

Published in *Annals of the American Psychotherapy Association*, Spring 2005, vol.8 (1), 4-11.

"This conceptual review celebrates the centennial of the *annus mirabilis*, 1905, when Einstein submitted five papers to *Annalen der physik* (the premier German physics journal) that introduced our current holistic perspective of space-time and theories of everything. Adopting Einstein as my mentor, I illustrate in this article the classical 4-stage creative process as a model of psychotherapy that now encompasses the neuroscience of gene expression and brain plasticity as a new holistic perspective of art, culture and philosophy."

**Words: 4,506**

### **Einstein's Eternal Mystery of Epistemology Explained:**

#### **The Four Stage Creative Process in Art, Science, Myth & Psychotherapy**

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#### **Abstract**

Einstein's eternal mystery of epistemology - how we can understand the world - is explained as a dynamic cycle of human creativity that engages gene expression, new protein synthesis, and brain plasticity. The classical 4-stage creative process in the arts and sciences is adapted as a positive model for highly focused short term psychotherapy wherein people learn to solve their own problems in their own way on all levels from social relationships to the interaction between mind, brain, and gene expression.

Psychotherapists would be wise not to buy the controversial image of being the know-it-all-answer-person of the popular media. As psychotherapists we really know only one thing: How to enjoy empowering others to discover and facilitate their own evolving style of creativity with implicit processing heuristics that turn on gene expression, brain plasticity and mind-body healing in response to the natural challenges, stresses and traumas of life that crowd the growing edge of our consciousness.

**Key Words:** art, brain plasticity, consciousness, creativity, dreaming, implicit processing heuristics, math, offline memory trace reactivation and reconstruction theory, psychosocial genomics, surprise, ultradian stress and healing response.

### **Einstein's Eternal Mystery of Epistemology Explained:**

#### **The Four Stage Creative Process in Art, Science, Myth & Psychotherapy**

On March 30<sup>th</sup> 1952 the mature Albert Einstein (1993) wrote a letter to his friend Maurice Solovine in which he tried to explain the “miracle” of how it is possible to comprehend the world.

“Now I come to the most interesting point in your letter. You find it strange that *I consider the comprehensibility of the world (to the extent that we are authorized to speak of such a comprehensibility) as a miracle or as an eternal mystery.* Well, *a priori* one should expect a chaotic world which cannot be grasped by the mind in any way. One could (*yes one should*) expect the world to be subjected to law only to the extent that we order it through our intelligence.

Ordering of this kind would be like the alphabetical ordering of the words of a language. By contrast, the kind of order created by Newton's theory of gravitation, for instance is wholly different. Even if the axioms of the theory are proposed by man, the success of such a project presupposes a high degree of ordering of the objective world, and this could not be expected *a priori*. That is the 'miracle' which is being constantly reinforced as our knowledge expands.

"There lies the weakness of positivists and professional atheists who are elated because they feel that they have not only rid the world of gods but 'bared the miracles.' *Oddly enough, we must be satisfied to acknowledge the 'miracle' without there being any legitimate way for us to approach it.* I am forced to add that just to keep you from thinking that – weakened by age – I have fallen prey to the parsons." (p. 133, italics added here)

In a previous paper I introduced the idea of how art, truth, beauty, and spirit were all connected via a special state of psychobiological arousal that "turned on" gene expression, protein synthesis and brain plasticity in the construction and daily reconstruction of consciousness, memory, and learning (Rossi, 2002, 2004a). I now extend this view to explain what Einstein called the "*miracle*" and "*eternal mystery*" of how is it possible to comprehend the world in a scientific manner. The connecting link is suggested by another letter about a month later on May 7<sup>th</sup> 1952 wherein Einstein tries to explain to Solovine the central unresolved mystery of epistemology – our theory of knowledge - a bit further with a hand sketched diagram in figure one.

