profile of these

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molecular dynamics of life at the genomic/protein levels in the millisecond time domain closely resembles the pyramidal wave profile of the basic-rest-activity cycle of consciousness, sleep, and dreaming originally illustrated in figure five.

I speculate that (1) the striking similarity of this pyramidal wave profile of life at the fundamental level of genomic and proteomic dynamics in the millisecond time domain and (2) the basic-rest-activity cycle of consciousness sleep and dreaming in the 90-120 minute time domain is not a random coincidence. It is the basis for making two conjectures about the foundations of quantum psychology.

I first propose a mathematical conjecture: The pyramidal wave profile of life in the millisecond time domain at the genomic and proteomic level and the basic-rest-activity cycle of consciousness, creativity, sleep and dreaming in the 90-120 minute time domain is an example of the self-similar fractal nature of life processes on all levels from mind to gene (Rossi, 1996).

I now propose second conjecture: The wave form profile of the self-similar fractal nature of life processes were originally generated at the quantum level. While the scientific evidence for this conjecture is certainly scant at this time, a program of research lead by Alan Moffitt (Moffitt, Kramer, & Hoffmann, 1993) at the Laboratory of Sleep and Chronopsychology at Carleton University, Ontario, Canada based, in part, on my previous research on dreams (Rossi, 1972/1986/2000), provides some rational for this quantum conjecture.

The significance of protein dynamics in life processes at the molecular/genomic level illustrated in figure six is described by Balch et al. (2008) as follows:

*“The protein components of eukaryotic [human] cells face acute and chronic challenges to their integrity. Eukaryotic [human] protein homeostasis, or *proteostasis*, enables healthy cell and organismal development and aging and protects against disease. Here, we describe the proteostasis network, a set of interacting activities that maintain the health of proteome and the organism. Deficiencies in proteostasis lead to many metabolic, ontological, neurodegenerative, and cardiovascular disorders. [p. 916]*

