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Mental Attention, Consciousness, and the Progressive Emergence of Wisdom

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I discuss the mental–attentional mechanisms of consciousness, meditation, and the emergence of wisdom. A developmental (neoPiagetian), dynamic flash-light model of mental attention is used. I model the initial stages of consciousness in infancy, showing that the growth of consciousness is influenced by the number of schemes that attention can coordinate. I discuss ordinary consciousness in adults and the stages/levels of adult development in consciousness. Wisdom is defined as an expectable but often missed outcome of adult development. To accelerate access to wisdom, two complementary paths are mentioned: a natural life-experience path and a meditation path. Maturational organismic factors and the role of mental attentional mechanisms in these two paths are discussed, and a constructivist neuropsychological model of what happens in the brain during meditation, and in higher consciousness, is sketched. Processes involved in higher stages of consciousness are then examined from this perspective.

KEY WORDS: Consciousness development; mental capacity; meditation; wisdom.

Charles (Skip) Alexander, in his theoretical and experimental work as developmental psychologist has argued that post-formal stages of life-span development may be followed, at least in those pursuing some "way to wisdom" (Jaspers, 1951), by higher stages of consciousness—spiritual enlightenment, wisdom, graceful life and aging (Alexander *et al.*, 1990; Alexander, Heaton, & Chandler, 1994). These claims help to clarify developmental mechanisms that might promote spiritual growth. Since Alexander's interpretation of Vedic psychology speaks of "inherent" mechanisms for the growth of consciousness, which the TM and other techniques help to unfold, and denies that these mechanisms are just the product of learning, his analyses suggest the following hypothesis: Both spiritual growth as described by Vedic psychology and the transition mechanisms of developmental stages might be related to the unfolding of innate mental-attentional mechanisms refined and enriched by special life practices. This is the idea that I wish to explore, inspired by Skip Alexander, even though he might not have taken the idea as far as I do.

To do so I adopt an epistemological perspective different from Alexander's. According to Vedic psychology, full consciousness is already available in a latent form in every person; only psychological noise of everyday life prevents people from unfolding this consciousness. Such an idealist rationalism (see Audi, 1995), or neonativist view, is akin to claims about the Self found, among other authors, in Jung's analytical psychology. I adopt a different, dialectical and constructivist, view (Pascual-Leone, 1995, 1996; Pascual-Leone & Irwin, 1998; Pascual-Leone & Johnson, 1999b). My viewpoint is constructivist because it does not assume that full consciousness as such exists latent in the subject's unconscious. Rather, consciousness is an *emergent* phenomenon—emergent in the sense that it cannot be reduced to a formal/material combination of its constituent parts, as performance of a computer program is to its program constituents (see "emergence" in Audi, 1995). This is an interactionist view: Innate "hardware" mechanisms (maturation) and learning (the constraints of reality), in their interaction, produce the emergence of con-

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sciousness. My viewpoint is dialectical because it assumes from the start a dialectical organization of very active processes in the brain, where in every moment multiple processes are continuously activated in competitive interaction, as if they were instrumental voices in a symphonic orchestra (Pascual-Leone, 1987; Pascual-Leone & Johnson, 1999b). And to follow this analogy, currently dominant executive processes, like the conductor of the orchestra, attempt to coordinate some "voices" and to inhibit or attenuate many others. Cognitive performance, including actual consciousness, would thus be, like a symphony played by an orchestra, dialectically constructed products of many coordinated but competitive "voices." In addition to the voices themselves (which in the human brain would be organismic schemes), the emergence of cognitive performance demands mechanisms for executive control and mechanisms for bringing about gestaltist closure to the unfolding phenomenal experience (this is William James' "stream of consciousness"). This process constitutes the totality (performance, state of consciousness) in question.

WHAT IS CONSCIOUSNESS?

On a first approximation, ordinary consciousness is the aptitude of an organism to have *a distinct* representation of some constituents of its own thinking (cognition), feeling (affects and emotions) and/or willing (deliberate intentions). I say distinct because to be conscious a representation must be different from the processes that it represents—its object or referent. A third constituent of self-experience, the agent who does the representation (the knower or knowing self) appears developmentally later, at the end of infancy, and this is the onset of reflective/conceptual self-consciousness (Legerstee, 1999). Thus, ordinary low-level perception may not qualify as consciousness in this technical sense (although indeed it qualifies as "sentience"—the disposition to have purely experiential or sensorimotor feelings). It may not because the processes represented in low-level perception and the representation itself are not distinct but the same. This is why Husserl, Piaget, and others talk in this case of "presentation" (presentational processes), which they contrast with "re-presentation" (see Pascual-Leone & Johnson, 1999a, for an explicit formulation).

The idea of consciousness adds three new conditions to the idea of representation. It adds (1) the claim that information given in consciousness is available for use as supervisory system (highest executive level of control) in other organismic processes. This intuition is at the origin of the legal practice of evaluating consciousness at the time of a crime, before determining a person's guilt. It is also at the origin of the recently popular cognitive and/or computer modelling of consciousness in terms of a "global workspace" or psychological "blackboard," where processes can be placed to be internally *broadcast* to any other psychological processing modules in the organism or system in question (e.g., Newman, Baars, & Cho, 1997; Sabah, 1997). Regardless of whether the "broadcasting" metaphor is altogether apt, phenomenological experience reveals, in states of consciousness, an active field of felt *internal complexity* (Greenberg & Pascual-Leone, 1995); which is interpretable as a complex manifold of hyperactivated *schemes* that spontaneously interact and produce the current stream of consciousness in our repertoire.' To enable this first condition of consciousness, i.e., its being a complex of representations, which creates the person's experiential/existential being-in-the-world, two other conditions are necessary: (2) The schemes that produce consciousness must be informationally dense, i.e., *semantically hypersaturated* (because they reflect vast amounts of schematic information extended in personal-historical space and time). (3) Finally, these schemes must be *hyperactivated,* thus dominating mental processing.