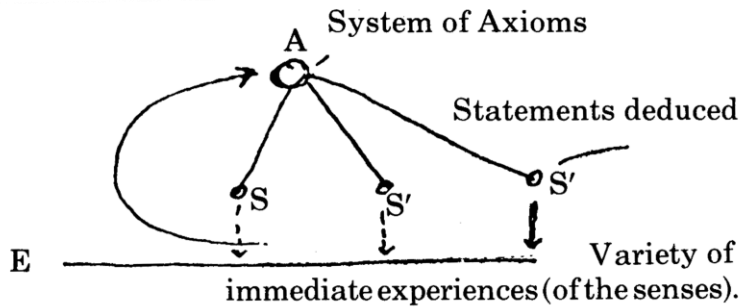


Figure 1. Einstein's Sketch of the eternal mystery of epistemology. "As for the epistemological question, you completely misunderstood me; I probably expressed myself badly. I see the matter schematically in this way:

- (1) The E's (immediate Experiences) are our data.
  - (2) The axioms from which we draw our conclusions are indicated by A. Psychologically the A's depend on the E's. But there is no logical route leading from the E's to the A's, but only an intuitive connection (psychological), which is always 're-turning.'
  - (3) *Logically*, specific statements S, S', S'' are deduced from A; these statements can lay claim to exactness.
  - (4) The A's are connected to the E's (verification through experience). Closer examination shows that this procedure also belongs to the extralogical (intuitive sphere), for the relation between the notions show up in S and the immediate experiences are not logical in nature.
- But the relation between S's and E's is (pragmatically) much less certain than the relation between the A's and the E's. (Take the notion 'dog' and the corresponding immediate experiences.) If such a relationship could

**not be set up with a high degree of certainty (though it may be beyond the reach of logic), logical machinery would have no value in the ‘comprehension of reality’ (example: theology).**

**“What this all boils down to is the eternally problematical connection between the world of ideas and that which can be experienced (immediate experiences of the senses).” (Einstein, 1993, p. 138-9)**

Einstein “eternally problematical connection” of how we can comprehend the world is illustrated in his sketch by the re-turning arrow on the left side pointing upward from the statements deduced (S, S', S'') and E (immediate experiences) to A (System of Axioms). Einstein correctly notes that psychologically the A's (axioms) depend on the E's (experiences) but at the present time there is no logical or scientific explanation for the re-turning arrow he draws from the S's and E's back to the A's. This is where the traditional philosophy of science, epistemology and logic fails. As Einstein writes, there is an “intuitive connection (psychological), which is always re-turning” or replaying between the sensory experience of the brain and mind but the mystery is that there is apparently no logic to it or satisfactory scientific explanation of it.

Einstein's use of terms like “miracle,” “mystery,” and “intuition” for this re-turning connection between the world of sensory experience and the logic of mind remind us of the theologian, Rudolph Otto, who formulated the concept of the “numinous” (the sense *fascination, mystery, and tremendously important*) to describe the essence of original, creative spiritual experience. I have noted how

such numinous states of creative, artistic, and spiritual excitement are essentially similar to *the psychobiological arousal evoked by novelty, environmental enrichment and physical exercise* that current neuroscience finds associated with gene expression, protein synthesis and brain plasticity in the normal process of the reconstructing consciousness, memory and learning in daily life (Rossi, 2002, 2004 a & b) .

In this new context that I call “psychosocial genomics” we can explain Einstein’s “eternal mystery” and the “miracle” of the *re-turning* arrow as an intuitive illustration of the *replay* of novel, surprising and numinous experiences during *offline states* (such as sleep, dreaming, quiet wakefulness, meditative moments, and “periods of private inner work and creative replay in psychotherapy”) when gene expression, new protein synthesis, and brain plasticity are busy reconstructing and updating the neural networks of the brain and mind (Rossi, 2002, 2004 a & b, 2005). I illustrate this new view in figure 2 by replacing Einstein’s returning arrow of mysterious “intuition” with my update of Kandel’s schematic image of how sensory neurons in the brain, when stimulated by novel and salient signals from the environment, actually turn on gene expression, new protein synthesis, and brain growth (usually called “brain plasticity” by neuroscientists).



