

CREATIVITY AND THE
NATURE OF THE NUMINOSUM:
THE PSYCHOSOCIAL GENOMICS OF JUNG'S
TRANSCENDENT FUNCTION IN ART,
SCIENCE, SPIRIT, AND PSYCHOTHERAPY

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“All psychological theoreticians in this field run the same risk, for they are playing with something that directly affects all that is uncontrolled in man – the numinosum, to use an apt expression of Rudolph Otto’s. . . Every time the researcher succeeds in advancing a little further towards the psychic tremendum, then, as before, reactions are let loose in the public. . .”

— Carl Jung, *The Structure and Dynamics of the Psyche*, 1934, p. 103-104

“There is nothing mysterious or metaphysical about the term “transcendent function.” It means a psychological function comparable in its way to a mathematical function of the same name, which is a function of real and imaginary numbers. The psychological “transcendent function” arises from a union of conscious and unconscious contents.”

— Carl Jung, *The Transcendent Function*, 1916, p. 67

In the beginning of his essay on psychology and religion Jung (1937/1958) outlined the relationship between religion, the numinosum, and the transformations of consciousness.

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“I want to make clear that by the term “religion” I do not mean a creed. It is, however, true that every creed is originally based on the one hand upon the experience of the *numinosum* and on the other hand . . . trust or loyalty, faith and confidence in certain experience of a numinous nature and in the change of consciousness that ensues. The conversion of Paul is a striking example of this. We might say, then, that the term “religion” designates the attitude particular to a consciousness which has been changed by experience of the *numinosum*.” (p. 8.)

The modern molecular biologist does not speak of religion but investigates the empirical basis of consciousness and the numinosum as states of psychobiological arousal that turn on gene expression and brain plasticity - the growth and transformations of neural networks throughout our lifetime (Cohen-Cory, 2002). Bentivoglio & Grassi-Zucconi (1999), for example, ask questions about the biological nature of consciousness, dreaming, behavior, memory, learning and gene expression that are fundamental for updating our understanding creativity and nature of the numinosum.

“The study of Immediate Early Genes (IEGs) indicates that sleep and wake, as well as [REM or dream sleep], are characterized by different genomic expressions, the level of IEGs being high during wake and low during sleep. . . *IEG induction [within seconds] may reveal the activation of neural networks in different behavioral states.* Although stimulating, these findings leave unanswered a number of questions. Do the areas in which IEGs oscillate during sleep and wake subserve specific roles in the regulation of these physiological states and in a general ‘resetting’ of behavioral states? Is gene induction a clue to understanding the alternation of sleep and wake, and REM and non-REM sleep? . . . *Does this explain the molecular and cellular correlates of arousal, alertness, and, more in general, of consciousness?*” (p. 249, italics added)

These questions bridge the “Cartesian gap” between mind and body by using the concept of biological information (von Baeyer, 2004). The modern concept of biological information was originally formulated as “the dogma of molecular biology” by Watson and Crick (1953a & b), for which they received the Nobel Prize. I expanded their original dogma of molecular biology in Figure 1a (now called “bioinformatics”) to include “psychological experience” in a circular loop as illustrated in Figure 1b (Rossi, 2002, 2003a-c, 2004a-d).



Figure 1a
 The Original Linear Dogma of Molecular
 Biology by Watson and Crick in 1953

The original dogma of molecular biology illustrated in figure 1a proposes how (1) the linear *sequence* of nucleotides in our genes is a code of biological information that (2) generates the 3-dimensional *structure* of the proteins, which *function* as the *physiological* molecular machines of the brain and body. That is as far as Watson and Crick were willing to go in 1953 – there was no place for the psyche, consciousness, and psychological experience in their original dogma