Consciousness of any real life situation involves many distinct, different schemes, most of which are not automatized and thus will not be by themselves hyperactivated. Some "hardware" mechanism must exist in the brain that, monitored by executive schemes, can bring about this hyperactivation. The mechanism in question is endogenous *mental attention,* a causal determinant of working memory (Pascual-Leone, 1987, Pascual-Leone & Baillargeon, 1994; Pascual-Leone & Johnson, 1999b). In my theoretical account, this mental attention is an organismic *psychological function* (symbolized by <. . .>) constituted by three resource capacities (here symbolized by letters *M, I,* and n, and a special subrepertoire

'Neurologically, schemes are collections of neuronal processes in the cortex that both work together to produce particular performances (i.e., are semantically co-functional), and often are activated in coordination (i.e., coactivated). These neuropsychological schemes are *hyperactivated* whenever the neuronal processes making them up are so active in firing that easily spread their activation to neuronal circuits related to them, and also inhibit/override contradictory circuits.

of executive schemes (symbolized by the letter E), which interact as a system of attentional *operators: <E,M,I,F>*. The component E is the set of currently dominant attentional executives, often collectively named "the executive". The component *M* is mental "energy" or capacity, which produces attentional *focussing* (Piaget's mental centration). The component I is "top-down", central inhibition that causes attentional *interruption* of task irrelevant or misleading processes. The component F is the neoGestaltist "field factor" of simplicity, which effortlessly (i.e., passively) suppresses processes that are either redundant or activated too weakly.' Mental attention can effectively change the dynamic "choice" of performance that cortical processes will produce by boosting, i.e., bringing into *hyperactivation* with the *M operator*, and/or deactivating (interruption) with the I operator, currently activated cortical schemes. Notice that in any situation there may be schemes hyperactivated by factors other than mental attention. Automatization, perceptual salience, affects/emotions, etc., could hyperactivate schemes, whether these schemes are task relevant or not. Hyperactivated but irrelevant schemes must be interrupted by mental attention to prevent them from affecting the person's (neuropsychological) output. These mental-attentional processes are central, top-down processes that generate mental, often conscious, operations. Often these processes are referred to in the literature as allocation and control of *working memory;* this alternative terminology highlights that working memory, as generally conceived by psychologists, is at any time the set of currently hyperactivated schemes in the person's cortex. From the perspective of this model of mental processes, we should think of consciousness as a dynamic meaning-making process of brain integration, which is carried out simultaneously over a progressively growing number of distinct and separate mental processes (or "entities")—the various schemes that mental attention can boost into hyperactivation (i.e., M-centrate) so as to achieve mindfulness (Langer, 1997; Pascual-Leone & Johnson, 1999b) of them all with their interrelations.

[3]The "hardware" operators of mental attention, i.e., *M, I,* and *F,* have a natural interpretation in brain processes. The operator *M* corresponds to a selective, and prefrontally-controlled, generator of bioelectrical activity, i.e., neuronal firing. This is a high-frequency oscillator capable of spreading hyperactivation on the information-bearing neuronal circuits (i.e., *schemes)* on which is bears. The operator I corresponds to prefrontally-controlled inhibitory processes that can reduce high-frequency neuronal firing on neuronal circuits where it applies. Both *M* and *I* mechanisms seem to involve a complex circuitry in the brain connecting prefrontal lobes with subcortical centers, as explained later in this paper. The operator *F,* in contrast, may involve only local cortical processes of lateral inhibition, i.e., the spreading of local inhibitory connections from highly activated neurons to other neighboring neurons. Because of this local lateral inhibitory processes, hyperactivated neuronal circuits tend to suppress less activated competing circuits; and thus the Gestallist principles of simplicity and good form in mental representation are generated. The dynamic interaction among these three "hardware" operators enables the prefrontal lobe to regulate which neural circuits are boosted (i.e., hyperactivated) and which ones are actively (with the I operator) or passively (with the F operator) suppressed.

THE GROWTH OF BASIC CONSCIOUSNESS FROM INFANCY TO ADULTHOOD

Consciousness appears whenever the cortical processes contain *hyperactivated* schemes *complex enough* to encompass the situation—i.e., the totality of aspects relevant to the experience/performance in question. Because time and again the complexity of schemes available cannot encompass the whole situation, and some schemes may be task irrelevant or misleading, subjects often rely on the power of mental attention to hyperactivate or interrupt schemes so as to generate the needed state, or stream, of consciousness. Only in this manner can the intended field of hyperactivated schemes be obtained. This field is what psychologists often call working memory, of which M-space (i.e., the set of schemes actually hyperactivated by M-capacity) is a part. Together these hyperactivated schemes dynamically synthesize the evolving focus or stream of consciousness. Since the number of distinct, separate schemes that a person can boost simultaneously with mental attention (M-capacity) increases from birth to adolescence, congruently with Piagetian/neoPiagetian substages, a prediction can be made: *Provided that there is a good learning environment, developmental onset and growth of basic consciousness should be a function of developmental rate of growth in M-capacity*. In the text, or in endnotes, I illustrate this point with task analyses of what I consider to be the three early developmental stages of basic consciousness. These stages are defined in Table I.