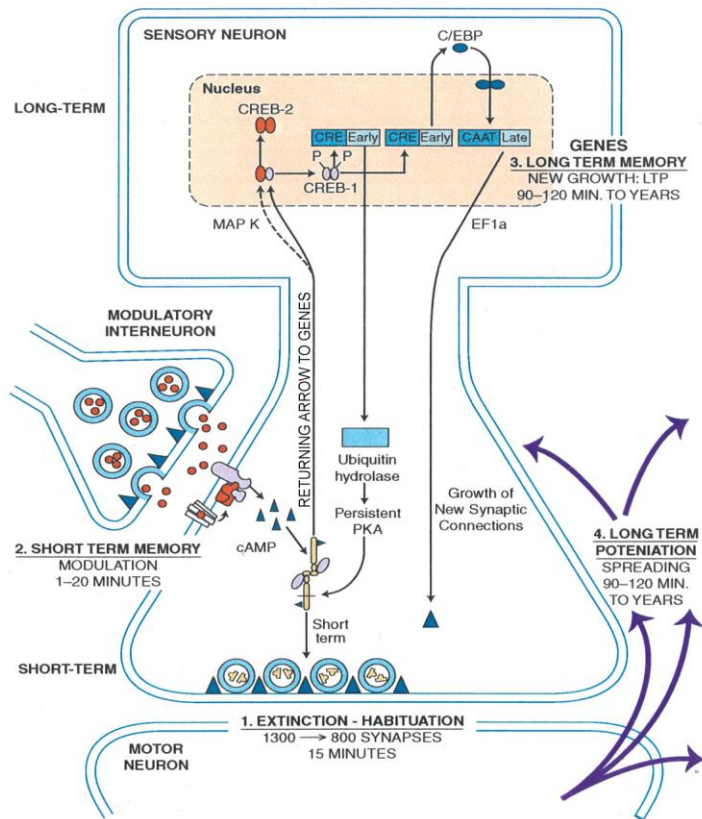


Figure 2. A Neuroscience Update Einstein’s “Eternal Mystery” and the Genomic Core of Psychotherapy. Einstein’s “Eternal Mystery” and the “miracle” of the *re-turning* arrow in figure 1 could be explained empirically by this illustration of how brain neurons receive novel and numinous “immediate experiences (of the senses)” and convert them into molecular signals (e.g. MAP K in the “Returning Arrow to Genes”) to transcribe (turn



on) a series of genes (CRE early, CAAT late) that generates the proteins that are used for the “*Growth of New Synaptic Connections*” in brain plasticity that reconstructs memory, learning and consciousness. This is the molecular-genomic core of creative replay in psychotherapy indicated by the “*Returning Arrow to Genes*” that we hope to access and turn on with implicit processing heuristics. Note how this dynamic molecular-genomic process of *Long Term Memory* requires about 90-120 minutes, which places it in the general time frame of a single session of psychotherapy. *Ordinary Short Term Memory* (1 to 20 minutes), by contrast, depends only on the millisecond dynamics of neurotransmitters flowing between one neuron and the next that do not require gene expression (Adapted and modified from Kandel et al., 2000; Rossi, 2002, 2004b).

I propose that this empirical (rather than philosophical) explanation of Einstein’s eternal mystery also explains what has been called “the unreasonable effectiveness of mathematics in the natural sciences” in a famous essay by the physicist Eugene Wigner (1960) that is still a staple on many college reading lists in the philosophy of science. The following quote from this bellwether essay helps us make the transition between these classical philosophical issues to my current practical approaches to facilitating the 4-stage creative process in short term psychotherapy.

“The first point is that the enormous usefulness of mathematics in the natural sciences is something bordering on the *mysterious and there is no rational explanation for it*. Second, it is just this uncanny usefulness of mathematical

concepts that raises the question[s]. . . ‘What is mathematics? Then, What is physics? Then, how mathematics enters physical theories, and last, why the success of mathematics in its role in physics appears so baffling?’ (p. 3, italics added here).

After discussing these questions and finding no satisfactory answer on either a philosophical or empirical level Wigner notes the need to look for a solution by integrating our understanding of consciousness, the biology of heredity, and physics as follows.