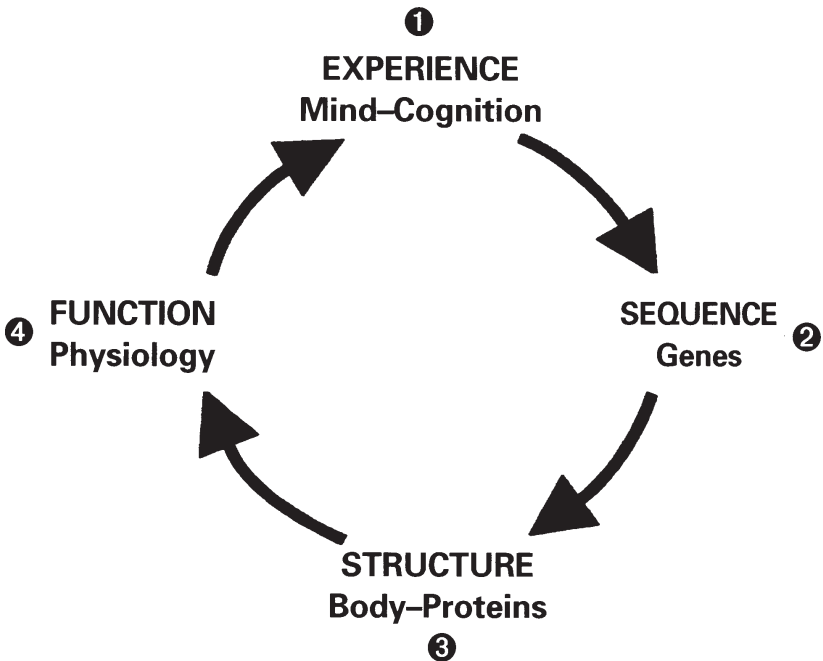


Figure 1b
 Rossi's Bioinformatics Cycle of
 Psychosocial and Cultural Genomics

of molecular biology. Since that time, however, neuroscience research has documented how the psychological experiences of *novelty* (Eriksson et al., 1998), *psychosocial enrichment* (Kempermann et al., 1997), and mental and physical *exercise* (Van Praag et al., 1999) can evoke gene expression (genomics), protein synthesis (proteomics), and the physiological functions of the brain and body. Such research is the empirical basis for my adding the dimension of psychological experience to Watson and Crick's linear dogma of molecular biology in figure 1a to construct the circular mind-body loop of psychosocial genomics in figure 1b, which illustrates how *psychological experiences* of psyche, mind, and consciousness can modulate gene expression and brain plasticity. The most profound implication of this mind-body loop is that heightened experiences of consciousness, which characterize the *numinosum*, can evoke gene expression, brain plasticity, and mind-body healing in the complex computations (iterations and recursions) of psychophysiology, psychosomatic medicine, and psychotherapy. The natural bioinformatic translations between mental experience (psyche) and biological information (soma) in figure 1b provides us with the possibility of understanding of how Jung apparently was able to cure cancer, psoriasis (molecular-genomic diseases) and other body dysfunctions with his purely psychological approach to the numinous experiences of the psyche (1937/1958, pp. 13-14).

Let us now review some of conceptual details this new bridge between psyche and soma to close the so-called "Cartesian gap" between mind and body for updating Jung's (1918/1966) "Synthetic or Constructive Method" of healing. The new discipline of *psychosocial and cultural genomics explores how psychological experiences modulate gene expression, protein synthesis, brain plasticity and the physiology of the body* as illustrated in figure 1b (Rossi, 2002, 2004). Notice how psychosocial and cultural genomics is a "top-down" synthetic approach, which emphasizes how the mind modulates biology. This is the opposite of the scientifically more popular "bottoms-up" approach of molecular biology, behavioral genetics, evolutionary psychology, and sociobiology, which emphasize how biology modulates the mind and behavior via the evolutionary selection over many generations of time. Psychosocial genomics, by contrast, is concerned with how psychological experiences and behavioral states in the here-and-now of this moment (e.g. during psychotherapy, dreaming and numinous experiences in the creative

arts and sciences) can modulate gene expression, brain plasticity, and mind-body healing – as we shall soon describe in greater detail.

The Psychosocial Genomics of Jung's Synthetic or Constructive Method

Jung (1918/1966) introduces his synthetic or constructive method of working with the transcendent function as follows.

“The process of coming to terms with the unconscious is a true labour, a work which involves both action and suffering. It has been named the “transcendent function” because it represents a function based on real and “imaginary,” or rational and irrational data, thus bridging the yawning gulf between conscious and unconscious. It is a natural process, a manifestation of the energy that springs from the tension of opposites, and it consists in a series of fantasy-occurrences which appear spontaneously in dreams and visions. . . The natural process by which the opposites unite came to serve me as the model and basis for a method consisting essentially in this: everything that happens at the behest of nature, unconsciously and spontaneously, is deliberately summoned forth and integrated into the conscious mind and its outlook. Failure in many cases is due precisely to the fact that they lack the mental and spiritual equipment to master the events taking place in them. Here medical help must intervene in the form of a special method of treatment.” (p. 80, italics added)

How would current neuroscience update Jung's constructive method of *“coming to terms with the unconscious [as] a true labour, a work which involves both action and suffering?”* What is this *“true labour?”* What is the *“natural process, a manifestation of the energy that springs from the tension of opposites”* in terms of psychosocial and cultural genomics? How shall we interpret Jung's words *“Failure in many cases is due precisely to the fact that they lack the mental and spiritual equipment to master the events taking place in them?”* Figure 2 is an empirical map of the nature of the numinosum and the bioinformatic transformations of the transcendent function for answering these questions.

Figure 2 illustrates a new psychosocial genomics perspective on the nature of the numinosum as the psychobiological arousal of consciousness via a wide variety of experiences such as pain, stress, trauma, novelty, dreaming (REM sleep), creative moments and the normal Basic Rest-Activity Cycle (BRAC) on all levels from mind to

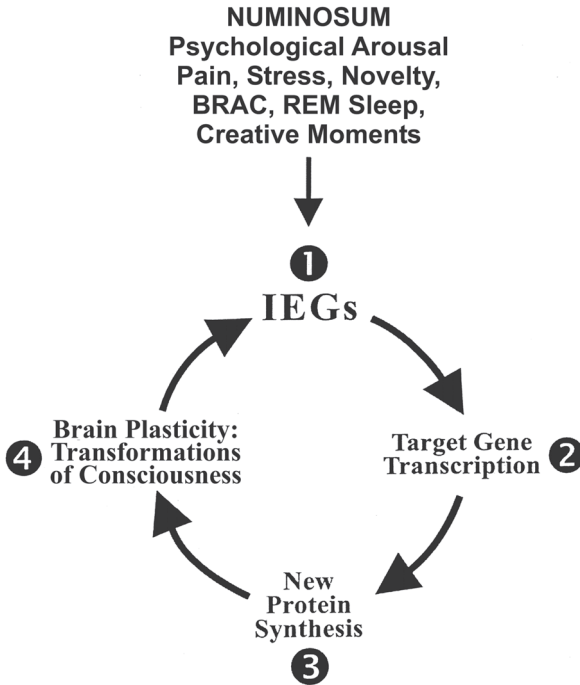


Figure 2
 Rossi's Numinosum as Psychological Arousal

gene. We now know that any experience of psychological arousal or behavioral activity stimulates sensory and neural action, which within seconds evokes (1) immediate early gene expression (IEGs as described above by Bentivoglio & Grassi-Zucconi, 1999) that turn on (2) target gene transcription providing the DNA code for (3) the new protein synthesis of the molecular machines (growth factors, hormones, neurotransmitters, etc.) that generate (4) brain plasticity, mind-body healing and the further transformations of consciousness.