In the first (weak) form of consciousness, which I call *awareness,* there is a distinct consciousness of the *object* of experience, which might be the subject herself taken as a distinct, deliberately considered, object. As is generally recognized, this early step is first detected in 5- to 8-month-old babies, when they see themselves in a mirror (Butterworth, 1990; Leg-

Table I. Initial Stages of Basic Consciousness

1. SENTIENCE—Some form of perception and reactivity vis-a-vis the environment.
2. AWARENESS—Conscious representation of the object, but not the subject of experience.
3. PROPER CONSCIOUSNESS—Conjoint conscious representation of both the object and the internal self-subject (i.e,. selfl).
4. SELF-CONSCIOUSNESS—The object, the internal subject (selfl), and awareness of being conscious of them (i.e., self2) are conjointly available in the brain's field of activation (i.e., internal complexity)

erstee, 1999; Nadel & Butterworth, 1999). Recognition is shown by the baby's cooing and smiling (behaving "socially") vis-a-vis the mirror reflection of themselves, more so than that of others. This observation suggests that one distinct aspect of experience, an *object, is* recognized and reacted to appropriately; but *object* and *subject* of experience are not simultaneously distinguished. To see the mental demand involved in acquiring this level of consciousness, it suffice to consider that a distinct recognition by the baby of his/her own face in the mirror, necessitates of two or three schemes simultaneously hyperactivated in the field of internal complexity (field of activation). Namely, (1) the baby's scheme of the mirror and its physically reflective characteristics, which I denote mirror* (where the postscript * indicates that this represents a figurative scheme); (2) the figurative scheme of the baby's face and its changing appearance under movements, which is connected to the *purely-experiential,* perceptual or unreflective, baby's self (symbolized by selfl) which is the source of the movements—a complex scheme which I symbolize with the expression baby-selfl-face*; (3) the operative/procedural scheme that serves to recognize an object, which I symbolize as RECOGNIZE, written in capitals to indicate that this is an operative scheme. To distinctly recognize herself in the mirror the baby must allocate mental attention (M-capacity) to each of these schemes, so that they become hyperactivated, and thus RECOGNIZE can apply on (or connect to) baby-selfl-face* and mirror* to bring about the recognition. This operation could be represented by the following expression:

M[RECOGNIZE(baby-selfl-face*, {mirror*}$1,,]
baby-selfl-face*-in-mirror (1)

In English, this formula says that the baby, when she hyperactivates with M-capacity the schemes of "recognize", "baby-selfl-face*" and "mirror*", ensures that RECOGNIZE will dynamically interconnect with baby-selfl-face* and mirror* to cause the *emergence* of awareness (here in the formulas symbolized by "") that the baby's own face is on the mirror—an awareness that is embodied in the new scheme baby-selfl-face*-in-mirror. Notice that because the concrete situation gives very salient cues that activate the scheme for the mirror, the scheme mirror* may not need to be boosted with M-capacity. This is indicated in the formula by placing mirror* inside braces {. . .} with "sit?" subscripted to them, thereby suggesting that in at least some children mirror* may not need to be boosted by M-capacity, because the situation is providing strong cues. Thus Formula (1) indicates that to produce the awareness of baby-selfl-face*-in-mirror the child must be able to boost with mental attention, simultaneously, 2 or 3 schemes. According to our theory, sufficient M-capacity for this achievement is only available, respectively, after 3–4 months of age and after 8 months of age (Pascual-Leone & Johnson, 1991, 1999a); which is consistent with findings reporting success sometime between 5 months (Legerstee, 1999) and 8 months of age (Butterworth, 1990; Nadal & Butterworth, 1999).

Next comes the emergence in the baby of *proper consciousness,* that is, when the child has a simultaneous distinct awareness of both the *object* and the *subject* of experience. The earliest time this appear in the baby is around 14 months (see Meltzoff, 1990, for details—p.142ff). A deliberate consciousness of both *object* and *subject, and their interrelations, is* not attained however until about 18 months, as shown by the classic mirror task of Gallup (Butterworth, 1990; Meltzoff, 1990). **In** this task, after the baby is familiarized with the mirror and his/her reflection in it (his/her perceptual self selfl), the experimenter surreptitiously marks the baby's face with rouge (forefront, ear, or nose). If when noticing the mark of rouge in the mirror image the infant brings the hand to his/her own face, touching the rouge mark, one concludes that he/she is fully conscious of the *interrelations* between the *subject* and the *object* of consciousness. This achievement appears at about 18 months but not earlier (Meltzoff, 1990; Butterworth, 1990); and its process analysis is modelled in the two steps of Formula (2). In this formula I call mirror* the baby's scheme for the mirror reflection; and call respectively baby-face* and face-selfl* his/her schemes for any baby's face and for his/her own face. Symbols written in capitals represent operative schemes: NOTICE or RECOGNIZE symbolize perceptual procedures for, respectively, noticing a novel

feature in a recognized pattern, or recognizing one pattern as being an instance of a known conceptual category (e.g., a face)! Finally, M[. . .] stands for the baby's mental attentional capacity as it applies on schemes (here replaced by suspension points) to hyperactivate them. This Formula (2) models the emergence into *proper consciousness* of the existence of red marks on the baby's own Face, seen in the mirror image:

M [NOTICE (baby-face *,mirror *)]
red-in-face/mirr* (2.1)

M[(NOTICE(RECOGNIZE(face-selfl *,mirrow*), red-in-face/mirror*)] red-in-face-selfl/mirr* (2.2)

In step (2.1) the infant notices a red mark on the face of the mirror image, without recognizing herself; then, in step (2.2), she *recognizes* the face as her own, thus *noticing* the red mark on her own face reflected by the mirror. The schemes involved in the most complex step (2.2) are 5: mirror*, face-selfl*, RECOGNIZE, red-in-face/mirr*, and NOTICE. Since growth of M-capacity in infancy does not allow simultaneous hyperactivation of five distinct schemes before 18 months (Pascual-Leone & Johnson, 1991, 1999a), the known resolution of this task at 18 months confirms the prediction that M-capacity is needed to enable proper consciousness.

Only at 3 years of age, when a child can simultaneously hyperactivate seven distinct schemes (Pascual-Leone & Johnson, 1991, 1999a), does reflective *self-consciousness* appear (this is *being aware of being aware* of both *object* and *subject).* Only with this achievement is there a full mental representation, which infants can objectively *symbolize* by drawing a picture.'

'These achievements come very early in the baby because, perhaps due to innate machinery for maternal attachment, they possess an "active intermodal mapping" procedure (Meltzoff & Moore, 1999) in which the infant's proprioceptive feedback from self-produced movements is compared to the visually specified target.