“A much more difficult and confusing situation would arise if we could, some day, establish a theory of the phenomena of consciousness, or of biology, which would be as coherent and convincing as our present theories of the inanimate world. Mendel’s laws of inheritance and the subsequent work on genes may well form the beginning of such a theory as far as biology is concerned. . . The reason that such a situation is conceivable is that, fundamentally, we do not know why our theories work so well. . . *The miracle of the appropriateness of the language of mathematics for the formulation of the laws of physics is a wonderful gift which we neither understand nor deserve.* We should be grateful for it and hope that it will remain valid in future research and that it will extend, for better or for worse, to our pleasure, even though perhaps to our bafflement, to wide branches of learning.” (p. 9, italics added).

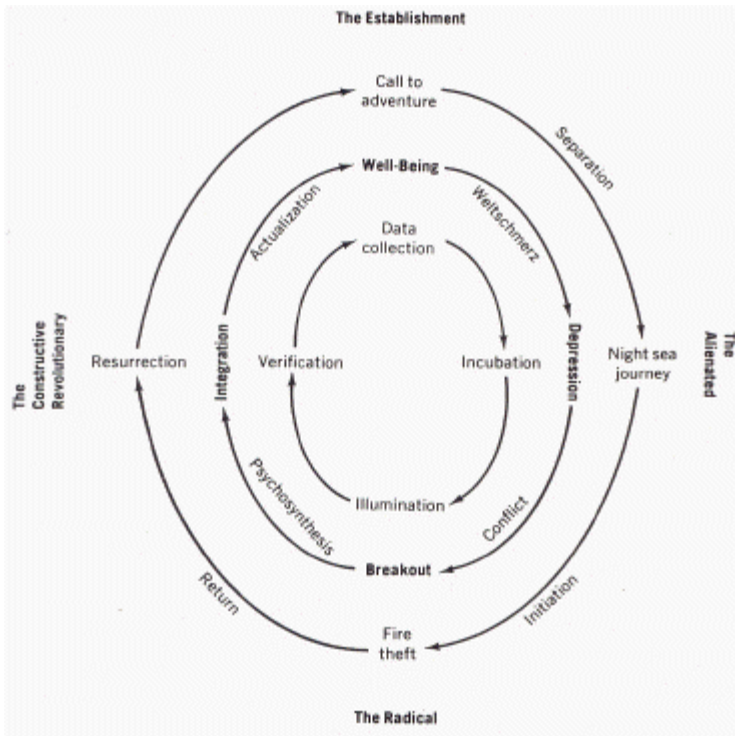
Notice that for Einstein writing in 1952 this fundamental problem of epistemology was an “eternal mystery” while for Wigner only 8 years later in

1960 it was still a “bafflement” but at least there was a hint for a solution “if we could, some day, establish a theory of the *phenomena of consciousness, or of biology*, which would be as coherent and convincing as our present theories of the inanimate world. *Mendel’s laws of inheritance and the subsequent work on genes may well form the beginning of such a theory as far as biology is concerned.*” (Italics added here)

What happened historically between Einstein’s letters of 1952 and Wigner’s essay of 1960 to change an “eternal mystery” into mere human “bafflement” that could be resolved with a new theory of consciousness, biology, and genes? Answer: Watson and Crick (1953 a & b) published their 2 famous papers solving DNA molecular code of life and some implication of this new understanding of genes, for which they received the Nobel Prize. Today, with the benefit of two generations of genomics and neuroscience research about this epochal discovery, we can hope to better understand how to generalize Wigner’s “wonderful gift” in the wide branch of learning that we call “psychotherapy.”

### **The 4-Stage Creative Process in Psychotherapy**

The origin of classical 4-stage process of creativity – Data Collection, Incubation, Illumination, and Verification – interestingly enough, is usually attributed to the French mathematician Henri Poincaré (Hadamard, 1954). I originally used this 4-stage creative process as the core “breakout heuristic” of psychotherapy as well as mythology and the socio-political process as illustrated in figure three (Rossi, 1968).