This bioinformatics model of the nature of the numinosum answers another mind-body question: how do we account for the difference between human consciousness and non-human primates when they both have about the same number of genes (~30,000) which are more than 99.6 % alike? Cáceres et al. (2003) summarize their research in this area as follows.

“Little is known about how the human brain differs from that of our closest relatives. To investigate the genetic basis of human

specializations in brain organization and cognition, we compared gene expression profiles for the cerebral cortex of humans, chimpanzees, and rhesus macaques by using several independent techniques. We identified 169 genes that exhibited expression differences between human and chimpanzee cortex, and 91 were ascribed to the human lineage by using macaques as an outgroup. Surprisingly, most differences between the brains of humans and non-human primates involved up-regulation, with ~90% of the genes being more highly expressed in humans. By contrast, in the comparison of human and chimpanzee heart and liver, the numbers of up- and down-regulated genes were nearly identical. *Our results indicate that the human brain displays a distinctive pattern of gene expression relative to non-human primates, with higher expression levels for many genes belonging to a wide variety of functional classes. The increased expression of these genes could provide the basis for extensive modifications of cerebral physiology and function in humans and suggests that the human brain is characterized by elevated levels of neuronal activity.*" (pp. 13030, italics added)

In other words, it is the higher activation of consciousness, what Carl Jung and Rudolph Otto (1923/1956) would call "the numinosum," generated by elevated gene expression levels that distinguish between the performance of human and non-human primate brains. These elevated gene expression levels can be detected with the new DNA microarray technology that can assess the entire human genome in a single sample of blood (Rossi, 2000, 2002, 2004 a-c). Figure 3 is an illustration of these communication pathways in the blood – the molecular messengers (e.g. hormones, neurotransmitters of the nervous system, cytokines and interleukins of the psychoneuroimmune system, etc.) between mind, brain and the genome of every cell of the body (Rossi, 2002, 2004 a-c).

Whitney et al. (2003) documented how individuality and variation in gene expression patterns in human blood can be assessed with DNA microarray (gene chip) technology to investigate these questions about varying states of health and illness.

"The extent, nature, and sources of variation in gene expression among healthy individuals are a fundamental, yet largely unexplored, aspect of human biology. *Future investigations of human gene expression programs associated with disease, and their potential application to the detection and diagnosis, will depend upon an understanding of normal*

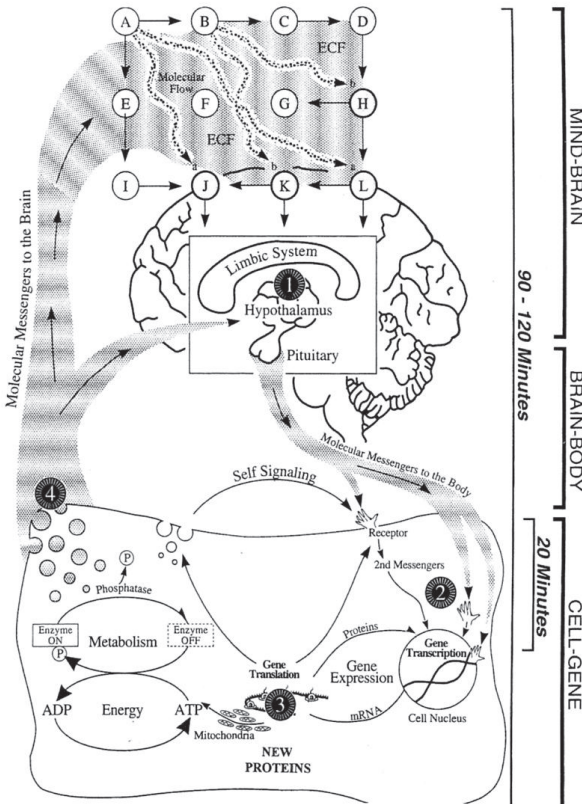


Figure 3
Rossi brain-cell-genome map

variation within and between individuals, over time, and with age, gender, and other aspects of the human condition (p.1896, italics added)

This implies that DNA microarrays are a more sensitive, comprehensive, and reliable measure of psychological states of consciousness, emotions, behavior, brain plasticity and mind-body healing. From the psychosocial genomics perspective,

cultivating this inner garden of our archetypal genomic resources is the ultimate task of Jung’s “coming to terms with the unconscious. . . a labour, a work which involves both action and suffering” in the process of individuation (Rossi, 1972/2000, 2004 a-c). Table 1 is a brief sampling of gene candidates for the DNA microarray technology assessment of the role of Otto’s numinosum and Jung’s transcendent function, active imagination and constructive method in modulating gene expression, brain plasticity and mind-body healing. A few quotations from the technical literature cited in table 1 provides a quick survey of the implications of this data for understanding the nature of the numinosum and the psychosocial genomics of Jung’s synthetic or constructive method.