[5]Consider how infants can reach the idea of *symbolizing* (objectively representing a person by drawing a picture. Formula 3 models this achievement with the example of drawing daddy's picture. This landmark indicates the true onset of reflective self-consciousness.

M[SYMBOLIZE(IMAGINE(daddy*,body*), DRAW(pencil*,paper*))1 drawing-image-of-daddy (3)

To symbolize him, the child imagines her daddy's body and draws it with pencil on paper. Imperfections of this drawing (typically it is a head with arms and legs) show the limits of a 3-year-old's mind. But now this is self-conscious representation: truly reflective thinking has begun.

From now till adolescence a child's mind will continue to grow. Both structural learning and maturational growth of M-capacity progressively increase the internal complexity of a child's mental representations. When this maturational growth ends, at 16 or 17 years of age, the person can keep in mind simultaneously 13 (6 + 7) *distinct and separate* schemes; i.e., 6 perceptual-motor schemes and 7 fully-mental, symbolic schemes (Johnson, Fabian, & Pascual-Leone, 1989; Pascual-Leone, 1987; Pascual-Leone & Baillargeon, 1994; Pascual-Leone & Johnson, 1999a). With this much processing power, the mental world of normal adulthood is now possible.

CONSCIOUSNESS IN ADULTS, AND EMERGENCE OF HIGHER CONSCIOUSNESS AFTER SPECIAL MEDITATION PRACTICES

With the possibility of simultaneously keeping within consciousness so many distinct schemes, world-, Other- and self-experiences of adulthood could develop fast, if learning opportunities exist. Often, however, this development is not optimal, because people acquire from childhood, and even adult life, not only inadequate patterns of conduct, but also dysfunctional emotions and ties between emotions and cognitive/psychosocial schemes, which disrupt learning and conscious experience, thus hindering mental growth. These are emotions such as fear, or unrestrained ambition or greed, which bias cognitive appraisal as they are transferred, often unconsciously, from one situation to another. Still, there is progress, at times described as life-span stages and emergent wisdom (e.g., Alexander *et al.,* 1990; Baltes, Lindenberger, & Staudinger, 1998; Pascual-Leone, 1990a, 1990b; Pascual-Leone & Irwin, 1998; Snarey, Kohlberg, & Noam, 1983).

Table II, modified from Baltes *et al.* (1998), outlines some formulations of adult-development levels/stages. In this table I have contrasted Piaget and Pascual-Leone's view of cognitive–developmental stages (as discussed by Baltes *et al.,* 1998), with Alexander's Vedic-Psychology formulation (Alexander *et al.,* 1994), Kohlberg's moral stages (Kolberg, 1981; Snarey *et al.,* 1983), Loevinger's ego-developmental stages (Loevinger, Carson, Westenberg, & Lasker, 1998; Cook-Greuter, 1999), and Erikson's stages of psychosocial development (Erikson, 1982). Notice that these levels are complementary: Piaget and Pascual-Leone describe the relational complexity of constructive processes in stages; Alexander highlights psycho-

Table H. A Sample of Source Life-Span Models with Relevance to Self and Personality Growth'

Piaget & Pascual-Leone	Alexander	Kohlberg	Loevinger	Erikson
Sensorimotor	Senses		Presocial Symbiotic	Trust vs. mistrust: Hope
Preoperational	Desire	*Preconventional* Punishment-Obedience	Impulsive Self-protective	Autonomy vs. shame: Will power Initiative vs. guilt: Purpose
Concrete Operational	Mind	Instrumental-Hedonistic	Conformist	Industry vs. inferiority: Competence
Formal Operations	Intellect	*Conventional* Good boy morality	Conscientious	Identity vs. confusion: Fidelity
Late formal Predialectical	Feeling Feeling	Authority Orientation *Postconventional* Morality of contract	Individualistic Autonomous	Intimacy vs. isolation: Love Generativity vs. stagnation: Care
Dialectical	Ego	Individual/ethical principles of conscience	Integrated: Ego/construct-aware°	Integrity vs. despair: Wisdom
Transcendental	Transcendental consciousness		Integrated: Unitive stage°	
Transcendence	Cosmic consciousness			
	Unity consciousness			

'This table is modified from: Baltes, Lindenberger, & Staudinger (1998), p. 1092.
'As reformulated by Cook-Greuter (1999).

logical functions dominant in each stage; Kohlberg gives the dominant pattern of moral judgement for each stage; Loevinger describes dominant styles of ego-coping in the stages; and Erikson gives their dominant psychosocial conflict, or dialectical contradiction. Whenever in a column of Table II a partition is missing (as in the last entry of Piaget and Pascual-Leone's column) even though partitions are found in another column (e.g., the last three entries in Alexander's column), this means that the latter system of stages is more differentiated and the former has a more global or ambiguous classification for the levels in question.

Contrasting the original comparative table of Baltes *etal.* (1998), with my Table II, and with the comparative analyses offered by others, one notices important disagreements among authors in matching alternative stage systems. Further, even when regarded as only probabilistic descriptions of regularities of change, these life-span stages are deceiving as descriptions of ordinary people in our culture. In real people stage characteristics might often vary with the area or domain of experience; and they may exhibit differential characteristics not included in traditional stage models. For instance, the mind/consciousness of ordinary people *tends* to show, I believe, the following features (F):

(Fl) Their *mind (i.e.,* their repertoire of conscious or unconscious mental structures) may be *crowded with conflicting thoughts and emotions,* in particular across different situational contexts; and these contradictions are often suppressed from consciousness (this is a function of emotional *defense mechanisms)* with the help of mental-attentional *interruption.*

(F2) The mind is also *crowded with content,* often imposed by the external situation, or by affects/emotions (expectations, wishes, obligations, fears, longings, ambitions, etc.) that the person harbours.

(F3) The mind clings to affectively-laden cognitions (objects, beliefs, goals, etc.) and positive or negative emotions, social stereotypes, etc.