**Figure 3. The Breakout Heuristic as a Model of Short Term Psychotherapy.** Inner circle illustrates the classical 4-Stage Creative Cycle of Data Collection, Incubation, Illumination and Verification. The middle circle applies this 4-stage creative cycle to psychotherapy. I apply this same 4-stage creative process to Joseph Campbell’s mono-myth of humankind as illustrated in the outer circle along with 4 socio-political groups noted in the outer labels (From Rossi, 1968, 2004b)

Table 1 outlines the four stages of the creative process as they are typically experienced for good or for ill every *hour and a half or two* - an *ultradian rhythm* - in contrast to the *24 hour circadian rhythm* in everyday life (Rossi and Nimmons, 1991). Throughout the day, particularly during the low phase of the creative cycle that Poincaré called “the rest phase,” we all have a choice as to how we shall proceed with our natural ultradian rhythm of consciousness, creativity,

performance and healing. For optimal health and performance we need to heed nature's call to take a healing break to experience what I call the "*Ultradian Healing Response*." I now believe that this so-called "*offline state*" (the recent technical term introduced by neuroscientists) is identical with what Milton H. Erickson informally called "the common everyday trance" and what Kleitman called the "rest phase" of the 90-120 minute Basic Rest Activity Cycle (BRAC). This normal 20 minute rest period at the low phase of the BRAC is often the best time to experience a nap or practice naturalistic forms of self-hypnosis, meditation, prayer, deep self-reflection and holistic healing (Rossi & Nimmons, 1991). 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.

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## THE ULTRADIAN HEALING RESPONSE

1. *Recognition Signals:* 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.

2. *Accessing the Deeper Breath:* 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 feeling of comfort that comes spontaneously. Wonder about the possibilities of mind-gene communications and healing with an attitude of "dispassionate compassion."

3. *Mind-Body Healing:* Spontaneous fantasy, memory, feeling-toned complexes, active imagination, and numinous states of being are orchestrated for healing and life reframing.

4. *Rejuvenation and Awakening:* 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.

## THE ULTRADIAN STRESS SYNDROME

1. *Take-a-Break Signals:* 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.

2. *High on Your Hormones:* 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.).

3. *Malfunction Junction:* Many mistakes creep into your performance, memory, and learning; emotional problems become manifest. You may become depressed or irritable and abusive to yourself and others.

4. *The Rebellious Body:* 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.

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**Table 1. The 90-120 minute Ultradian Basic Rest-Activity Cycle as the Psychobiological Basis of the Four Stage Creative Process in Everyday Life.** The 4 stages of the creative process as they are typically experienced for good (The Ultradian Healing Response) or for ill (The Ultradian Stress Response) every *hour and a half or two* throughout the day (Rossi and Nimmons, 1991, p. 58).

### **A Videotaped Demonstration of the 4-Stage Creative Process in Single Session Psychotherapy**

The 4 stages in the accompanying sketches are from a videotaped demonstration of therapeutic hypnosis with a young woman volunteer with severe rheumatoid arthritis in her hands. This 1 hour videotape titled "A sensitive fail-safe approach to hypnosis" (IC-92-D-V9) is available from the Ericksonian Foundation ([www.erickson-foundation.org](http://www.erickson-foundation.org)) for study by professionals and students. Chapters 7 and 8 of my book (Rossi, 2002) present a detailed verbatim analysis of the entire videotape from an Ericksonian perspective together with my *speculations* about how activity-dependent and behavioral state-related gene expression and brain plasticity may be engaged by the deep psychosocial genomics of the 4-stage of the creative process in psychotherapy. Current DNA microarray technology is making it possible to assess gene expression profiles in human blood in real time that could be used to identify changing psychobiological states. I expect that in the near future we will be able to explore such gene expression profiles with computer software such as *GeneSpring* (<http://www.silicongenetics.com>) to identify the deep

psychobiological dynamics of psychotherapy in real time to empirically validate what we can only speculate about at this time.