Table 1		
<i>A brief sampling of gene candidates for the DNA microarray technology assessment of the dynamics of Otto's numinosum and Jung's transcendent function in modulating gene expression, brain plasticity and mind-body healing (From Rossi, 2002, 2004 a-c).</i>		
The Numinosum as Heightened Gene Expression in the Human Cortex		
SYN47	DCTN1	Cáceres et al. 2003
CAMK2A	MAP1B	
IMPA1	RAB3GAP	
CDS2	ATP2B1	
KIF3A	USP14	
Brain Plasticity in Consciousness, Memory, Learning and Behavior Change		
c-fos, c-jun, krox, NGFI-A & B		Bentivoglio & Grassi-Zucconi, 1999 Kandel et al., 2000 Russo-Neustadt et al., 2001 Ridley, 1999 Rossi, 2002, 2004a
CREB		
BDNF		
CYP-17		
~ 100 Immediate Early Genes		
Dreaming and Replay in the Reconstruction of Fear, Stress and Trauma		
Zif-268		Ribeiro et al., 2002, 2004 Nader et al., 2000
Chronic Psychosocial Stress and Alternative Gene Expression		
Acetylcholinesterase (AChE-S & AChE-R)		Sternfield, et al., 2000 Perry, et al., 2004 Alfonso et al., 2004 Alejel, 2001
Nerve Growth Factor (NGF)		
Membrane Glycoprotein 6a (M6a)		
CDC-like Kinase 1 (CLK-1)		
G-protein alpha q (GNAQ)		
CRE- dependent reporter gene		
Psycho-neuro-immunology		
Interleukin 1, 2, 1β, Cox-2		Castes et al., 1999 Glaser et al., 1993
Clock Genes & Behavior State-Related Genes		
About 100 sleep related genes		Cirelli et al., 2004 Rossi, 2004d Rosbash & Takahashi, 2002
Clock, Period 1, BMAL		
Period 2		
Maternal Behavior and Therapeutic Touch		
ODC gene		Schanberg, 1995 Moles et al., 2004
Opioid Receptor Gene		

*The Numinosum is Heightened Gene
Expression in the Human Cortex*

Cáceres et al. (2003) do not use the word “numinosum” in their empirical paper on the elevated gene expression levels that distinguish human from non-human primate brains, but their molecular-genomic outline of heightened neuronal activity in human consciousness is of profound significance for understanding the nature of the numinosum and the transcendent function in Jungian psychology.

“The identification of the genes that exhibit regulatory changes in adult human cortex provides clues to the biochemical pathways and cell-biological processes that were modified during evolution. *The apparent up-regulation of so many different genes suggests, among other things, that the general level of neuronal activity and the metabolic processes that support it may be unusually high in human cortex.* Consistent with this is the up-regulation of genes involved in synaptic transmission, including the control of glutamatergic excitability (*SYN47*, also known as Homer 1b), plasticity at glutamatergic synapses (*CAMK2A*), phosphatidylinositol signaling (*IMPA1*, *CDS2*), synaptic vesicle release (*RAB3GAP*, *ATP2B1*), axonal transport along microtubules (*KIF3A*, *DCTN1*), microtubule assembly (*MAP1B*), and targeting of proteins to postsynaptic densities (*USP14*). *We have also found expression changes related to energy metabolism.* For example, *CA2*, which is expressed in glia, has been related to the generation and transport of lactate by astrocytes for use by neurons as an energy source. To our knowledge, the possibility that the human brain has an unusually high metabolism has not been previously considered. Typically, larger brains have lower metabolic rates (per unit of tissue) than smaller brains. Nevertheless, recent studies with imaging techniques to measure cerebral glucose metabolism in the conscious state suggest that metabolic rates are as high or even higher in humans than in macaques. *Higher levels of neuronal activity are likely to have important consequences in cognitive and behavioral capacities,* and of the genes up-regulated in humans, *CAMK2A* is involved in learning and memory, and mutations of *GTF2I* (Williams syndrome), *CA2* (marble brain disease), and *SC5DL* (lathosterolosis) have been linked to mental retardation.” (pp. 13034)

*Brain Plasticity in Consciousness, Memory,
Learning and Behavior Change*

Eric Kandel (1998), who received a Nobel Prize for Physiology or Medicine in 2000 described the relationship between gene expression, brain plasticity, and mind-body healing via psychotherapy and counseling that is of essence for understanding the psychosocial genomics of Jung's constructive method

“Insofar as psychotherapy or counseling is effective and produces long-term changes in behavior, it presumably does so through learning, by producing *changes in gene expression that alter the strength of synaptic connections and structural changes that alter the anatomical pattern of interconnections between nerve cells of the brain*. As the resolution of brain imaging increases, it should eventually permit quantitative evaluation of the outcome of psychotherapy . . . Stated simply, *the regulation of gene expression by social factors makes all bodily functions, including all functions of the brain, susceptible to social influences. These social influences will be biologically incorporated in the altered expressions of specific genes in specific nerve cells of specific regions of the brain*. These socially influenced alterations are transmitted culturally. They are not incorporated in the sperm and egg and therefore are not transmitted genetically.” (p.140, italics added).

*Dreaming and Creative Replay in the Reconstruction
Of Fear, Stress and Traumatic Memories*

Recent neuroscience research has found that when experimental animals experience significant *novelty, environmental enrichment and exercise* during their awake state, the *zif-268 gene* is expressed during their REM sleep (Ribeiro et al., 2002, 2004). *Zif-268* is an *immediate-early gene* and *behavioral-state related gene* that is associated with the generation of proteins and growth factors that facilitate brain plasticity. Ribeiro et al (2004) summarized their results as follows.

“The discovery of experience-dependent brain reactivation during both slow-wave (SW) and rapid eye-movement (REM, dream) sleep led to the notion *that the consolidation of recently acquired memory traces requires neural replay during sleep*. . . Based on our current and previous results, we propose that the 2 major periods of sleep play distinct and

complementary roles in memory consolidation: pretranscriptional recall during SW sleep and transcriptional storage during REM sleep. . .In conclusion, *sustained neuronal reverberation during SW sleep, immediately followed by plasticity-related gene expression during REM [dreaming] sleep, may be sufficient to explain the beneficial role of sleep on the consolidation of new memories.*" (p. 126 – 135, italics added.)