(F4) The mind *lets impulsive emotions and overlearned dysfunctional structures* (for instance, less-adaptive schemes from earlier stages) *disrupt the appraisal of here-and-now reality,* clouding judgement; and this may prevent development of more refined affects and emotions that guide life goals, and motivate enriching experiences.

(F5) Consciousness is often *self-centered,* and fails to empathize with people who do not belong to the self-chosen kindred "family."

Yet these five tendencies of the ordinary mind change to a more open, cordial mood, as the person progresses into higher stages of consciousness, and towards wisdom.

Wisdom, as a mode of mental processing, is *concerned with human life as a totality* from the perspective of an intelligent, deliberate life-coping. Although originally developed as a concept in the context of Re-

ligion and Philosophy, many psychologists today concur in considering wisdom a potential (not often attained), natural stage of adult development (e.g., Sternberg, 1990; Baltes *et al.,* 1998). I have discussed this complex concept in detail elsewhere (Pascual-Leone, 1990a). I only provide a partial definition in the current paper.

Wisdom deals with *vital reason* (Ortega y Gasset, 1980), that is, insightful practical rationality about one's life *(vita* in Latin) and living in all its aspects. Vital reason is concerned with the person as a concrete, multifaceted, evolving totality—a totality that extends into the future *and the possible* of a person. The way to wisdom may result from learning to face life mindfully and insightfully but in an unmediated, nonconceptual ("postsymbolic"), spontaneous, "nononsense" but loving, direct way—as a young child might learn with the knowledge of an experienced, caring adult. *Vital reason,* the direct way of using reason in life, is at hand once the *self (i.e.,* the mind's subrepertoire of schemes that directly refer to the mind's beholder), and its mechanisms for consciousness, are detached from dysfunctional associations, disturbing emotions or unwanted automatisms that come from the person's past life and history. Such a change can come by two alternative paths: Either naturally (this is the *external path),* with mentors (perhaps within psychotherapy) and *life experience,* through the so-called "midlife crisis" and adaptation to the aging process; or, somewhat less naturally (this is the *internal path),* with a different sort of mentor and by means of *meditation practices.*

What I would like to emphasize now is not the role of mentors, although this issue is an important one, but the role of organismic processes, which play a distinct role in every alternative path, but a different one in each. In the *natural life-experience path* the organismic processes involved are natural (externally induced) biological changes that propitiate in subtle ways the resolution of conflicts and psychological obstacles to growth. In the *meditation path* the organismic processes (internally induced by specialized individual practices—mental or spiritual exercises) are directly acting on the brain's state of self-consciousness to detach it, and thus the person, from disturbing emotions and dysfunctional schemes that previously were preventing growth. In the remainder of this section I will discuss the first and in the next section the second, so as to contrast the two sorts of organismic processes.

In the *natural life-experience path* the spontaneous spiritual growth (i.e., internal change towards wisdom) of the person owes much, I believe, to what Jaspers, the existential philosopher, aptly called *limit situations* (Jaspers, 1970, 1986; Latzel, 1981; Pascual-Leone, 1990b). In a limit situation the person experiences, *with awareness and resolve,* an enduring failure to cope with unwanted and overwhelming circumstances that cannot be avoided or apparently resolved. Every experience of enduring in the context of hard effort and fear of failure, functionally approaches a limit situation; this is so for as long as the person does not succeed or give up. For this reason life hardships that are endured with existential awareness lead to remarkable growth in the self. But *ultimate limit situations* that cannot be undone and are nonetheless faced with consciousness and resolve—situations like death, illness, aging, irremediable oppression or loss, extreme poverty, rightful resistance or rebellion, guilt, absolute failure, danger, uncontrollable fear, etc., lead to the natural emergence of a transcendental self, if they do not destroy the person first. In the spiritual traditions, this is often regarded as the ascetic way to enlightenment.° This sort of existentially conscious coping with hardship in life may not bring the person to mature, perhaps because of dysfunctional defense mechanisms that prevent a clear experiencing of limit situations (e.g., rigid character structures, uncritical acceptance and pursuit of social recognition and acclaim, depression, drugs, alcohol, delusions and false self-image, etc.). Then counselling by mentors and psychotherapists might help in bringing existential insight to the person. The last but not least resort would be the most natural of all: the aging process (Pascual-Leone, 1983, 1990a). Beginning at around 35 or 40 years of age, the defensive inhibition (i.e., attentional interruption

'The conception of ascetism emphasized here is that of a discipline, practice, or method—a path—to pursue spiritual growth while remaining within the lifeworld experience (see the entry on "ascetism" in classic philosophical dictionaries—I use Ferrater Mora, 1958). Jeffrey C. Alexander, in his contribution to this Special Issue (Alexander, J., in press), uses Max Weber's distinction between ascetism and mysticism. He also emphasizes, albeit in different words, that ascetism seeks spiritual growth by going out to the world and living with detached ascetic practice—becoming "a "tool" of God, transforming the religious spirit into a system of ethical injunctions guiding practical action in the world." My conception of ascetism can be obtained from this formulation if the reference to God is read agnostically—as Jaspers or Jung would—as referring to an idealized transcendence: the perhaps projected existential construal of a humanly-sensitive and ultimate being-of-the-world. As Jeffrey Alexander emphasizes very clearly, Skip Alexander's construal of Transcendental Meditation as a way to wisdom retains the ascetic path of a worldly disciplined practice, albeit grafting into it regular "mystical" moments—i.e., systematic practice of TM meditation.

by the I operator) of life's conflicts and dialectical contradictions, so that they are excluded from consciousness, or disguised, may no longer be easy. Regressive processes of aging have begun to change the power of four *hardware operators (i.e.,* information processing mechanisms—part of what Baltes *et al.*, 1998, call the "mechanics") of the brain; these operators are variously involved in the work of emotional defense mechanisms that protect coherence of the ego/self (its synthesis function). The change in these four hardware operators (HO) during the midlife transition tends to be as follows (Pascual-Leone, 1983, 1990b):

(HO1) The attentional interrupt (I operator) mechanism begins to falter functionally, or to relax unduly; it becomes progressively harder both to *interrupt* (suppress from attention or inhibit unwanted schemes), or to *disinterrupt* (minimize the inhibition of potentially relevant schemes, and thus maximize their accessibility from long-term memory).