**Figure 4. Stage One of the Creative Cycle in Psychotherapy: Implicit Processing Heuristics Facilitating Immediate Early Genes in Preparation for Problem Solving.**

The typical psychotherapeutic session ideally begins with patient and therapist cooperating in a search for the problems and issues that the patient hopes to resolve. The therapist's role in this initial stage is to facilitate this search with familiar yet mildly provocative open-ended questions such as: What is on your mind today? What is most alive in you, right now!? Well, what is your truth and beauty these days? I now call these evocative openings "implicit processing heuristics" in keeping with the current



neuroscience use of the word “implicit” to describe the “unconscious” dynamics of memory and motivation. They often serve as mini-rites of transition between the everyday world of congenial talk to the more focused creative work of the therapy session (detailed in chapter 9 of Rossi, 2002).

From our current neuroscience perspective, these open-ended implicit processing heuristics tend to evoke and replay the person’s personal history and the dissociated (state-dependent) sources and encoding of their problems. When emotional problems and highly numinous personal issues are discussed they will naturally evoke *immediate early genes, behavioral state-related genes and activity-dependent gene expression* that generate the possibility of Darwinian natural variation and selection in new cascades of protein synthesis, brain plasticity, problem-solving and mind-body healing. This is the molecular-genomic core of psychotherapy indicated by the “Returning Arrow to Genes” in figure 2 above that is our empirical solution to Einstein’s “eternal mystery” of epistemology.

The therapist models a delicately balanced and symmetrical hand position a few inches above the lap to initiate Erickson’s hand levitation approach to therapeutic hypnosis and psychotherapy. The therapist initially wonders what stage of Kleitman’s Basic Rest-Activity Cycle (BRAC) the patient may be experiencing. He wonders whether CYP17 — the social gene — is becoming engaged as a natural manifestation of the psychotherapeutic transference, and to what extent immediate-early genes (IEGs) such as c-fos and c-jun — associated with a creative state of psychobiological arousal, problem solving, and healing, particularly of the psychoneuroimmune system — are becoming engaged .



**Figure 5. Stage Two of the Creative Cycle in Psychotherapy: Incubation, Creative Replay, and Psychobiological Arousal Evokes Behavior State-Related Gene Expression.**

She now experiences psychobiological arousal (associated with behavioral state-related gene expression (BSGE) as evidenced by the very slight, rapid, involuntary shaking and twitching of her hands and fingers. She is surprised, embarrassed and confused about these unusual sensations and involuntary movements that were *not* suggested by the therapist. This surprising, novel and numinous experience is evoking a heightened behavioral state-related gene expression that the therapist would like to use for therapeutic purposes. The therapist wonders, for example, how to facilitate the psychosocial genomics of immunological variables such as the interleukins associated with Cox2, which have been implicated in rheumatoid arthritis which is her presenting symptom. Unfortunately all psychotherapists are working blind at this time because a

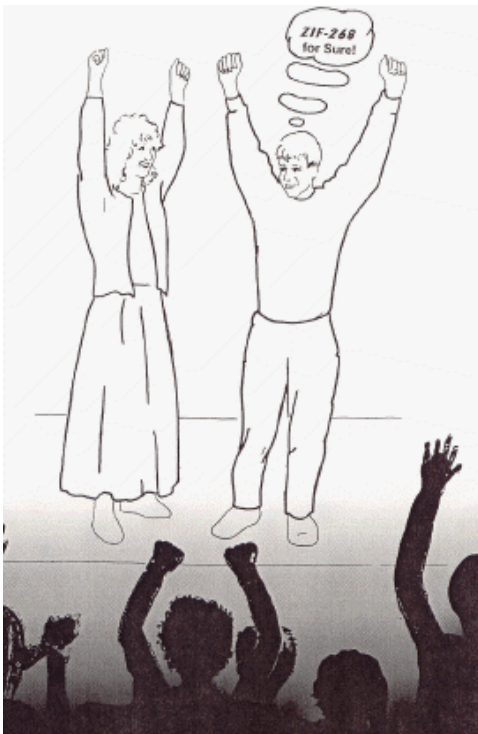
relatively simple (but expensive) DNA microarray assessment of a blood sample that could provide a gene expression profile of the patient's deep psychobiological state in real time is not yet available. None the less the therapist continues to support her with *non-directive implicit processing heuristics* like, "Do you have the courage to allow that to continue for another moment or two until. . .?" Until - what? Well, hopefully, until she stumbles by random Darwinian chance into association patterns about the source of her problems that may set the stage for their creative resolution in stage three.