I have hypothesized that what the neuroscientist calls "*novelty, enrichment, and exercise*" in the evocation of gene expression and brain plasticity is on the same continuum of psychobiological states, which Rudolph Otto (1923/1950) describes as "*fascination, mysteriousness, and tremendousness*" - the essence of the numinosum in spiritual experience. *This "novelty-numinosum-neurogenesis-effect" implies that gene expression and creative "neural replay" during dreaming and active imagination is the psychosocial genomic essence of Jung's constructive method and psychotherapy in general* (Rossi, 2002, 2004 a-c).

The genes listed in Table 1 are, in principle, all accessible via the creative replay dynamics in the arts, sciences, spiritual rituals, and psychotherapy. It is the mission of the psychosocial genomics of Jung's constructive method to explore the conditions that make this possible. The genes listed in Table 1 are only a very tiny fraction of the approximately 30,000 genes in the human genome and an even smaller percentage of the 1.2 million genes now estimated to exist in nature as a whole (Venter et al., 2004). This list is certain to grow with further research in the psychosocial genomics of the transcendent function.

*Acute and Chronic Stress Evokes Alternative Gene
Expression: The Cancer Connection*

Chronic psychosocial stress associated with disturbed circadian rhythms in everyday life has been associated with cancer (Rosbash & Takahashi, 2002). Acute stress can induce a series of dramatic changes in cholinergic gene expression (or "splicing") that alter the normal balance of acetylcholine and acetylcholinesterase metabolism associated with the posttraumatic stress disorders (PTSD) and many related mind-body dysfunctions, which are well summarized by Sternfeld et al. (2000).

". . .up to 30% of individuals exposed to an acute traumatic experience develop posttraumatic stress disorder, a syndrome characterized by progressively worsening personality disturbances and cognitive impairments. . . The

accepted notion is that physiological stress responses are beneficial in the short run but detrimental if over-activated or prolonged. . . We recently reported massive induction of a unique mRNA species encoding the rare “read-through” variant of acetylcholinesterase (AChE-R) in brains of mice subjected to forced swimming stress. AChE-R differs from the dominant “synaptic” variant, AChE-S, in the composition of its C-terminal sequence. . . In hippocampal brain slices, induced AChE-R seemed to play a role in delimiting a state of enhanced neuronal excitation observed after acute cholinergic stimulation. This observation suggested that AChE-R acts as a stress modulator in mammalian brain. (p. 8647). . . Our current findings therefore demonstrate that AChE-R, most likely with another modulator or modulators, may be beneficial in the response to acute stress at two levels: (i) by dampening the acute cholinergic hyperactivation that accompanies stress and (ii) by protecting the brain from entering a downward spiral into progressive neurodegeneration through an as-yet unidentified mechanism, which could involve noncatalytic activities and/or direct competition with AChE-S. In that case, the diversion of up-regulated AChE expression after insults to the central nervous system from production of the usual AChE-S to the unusual AChE-R isoform [by stress-induced alternative gene expression or splicing] would reflect an elegant evolutionary mechanism to avoid the dangers of over-expressed AChE-S. These findings imply that mutations conferring heritable up-regulation of AChE-R would protect the mammalian central nervous system from some age-dependent neuropathologies.” (p. 8652, Italics added.)

While such up-regulation of AChE-R has a protective effect in acute stress, the most recent findings in this area suggest that chronic over-production of AChE-R can lead to over-proliferation of cells that can lead to cancer as noted by Perry et al. (2004).

“In conclusion, our findings are compatible with the hypothesis that CREB’s basal levels are insufficient to block the AChE-R proliferative effect in cells with extreme excess of AChE-R compared to CREB. . . *This may increase the risk for glial tumor growth in individuals exposed to anticholinesterases or head trauma, both shown to induce massive AChE-R overexpression.*” (p. 7, Italics added.)

CREB is a transcription factor that turns on gene expression related to brain plasticity in consciousness, memory, learning and behavior change (see table 1) that are of essence for the creative process, the numinosum, and Jung’s transcendent function.

The Nature of the Numinosum: The Psychosocial Genomics of the 4-Stage Creative Process in the Jung's Transcendent Function

Figure 4 outlines the classical 4-stage process of creativity that relates Jung's 4 psychological functions (sensation, feeling, intuition, and thinking) as they emerge from the psychosocial genomics of the transcendent function in the arts, sciences, and psychotherapy as well as numinous experiences in spiritual practices.

The lower diagram in Figure 4 summarizes the normal circadian (~ 24 hours) profile of alternating 90–120 minute rhythms of waking and sleeping characteristic of Kleitman's Basic Rest-Activity Cycle (BRAC) in a simplified manner. The ascending peaks of rapid eye movement (REM) sleep typical 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. This lower figure also illustrates how many hormonal messenger molecules of the endocrine system such, as *growth hormone*, the activating and stress hormone

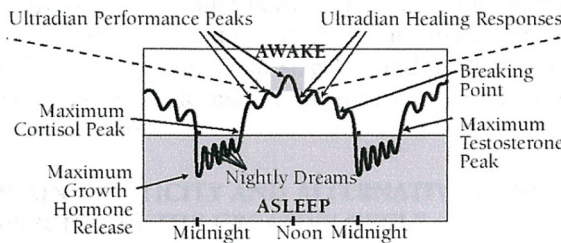
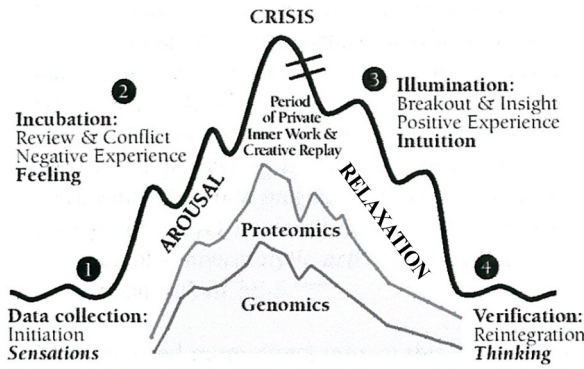