(HO2) Mental attentional boosting capacity lowers its readiness, and the subject becomes progressively less able to mobilize *with ease* his/her mental attention (or *M* capacity).

(H03) Acquisition of purely concrete experience via effortless *Content learning* (verbal, perceptual, representational, motor)' becomes much harder to achieve and slower. For this reason, aging persons often have difficulty in recalling names, and may have reduced memory for, and less interest in, new content (e.g., concrete things, persons and events). In contrast, the attentive and deliberate *(effortful)* learning of new structures and procedures—logical-structural schemes selectively abstracted by means of mental attention—is much better preserved.' This differential change of learning mechanisms might explain the promptness that older adults may have for recalling and synthesizing from past experience mindfully abstracted structural concepts—whether memories, wise advise or categorical conclusions about life.

(HO4) *Affects* (the brain limbic system's input to the cortex) decrease their drive. Emotions mellow and affects become more subtle. Consequently, affective arousal may decline at a time when allocation of *M* capacity increasingly requires its services (this is due to H02).[9]

These four natural (age-bound) changes of the adult mind, may alleviate, but other times predictably increase, problems of ordinary consciousness that I mentioned above (features Fl to F5).[10] The change H02, together with the exacerbation of Fl, might be useful in a different way: By creating internal conflicts and scarcity of *M* resources (causing disequilibration in Piaget's sense), they may force the person to construct more integrative and efficient, "wiser" schemes.

The result of these changes is often the emergence of new forms of conscious reasoning: dialectical operations and transcendental operations. *Dialectical operations* are "the constructed conceptual operations that serve to coordinate semantically unrelated, but often mutually contradictory, formal-operational systems that in practical use cannot be separated" (Pascual-Leone, 1983, p. 142; see also Pascual-Leone and Johnson, 1999b). *Transcendental operations* are a particular sort of dialectical operation. That is to say: "whereas ordinary dialectical operations (that create the transcendental self) emerge in the context of action processes (i.e., in the midst of the life struggle), transcendental operations emerge in the context of pure executive processing" (i.e., when action is not being pursued and action processing does not take place—only reflection, planning, evaluation of results is being pursued; Pascual-Leone, 1983, p. 146).

These changes that come with adult aging prepare, but rarely suffice, to bring about wisdom and higher forms of consciousness (Alexander *et* a1.,1994; Jaspers, 1986; Pascual-Leone, 1990a, 1990b). Implicit or explicit meditation practices are often also needed.

THE MEDITATION PATH: AN ORGANISMIC, CONSTRUCTIVIST INTERPRETATION OF HIGHER CONSCIOUSNESS

All forms of meditation have some features in common. In all of them there is an *object* of meditation which is maintained over a prescribed period of time (often 20 min, twice a day), there is a *ritual*

'This is what I have called *C-learning* and *LC-learning* (respectively, the learning of Content and of automatized patterns—i.e., Logical-Content complexes of relational schemes).

These are the sort of structures acquired via what I have called *LM-learning;* that is, Logical learning attained by using M-capacity to boost scheme constituents of the to-be-abstracted structure.

'In my view, affects drive cognition (set the goals for it); and so affective arousal (which I sometimes call the A-operator) can, in suitable (facilitating!) circumstances, be used to boost task-relevant schemes—thus substituting for M-capacity.

'Indeed, *the change HO1 could exacerbate problem Fl,* perhaps precipitating a "midlife crisis"; and changes H03 and H04 could help correct F2, F3, F4, and F5.

(routine) to follow (including a prescription not to attend to distracting thoughts, images, feelings, noises, etc., and do so amiably—without actively rejecting them). There is also *a subject* of meditation (the meditator's self-consciousness), quietly contemplating the object and the ritual, both of which are held constant across sessions throughout the practice. There is *a philosophical foundation* for the practice, which may or not be explicit in the ritual, that the subject tacitly keeps in her mental horizon as motivation," and also serves to articulate object, ritual and subject into a practice of human/spiritual growth. Initially in the practice (and the session) the object and ritual of meditation are concrete. For instance, object and ritual might be contemplating or counting the breathing of one's body at rest, or mentally repeating a word or short phrase (Mantra) or a prayer, or looking at (or imagining) the image of a saint/guru, or reflecting on a spiritual question, issue or problem; or maintaining a bodily posture (e.g., Hatha Yoga), or mentally focussing successively on the sequence of various spiritual bodily centres (e.g., Chakras), or a sequence of self-produced bodily movements (e.g., Tai-Chi), etc. In every case there is initially a mindful repeating of the sequence of concrete acts, made meaningful by the practitioner's philosophical foundation—a repetition cyclically reiterated within and across sessions. As the sessions proceed, the sequence of mindful acts becomes first purified (interfering thoughts, tensions, etc., drop out) and then well learned; and eventually habituation (in the technical psychological sense of this word) sinks in. Even though maintaining *mindfulness* (Langer, 1997, Pascual-Leone & Johnson, in press; Thich Nhat Hanh, 1998), the subject begins, because of habituation (and automatization of the practice), to progressively lose details of the concrete sequence, keeping only a wholistic contemplation. This transition into a dynamic totality, or encompassing *internal complexity,* which subsumes subject and object of meditation fused into one, is often called *transcending.* As consciousness transcends, faster or slower depending upon the practice, it becomes detached from experiential details, taking on holistic feelings that evoke the sensations (phenomenology) of transition-into-sleep. But in meditation, unlike this sleep transition, consciousness itself is kept alert, and the meditation state maintains high arousal for, and awareness of, external sensorial stimulation; also, unlike the transition into sleep, the state of transcending in meditation can be maintained with practice for a long time. This state is analogous, with regard to consciousness, to keeping the engine of a car running while the gear (the processing of life content) remains disengaged.