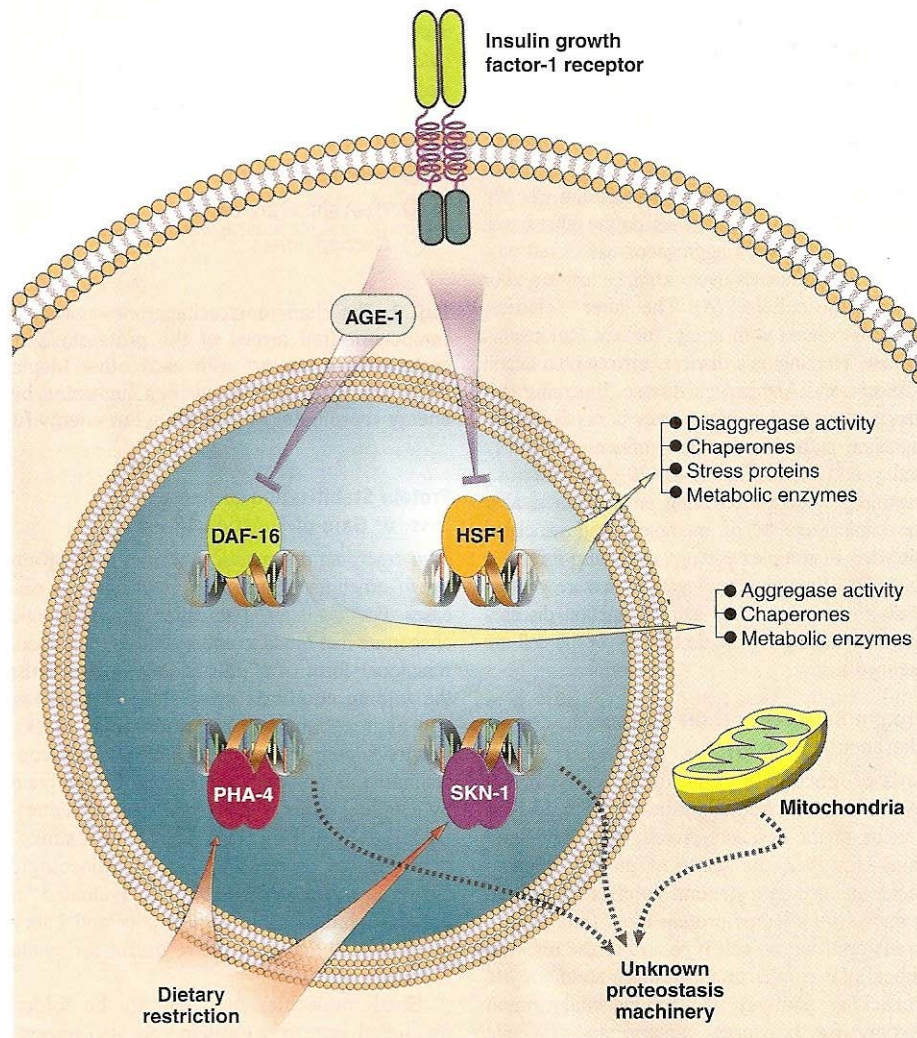


Figure 7: Signaling pathways that control longevity and youthfulness strongly influence proteostasis. The insulin growth factor-1 receptor signaling pathway negatively regulates the activity of the transcription factors DAF-16 and HSF-1. HSF-1 regulates the transcription of stress response proteins, including chaperones, as well as a protein disaggregase activity. DAF-16 also mediates chaperone expression and appears to regulate an active aggregase activity. The dietary restriction pathway is known to suppress proteotoxicity in rodent models, which suggests that this pathway(s) also influences proteostasis. In a fourth mechanism, a decline in the flux through the mitochondrial electron transport chain results in extended life span; however, the links to proteostasis, if any, are unknown (With permission from Science, Balch et al. 2008).

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“Proteostasis refers to controlling the concentration, conformation, binding interactions (quaternary structure), and location of individual proteins making up the proteome by readapting the innate biology of the cell, often through [gene] transcriptional and translational changes [figures 6 & 7].

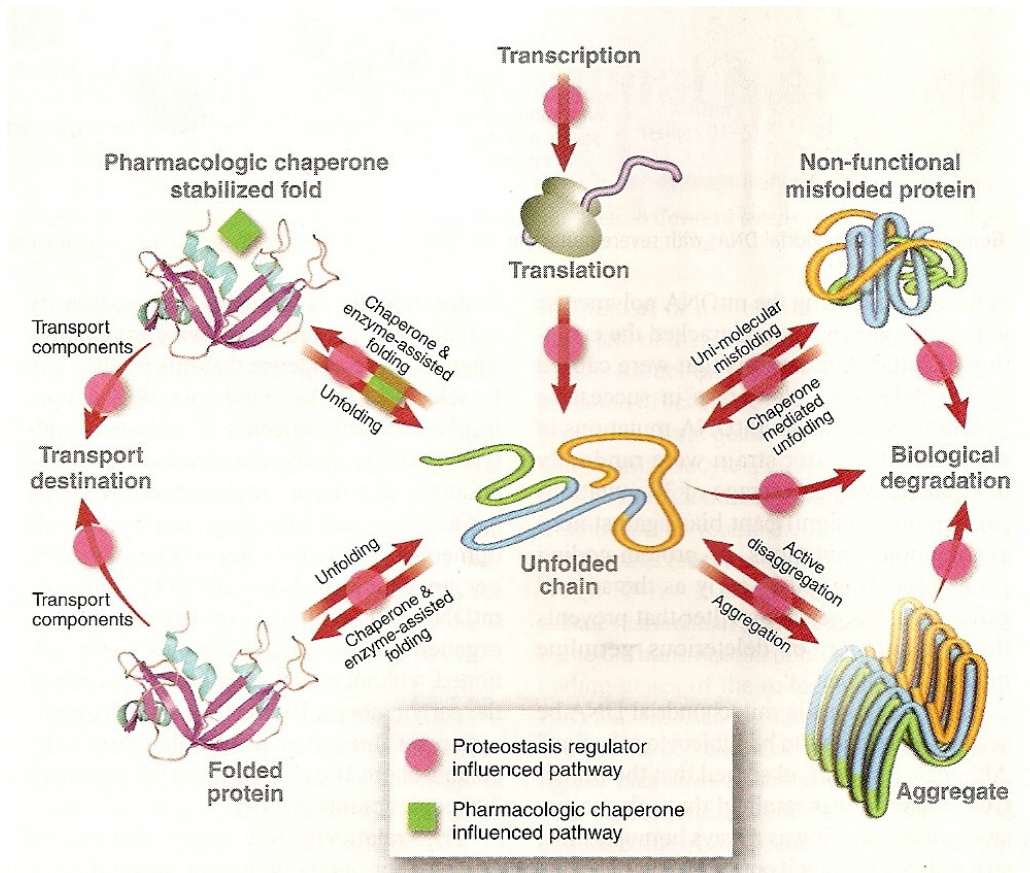


Figure 8: A proteostasis network comprising pathways represented by the red arrows. Imbalances in proteostasis often lead to disease and, therefore, proteostasis regulators (magenta circles) that manipulate the proteostasis pathways/network can restore protein homeostasis and ameliorate both loss-and-gain of function diseases. A finite population of the folded conformational ensemble is required for pharmacological chaperones (green squares) to enhance folding and trafficking, through a mechanism distinct from the innate biological pathways influenced by proteostasis regulators (ribonuclease A is shown; Protein Data Bank ID, 2BLP). (With permission from Science, Balch et al. 2008).