Figure 4

The psychosocial genomics of the 4-stage creative cycle in Jungian psychology

cortisol and the sexual hormone *testosterone*, has typical circadian peaks at different times of the 24-hour cycle. The upper portion of figure 4 outlines how a psychotherapy session is the creative utilization of one natural 90–120 minute BRAC rhythm of arousal and relaxation. I have outlined research that suggests how the classical four

stages of the creative process (data collection, incubation, illumination, and verification) utilize Jung's four basic psychological functions (sensations, feeling, intuition, and thinking) (Rossi, 2002, 2004a).

Figure 4 illustrates how the psychological experience of the four stage creative process (upper curve) emerges from the proteomics (protein) level (middle curve) depicting the energy landscape for protein folding into the correct structures needed for psychobiological functioning (adapted and redrawn from Cheung et al. 2004). This proteomic level is, in turn, emergent from the genomics level illustrated by the curve below it (adapted from Levsky, et al., 2002). This genomics curve represents the actual gene expression profiles of the immediate-early gene *c-fos* and 10 other genes (alleles) over the typical Basic Rest-Activity (BRAC) period of 90-120 minutes.

This set of curves illustrates our basic psychosocial genomics hypothesis: gene expression (genomics) and the dynamics of proteins (proteomics) are the ultimate bioinformatics foundation of the classical 4-stage creative process in psychotherapy and mind-body medicine. These biological transformations at the genomics and proteomics levels are typically experienced as Kleitman's 90-120 minute Basic Rest-Activity Cycle in normal human psychophysiological rhythms. The basic psychosocial genomics hypothesis implies that these psychobiological rhythms can be entrained and utilized to modulate the genomics and proteomics levels for therapeutic purposes by many of the diverse and seemingly unrelated approaches of mind-body medicine (Rossi, 2002, 2004 a-c; Rossi and Nimmons, 1991).

*The Psychosocial Genomics of the 4-Stage Creative
Process in the Transcendent Function*

We are now in a position to better understand the bioinformatics of Jung's view that failure in coping adequately with the transcendent function in many cases is due precisely to the fact that people lack the mental and spiritual equipment to master the events taking place within them. From the perspective of psychosocial genomics, Jung's failure in "*coming to terms with the unconscious [as] a true labour, a work which involves both action and suffering*" could refer to a breakdown in any of the 4 stages of the creative process, which require specific types of therapeutic intervention by Jung's constructive method as outlined here.

Stage 1: Preparation, Data Gathering. Intense and deeply meaningful psychological states of arousal — such as trauma, pain, stress, novelty, dreaming (REM sleep), and creative moments in everyday life as well as all the arts and sciences can initiate the activity of Immediate Early Genes, Activity (or Experience) Dependent, and Behavior-State Related Genes in our brain and body. Our genes are not always in an active state; genes have to be stimulated in everyday life by internal and external environmental and psychosocial signals to generate the proteins that are the molecular machines of life that do creative work. Stage one of the creative process includes a search for the problem the mind-body is attempting to solve on an unconscious or implicit level that often begins with Jung's sensation function. Sensations stimulate neural activity and curiosity, the desire to learn more, that sets us forth on deeply motivating outer and inner journeys of discovery and self-creation on all levels from mind to gene expression.

A natural initiation to mind-body healing begins with the typical history taking at the beginning of any form of psychotherapy. The typical tears and distress in an initial interview, for example, indicate that the person is already accessing state dependent memory and emotional arousal that evoke gene expression, new protein synthesis a potentially healing adventure. *The therapist's main job at this point is to recognize that therapy has already begun and simply facilitate it by letting people to tell their own story.*

Stage Two: Incubation. The Dark Night of the Soul. This is the valley of shadow, doubt, and depression that leads many people to psychotherapy. This is "the storm before the light" that portrayed in drama, poetry, myth and song in many cultures. Stage 2 is the crux of the transcendent function that is frequently manifested as emotional conflict, crisis, and psychosomatic symptoms. *Stress induced alternative pathways of gene expression and protein synthesis often generate conflict in the period of private inner work and creative replay of Jung's feeling function at this stage.* I hypothesize that in the natural processes of growth and the transformations of consciousness during life transitions one invariably falls into anxiety (Sklan et al., 2004), conflict (Birikh et al., 2003), and the reconstruction of memory and learning (Cohen et al., 2003) on all levels from mind to gene that some molecular biologists describe in terms of the genomic shift from AChE-S (Stimulation) to AChE-R (Relaxation). *This is the struggle stage of the hero's journey when*

many people experience a failure in their mental or spiritual equipment that Jung described during the process of individuation.

The therapist's main job in stage 2 is (1) to offer open-ended therapeutic questions designed to access the emotional complexes and archetypal patterns encoding symptoms and (2) to support the person through the sometimes painful arousal that makes them abort their natural cycle of creativity, problem solving and healing in everyday life. After a painful emotional crisis and catharsis some people experience a private period of creative inner work that should not be intruded upon by the therapist. Less is often more at this delicate stage of the transcendent function when respectful listening and emotional support to encourage the person to reengage their numinous dream dramas with the creative replays of active imagination to facilitate their development and healing on all levels from mind to gene is required (Rossi, 2004a-c).