Transcending is the proximal purpose of the practice; distally, it yields spiritual insights and experiences interpretable from the philosophical foundation, and also an unusual sensorial and mental clarity, heightened mindfulness, and a sense of well-being that often lasts longer than the session itself. As the practice proceeds, these feelings tend to linger, accompanied by the heightened self-consciousness of an inner observer ("silent witness"), and various good physiological changes. Eventually they may transfer to the experience of everyday. Greater inner autonomy, coupled with positive feelings of empathy for others and nature, easier self-discipline, good judgement and progressively deeper wisdom, may appear later as the practice advances.

To explain why meditation might work, leading to states of higher consciousness through so many different practices, I use *a theoretical model* founded in neuroscience but simplified for non-specialists. Fig. 1 illustrates in a diagram the key ideas. This figure is derived, with considerable modifications, from Fig. 2 (the "Wagon Wheel" model) of Newman, Baars, & Cho (1997).

The central, circular constituent of this figure represents the thalamus, a twin (right and left) structure deep inside the brain. The thalamus is the gatekeeper of the cortex (Newman, 1995); like the visitors who approach the information desk on the first floor of an urban corporation tower, information coming from the senses (or brain stem) on the way to the cortex, has to stop first in the thalamus to be screened. The thalamus filters the input attempting to reach the cortex. This input is described in Fig. 1 by the five boxes at the bottom of the figure. The six boxes at the top of the figure represent various regions of the cortex, which are closely interconnected (one to one) with particular nuclei in the thalamus. The arrows represent some of the anatomic connections. The thicker line going from the midbrain reticular formation to the thalamus, represents activatory stimulation. The reticular formation of the midbrain is a major source of the brain's functioning energy—somewhat like the power plant of a computer.

"In analogy to the spatial horizon, Husserl, founder of modern phenomenology, pointed out that consciousness has a (semantic) horizon; it is constituted by knowledge we currently have just outside consciousness, just ready to enter into it when our mind moves in the appropriate semantic direction. This is the sense of horizon intended here.

The thalamus is represented in this figure with the shape of an egg whose shell, labelled NRT, is the nucleus reticularis of the thalamus. This nucleus functions as a filter that regulates the amount of information going from sensory channels (vision, audition, bodily senses) to the cortex. In Fig. 1, I represent this incoming information by a thick arrow with thin collaterals going into the cortex. The nucleus reticularis of the thalamus functions as gates, one for each input to the cortex; and these various gates are regulated by controls that either enhance or suppress the outputs. The output-enhancing controls come to the gates from the midbrain reticular formation. The interruption (output-suppressing) controls come from the prefrontal cortex (upper left side of the figure).

As mentioned above, the mental attentional system is located in the prefrontal cortex, and the attentional interruption mechanism is likely to be related to this interruption control from the prefrontal lobe. The mental attentional activatory capacity (M-capacity) might be related (this is not yet clear) to specific activatory input arriving to the midbrain reticular formation from the prefrontal cortex and limbic system (the *limbic system is* the site of affects and emotions, where intentions and affective/cognitive goals are formed); both these inputs to the reticular formation are omitted in Fig. 1. Thus enhanced in its activatory output, the reticular formation could transfer this output-enhancing information to specific gates of the reticular nucleus of the thalamus.

These neurological connections are important for understanding consciousness. They suggest how the higher information-processing centers of the cortex, the so-called high tertiary or *quaternary areas (e.g.,* Eccles, 1980), are able to regulate and direct the beam of mental attention to various currently relevant sites located elsewhere in the cortex (Crick, 1984, 1994; Newman, 1995; Pascual-Leone, 1984; Pascual-Leone & Baillargeon, 1994). This is done using attentional mechanisms that are partly outside the cortex, in subcortical centers such as the midbrain reticular formation, thalamus, etc. The cortical centers that regulate the beam of mental attention and consciousness *in interaction with the limbic system*, are likely to be quaternary areas. These are the prefrontal lobes (site of executive processes) and the areas of the parieto–temporo–occipital region—the site where most complex cognitive objects of life experience are formed. These quaternary centers, *which are directly interconnected,* can together abstract and functionally represent the gist of current neuropsychological states—this is what is needed to monitor meaningfully the stream of consciousness. In the case of meditation practices, these centers might be involved in monitoring which parts of the