“Proteostasis thus influences specific cellular functions and enables differentiated cells to change their physiology for successful organismal

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development and aging in the face of constant intrinsic and environmental challenges to prevent disease onset. [p. 916]

“Proteostasis is influenced by the chemistry of protein folding/misfolding and by numerous regulated networks of interacting and competing biological pathways that influence protein synthesis, folding, trafficking, disaggregation, and degradation. Herein, we examine a growing body of evidence suggesting that adapting the cellular proteostasis network by using “proteostasis regulators” can partially correct proteostatic deficiencies that contribute to a broad range of human diseases, some that present at birth, but most upon aging. [p. 916]

The challenge of the deep psychobiology of psychotherapy and neuroscience today is to bridge the ever narrowing mindbody gap to facilitate practical “top-down” approaches to problem solving and healing that embrace all levels from quantum, molecule, genes, and brain to mind and consciousness. For continuing insights and updates of this profound saga see *The New Neuroscience of Psychotherapy, Therapeutic Hypnosis & Rehabilitation: A Creative Dialogue with our Genes*, a free book on our website www.ErnestRossi.com.

SUMMARY

This chapter outlines currently evolving views of how complex, self-organizing systems of communication across all levels from the quantum and molecular-genomic to consciousness could eventually generate a unified theory of psychotherapy. A deep psychobiological perspective on psychotherapy that is consistent with much of the classical theory of psychoanalysis and psychosomatic medicine as well as the modern neuroscience of memory and learning at the cellular-genetic level is proposed. This integration of theory and research, which generates a new model of how we may utilize the four stage creative process to facilitate mindbody healing, may seem visionary to some. Such an integrative visionary ideal on all levels from mind to gene and protein folding, however, may be just what we need to develop truly new and inspired approaches to psychotherapy in the new millennium.

New Horizons on Life, Logic and Information (2008 Update)

Paul Nurse (2008), was awarded the 2001 Nobel Prize in Physiology or Medicine, recently wrote what we may regard as an update to this essay on the Deep Psychobiology of Psychotherapy in the following quotes.

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“Biology stands at an interesting juncture. The past decades have seen remarkable advances in our understanding of how living organisms work. These advances have been built mostly on molecular biology: applying the idea that the gene is the fundamental unit of information and that chemistry provides effective mechanistic explanations of biological processes... (p. 424).

“The logic circuits that operate within cells need to be broken down into the individual segments that carry out specific computational functions [of information flow]. I shall call these segments ‘logic modules.’ One example of such a module is the negative feedback loop, which often acts in a homeostatic manner. *Another example is the positive feedback loop, which can generate irreversible switching behavior from one state to another. Combinations of modules will produce more sophisticated outcomes: for example, reversible toggle switches, timers, and oscillators.*

“The behavior of the outputs from modules will be influenced by the shapes of the response curves embedded within them, with the outputs generated depending on whether, for example, the curves are linear, hyperbolic or sigmoidal. Modules could act as a short-term memory device, as seen in a G protein locked in a GTP-bound state, or as a long-term digital memory device as seen in the case of DNA. The identification of the logic modules used in cellular systems will allow a catalogue to be generated that defines the logic ‘tool kit’ that is available to cells... (p. 425, ital added here).

Paul Nurses comments on the general response curves that are generated by the logic circuits of the cells of life has profound implications for the shape of Stonier and Rossi’s figures 1a and 1b in this essay that summarizes the flow of information transduction from the Big Bang to biological Life and Jung’s concept of the Self. Paul Nurse’s concepts may be used to describe how we could eventually calculate the circadian and ultradian curves of the 4-stage creative process illustrated in figure 5 of this essay on The Deep Psychobiology of Psychotherapy with differential equations as follows.

“The initial identification of the logic modules operating in cells requires detailed biochemical descriptions of the interactions between different molecular components. Knowledge of the rate constants and strengths of interactions allows models to be built and differential equations to be generated and solved... As we learn more about how molecules interact to generate logic modules it may become less necessary to know the

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details of the rate constants and the molecular concentrations and to solve the differential equations they generate. If detailed modeling reveals that certain molecules wired together in particular ways are often associated with specific modules, then it might become possible to predict some behaviors without having precise measurements of the variables involved. Simply knowing which molecular components are present and how they are linked together might be sufficient to speculate about which logic modules are in operation... *Finally, the modules will be linked together into a complete circuit, allowing outputs to be predicted so that the functioning circuit can be translated into a narrative of information flow to describe how the cellular phenomenon works...* (p. 455-456, ital added here).

To complete this 2008 update of *The Deep Psychobiology of Psychotherapy*, we need only generalize Paul Nurse's words, "*a narrative of information flow to describe how the cellular phenomenon works*" to describe how consciousness operates the psychological level. This would complete the flow of information transduction between all the salient levels described in this essay from the quantum and molecular to the gene, the creative process, and the life of the mind (Lloyd & Rossi, 1992, 2008; Rossi, 2002, 2004, 2007).

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