Stage Three: Illumination, Numinosum. Creative Insight, Problem Solving, and Healing. This the famous "Ah-ha" or "Eureka" experience celebrated in ancient and modern literature when Jung's intuitive function is manifest in the arts, sciences and creative moments of everyday life. People are surprised when they receive a creative thought and automatically dismiss their originality as worthless since it has never been reinforced in their early life experience. *I hypothesize that gene expression and new protein synthesis at this numinous stage generates brain plasticity – the making and breaking of brain connections - the actual synthesis of new synapses and connections between brain cells that encode new human experience and the creative transformations of consciousness via the transcendent function.* It is of essence that people learn how to recognize and support these new developments in their consciousness that often are heralded by little smiles and joy that breaks through the clouds of previous conflict. Psychosomatic symptoms tend to disappear dramatically as personal problems are resolved with the new perspectives that develop. *The therapist's main job at this stage is to help the subject recognize and appreciate the value of the "new" that often appears to emerge spontaneously and unheralded.* Often the subject may have already thought of the options that come up for problem solving at this stage but dismissed them since they were never validated.

Stage Four: Verification and Reality Replays. In this final stage of the creative cycle the person needs to verify the value of the new experiences of stage three by exercising them with creative replays in real world as

well as dreams and active imagination. New experiences and insights are often fragile and can be easily lost. It is ironic that our family and friends, who wish us well, often do not recognize the new that develops within us. Because of this the people who are closest to us often do not know how to support us in the realization of our new reality. Thus adolescents experience the generation gap when they have difficulties with their family and friends. Falling in love can be fragile and fickle. Innovators and creative workers have been perpetually misunderstood and persecuted throughout history for daring to assert their new consciousness. *The therapist's job in this stage is to (1) facilitate a follow-up discussion to validate the value of the psychotherapeutic process, (2) reframe symptoms into signals and psychological problems into inner resources, and (3) prescribe further "reality homework" to test, extend and reinforce the new neural connections being synthesized. Evidence suggests that 4 weeks to 4 months are required to stabilize these new neural networks* (Van Praag et al., 2002).

Summary and Implications

Current neuroscience research implies that psychobiological arousal during creative experience in psychotherapy as well as the arts, sciences, and spiritual practices can modulate gene expression, protein synthesis, and brain plasticity. We have traced the source of Jung's "failure in . . . the *mental and spiritual equipment to master the events taking place*" *within themselves to the genomic level during stage 2 of the creative process*. We do not know the extent and limitations of this new "top-down" psychosocial genomic perspective on Jung's synthetic or constructive method for the "true labour" of optimizing our archetypal genomic resources, however. This suggests that Jung's (1918/1966, p.5) call for a "return of the individual to the ground of human nature, to his own deepest being with its individual and social destiny" can be taken literally. We need to support psychosocial and cultural genomics research with the new DNA microarrays (gene chips) for exploring our relationship to the genomic ground of our creative being, the transcendent function, and the nature of the numinosum.

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FIGURES

SEQUENCE STRUCTURE FUNCTION

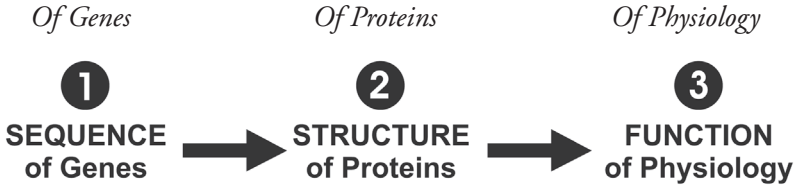


Figure 1a
The Original Linear Dogma of Molecular Biology by Watson and Crick in 1953

Figure 1a: The Watson & Crick linear dogma of molecular biology of 1953 with no explicit role for consciousness and psychological experience.

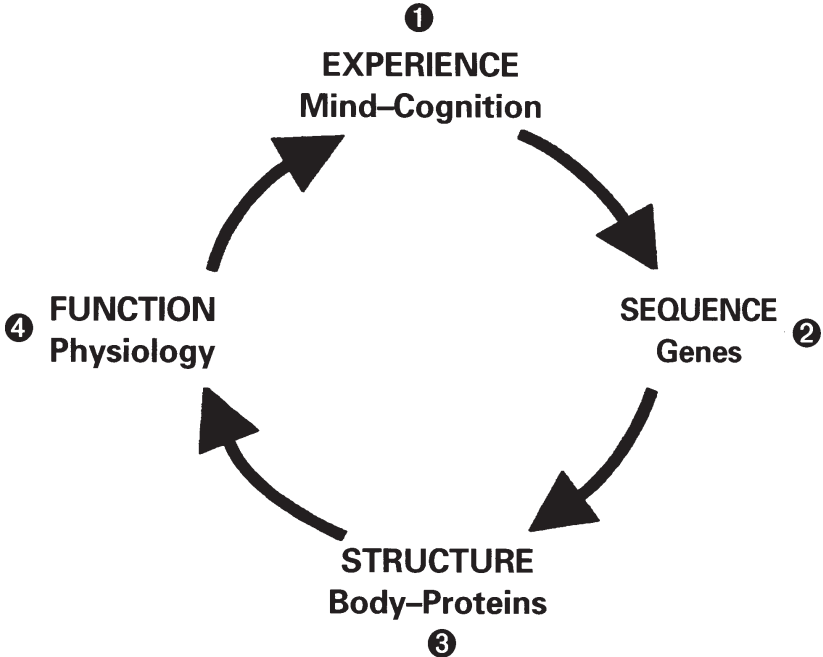


Figure 1b
Rossi's Bioinformatics Cycle of Psychosocial and Cultural Genomics

Figure 1b: Rossi's Bioinformatics Cycle of Psychosocial and Cultural Genomics.