**Figure 6. Stage 3 of the Creative Cycle in Psychotherapy: Illumination via Activity-Dependent Gene Expression and Brain Plasticity.**

She now experiences the playful activity-dependent exercise of shadow boxing as a creative breakout of her typically restrained hand and finger movements associated with angry feeling about her boss, her boyfriend and her rheumatoid arthritis. Future research

will be needed to determine if activity-dependent gene expression (ADGE) — such as the CREB related genes and proteins associated with new memory and learning as illustrated in figure 2 — as well as the ODC and BDNF genes associated with physical growth and brain plasticity are actually being engaged during the replay of such creative moments in psychotherapy.



**Figure 7. Stage 4 of the Creative Cycle in Psychotherapy: Verification, Social Support, and the Possibility Zif-268 Gene Expression Facilitating Brain Plasticity.**

After flexing her hands and fingers with a mixture of pain and relief she received a standing ovation from the audience. The therapist speculates silently to himself that the zif-268 gene will be expressed in her REM dream states tonight to encode her new, novel, and enriching therapeutic experiences with this unusually enriching, perhaps once-in-a-lifetime show of psychosocial support. Recent research documents that the zif-268 gene codes for a protein important for brain plasticity during changes in memory and

learning while awake (Lee et al. 2004) as well as during creative replays of salient daytime experiences during our REM dreams while asleep at night (Ribeiro et al., 2004).

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### **Putting it All Together: Who Will Research the Mind-Body Gap at the Genomic Level?**

This paper proposes a new world view of how the psychological levels of consciousness and human experience can modulate gene expression and brain plasticity in sickness and health. The psychosocial genomics of gene expression in neurons of the brain is used as a new model of how current neuroscience could resolve Einstein's eternal mystery of epistemology – how we can understand the world. Psychosocial genomics explores how we can bridge the Cartesian mind-body gap with implicit processing heuristics to creatively replay gene expression and brain plasticity with the novel, numinous, and enriching experiences of psychotherapy, myths and dreams as well as the humanistic arts and spiritual traditions of all human cultures. Much of this new view is still highly controversial, however, and will require the psychotherapeutic community to adopt the techniques of modern neuroscience, functional genomics, and DNA microarray technology to update and further develop the art and science of psychotherapy.

This deep psychobiological perspective of creative psychotherapy is consistent with much of classical psychoanalysis as well as the cognitive-behavioral approaches that are now attempting to integrate the modern neuroscience of consciousness, memory and learning at the cellular-genomic

level. This new integration of theory and research leads to a profound vision of how we may utilize the creative process in psychotherapy to facilitate the development and efficacy of our personal consciousness on all levels from the philosophical to the biological matrix of our being in gene expression and brain plasticity.

The unfortunate reality at the present time, however, is there is as yet no comprehensive program of experimental research investigating creative psychotherapy on the molecular-genomic level as proposed here. This may be why the National Institute of Mental Health (NIMH) is no longer supporting funding for psychological research on a purely cognitive-behavioral level without regard for the fundamentals of mental illness on molecular-genomic level (Holden, 2004; Kaiser, 2004). To resolve this unfortunate funding gap between the behavioral and biological I am currently exploring the development of new psychosocial genomic paradigms of psychotherapy with “*GeneSpring*,” a computer program now widely used by many researchers to trace the ontology of gene expression in mood and behavioral disorders. The psychotherapeutic community urgently needs to network with researchers on the molecular-genomic level who are interested in understanding the significance of their work for the profound issues of how the mind can heal the brain and the body – how psychological experiences can facilitate genuine mind-body healing and rehabilitation. Such a visionary ideal may be what we need to develop truly new and inspired approaches to creative psychotherapy and a satisfying resolution for Einstein’s eternal mystery of epistemology in the new millennium.

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