(1) Psychosocial stress and the psychological *experiences* of psyche and mind can modulate (2) the alternative splicing of the *sequence* of gene expression (genomics), (3) protein synthesis and *structure* (proteomics), and (4) the physiological *functions* of the brain and body. This psychosocial genomics “top-down” approach to Jung’s synthetic or constructive method illustrated on the right side of this mind-body circle of information transduction is balanced by the more usual “bottoms up” approach of molecular biology, behavioral genetics, evolutionary psychology, and sociobiology illustrated on the left side of the mind-body circle.

Figure 2: The Numinosum as a Special State of Psychobiological Arousal Activating the Gene Expression and Protein Synthesis Cycle in Jung's Transcendent Function. A major implication of current neuroscience research is that the numinosum is an unusually heightened state of



Figure 2
Rossi's Numinosum as Psychological Arousal

psychobiological arousal via a wide variety of experiences [such as pain, stress, trauma, novelty, dreaming (REM sleep), creative moments and the normal 90-120 minute Basic Rest-Activity Cycle (BRAC)], which can turn on (1) immediate early genes (IEGs) within seconds, which (2) promote target gene expression (transcription) that (3) code for the synthesis of proteins that are the molecular machines of life regulating (4) brain plasticity in the transformations of consciousness via the Jung's transcendent function, memory, and learning.

Figure 3: Psychosocial and cultural genomics illustrated as a four-stage model of the complex adaptive system of mind-body communication and healing. This circular loop of information transduction between mind and gene emphasizes the flow of hormones (messenger molecules) between the mind-brain, brain-body, and cellular level of gene expression via the blood stream that normally takes place every 90-120

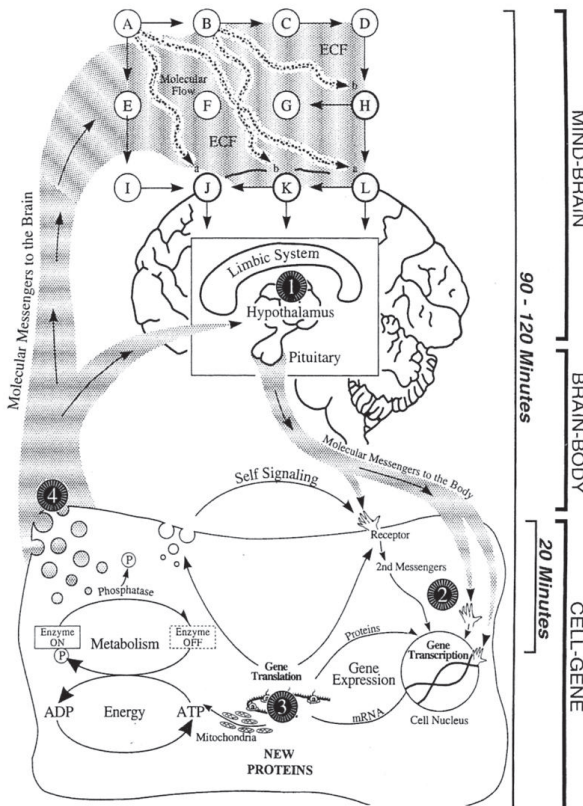


Figure 3
Rossi brain-cell-genome map

minutes in Kleitman's Basic Rest-Activity Cycle. The brain's neural networks at the top represented by the rectangle of neural units, A through L, that receive molecular signaling through the extra cellular

fluid [ECF] from the blood are regarded as a complex adaptive system: a field of self-organizing communication processes that are the psychobiological basis of mind, memory, learning, and psychosomatic medicine. (1) The Limbic-Hypothalamic-Pituitary bioinformatic system between mind and brain; (2) molecular messengers evoked by sensations and psychosocial cues turn on gene transcription (expression) within minutes; (3) messenger RNA (mRNA) from gene expression codes for new protein synthesis within minutes to hours; (4) many of these proteins are the basis for enzymatic activity generating the energy of metabolism and other messenger molecules (e. g. hormones, neurotransmitters, cytokines) that return via the blood to the

brain to modulate consciousness, memory, and learning to complete the circle of information transduction between mind and brain.

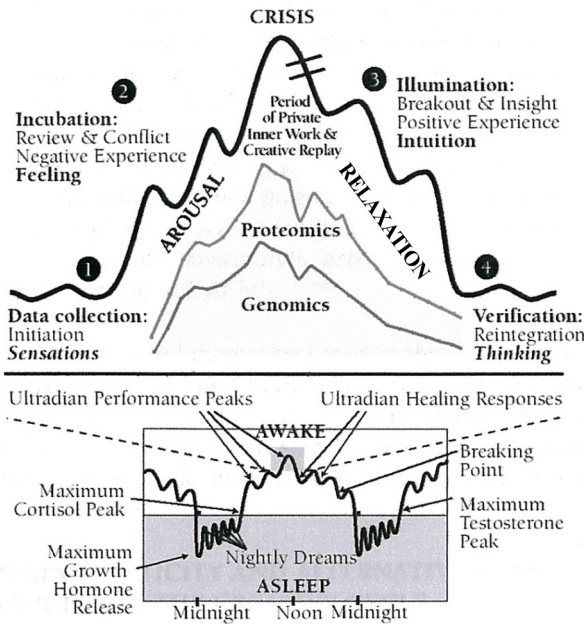


Figure 4
The psychosocial genomics of the 4-stage creative cycle in Jungian psychology

Figure 4: The 4-stage creative process of the transcendent function emerging from genomic and proteomic levels in everyday life as well as the arts, sciences, and psychotherapy.