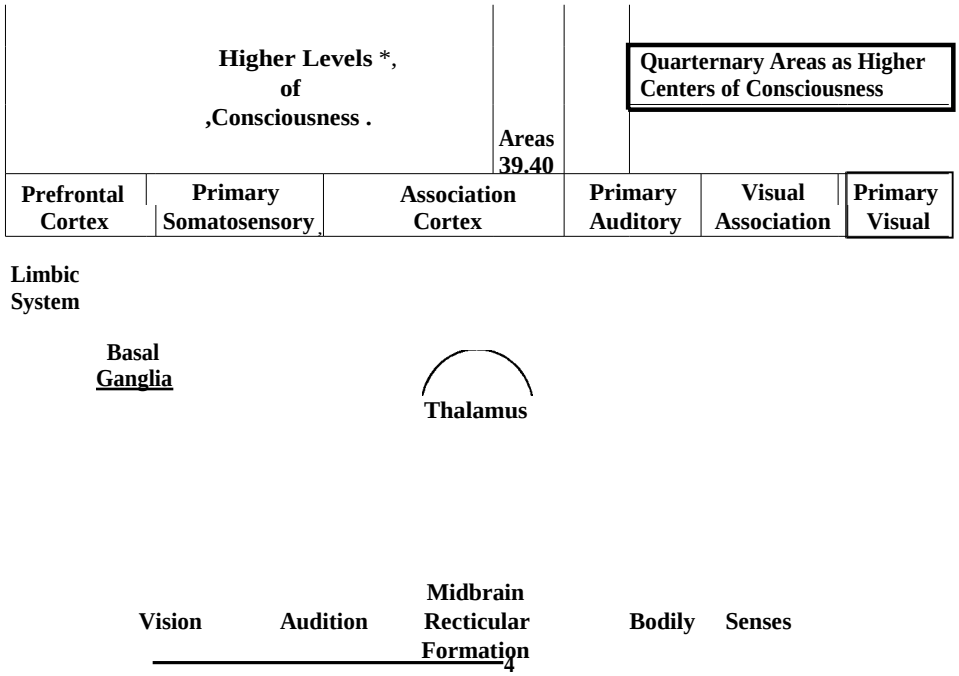

Fig. 1. Model of gross brain connections that may underlie consciousness.

cortex are initially activated, depending on the content of the practice in question.

Using this background, summarized by Fig. 1, we can now explore the difference between ordinary states of consciousness (i.e., initial steps in the meditation practice) and higher states of consciousness (advanced steps in meditation). In ordinary consciousness, even with eyes closed, the boosting of activation that the midbrain reticular formation sends towards the cortex, via thalamic gates, is often predominantly expressed in *fast cortical activity* (beta waves located in areas corresponding to the experiential content entertained by the person).

Electroencephalography (EEG), indexing the processing of information by these areas, shows predominantly beta waves (electrophysiological waves with a frequency above 12 cycles per second, perhaps 20, 40 or more). When beta waves are found in a cortical area it means that thalamic gates leading to this area are *open;* that is to say: there is activation from the reticular formation that has come through the gate (this activation might perhaps indicate the prefrontal stimulation of the reticular system, which now has reached the thalamic gates—a neuronal circuit that possibly underlies M-capacity). When this activation is suppressed in the thalamic gate, perhaps because of interruption by the prefrontal cortex (e.g., under habituation conditions), slower waves, such as alpha waves (8 to 12 cycles per second), or theta waves (4 to 7 cycles per second), are found in the corresponding cortical areas. This pattern of slow alpha and theta waves indicates that cortical areas in question are currently processing very little, if any, information, possibly because their thalamic gates are practically *closed.*

Moreover, alpha waves, as contrasted with theta waves, indicate that much activation energy is reaching the thalamus from the reticular formation, activation energy that is not allowed to reach the cortex due to the closing of the gates. That is what one would theoretically expect when the object and ritual of a meditation practice begin to habituate, and transcending starts because mindfulness is maintained. This is most important, because cortical EEG patterns customarily found with eyes closed in well practiced meditators (as opposed to nonmeditators), exhibit a marked increase of alpha waves in the cortex, in particular in the frontal and central regions. Also, as meditation progresses, there is increased energy going into alpha-wave activity (also into some theta waves), which may show coherence over the cortex . . . and there are much fewer beta waves than normally (Alexander, Rainforth, & Gelderloos, 1991; Travis, 1991, 1994; Travis & Wallace, in press; Alexander *et al.,* 1990; Travis & Orme-Johnson, 1990). See Alexander *et al.* (1990), Pascual-Leone (1990a), Thatcher (1997), and Travis and Orme-Johnson (1990), for an interpretation of coherence.

This evidence is consistent with four ideas:

(1) In a state of mental rest during meditation (and also, I expect, during higher states of consciousness at rest) *there is much arousal—much* activity from midbrain reticular formation is reaching the thalamic gates (motivation provided by the philosophical foundation).

(2) The thalamic gates are largely closed by the prefrontal corticothalamic connection, so that *cortex exhibits slow and perhaps coherent endogenous activity* (habituation in meditation practice has begun).

(3) The cortical regions with more activity, aside from content areas related to the practice, are the *quaternary areas* (prefrontal lobe and Broadmann areas 39 and 40) and the *limbic system*.

(4) Two consequences of practicing meditation regularly are: *(a) habituation* of cortical activity to the situation (caused by cortico-thalamic closing of reticular-nucleus gates connecting to the areas in question—reduction/interruption of activity); and (b) *automatization of an executive process for maintaining this special cortical state.* Because *basal ganglia* (see Fig. 1) are, so to speak, the automatic pilot of the brain's operative/motor system, this automatization will be manifested, as meditation practice progresses, in further reduction of activity at the frontal regions, dominance of alpha waves, and perhaps electrophysiological coherence patterns across the cortex (if wholistic scheme structures have been formed). This is so because maintenance of the high-arousal/minimal-cortical-processing state will have been taken over by basal ganglia control. Notice that at this moment the cortex, perhaps with help from the meditation practice, has achieved an economy of functioning. Generalized cortical activation is minimized while meaningful differentials in cortical activation are maintained (Travis, Tecce, & Guttman, 1999). The subjective phenomenal experience of this unique state might be transcendental consciousness—the pure Self having been constructed *(with the support of a suitable life philosophy)* from processing activities centered on *quaternary brain areas* and the *limbic system*.

This explanation applies, I believe, to all forms of meditation. But one might ask whether there is a better, easier form than others. Alexander *et al.*

(1990, 1994) claim that this privileged method is Transcendental Meditation (TM). An argument might be made that in TM, because it enters meditation via a linguistic/phonological mode of processing (a mantra), the possible interference of concrete organismic feedback during transcending might be minimized, since linguistic processing is known to be relatively detached from other bodily processes (e.g., imagery, movements, sensorial stimulation). If this were so TM's claim could be valid. But there is another problem: Individual differences. Given the variation among people regarding relative dominance of linguistic–representational versus purely experiential (bodily-representational) processes, one should not accept TM's claim without sufficient comparative studies across schools/methods of meditation. These studies are not yet available. Further, entering meditation via purely experiential processes might have its own advantages once the initiation has been passed. The time has come to intensify comparative research on meditation methods.

RETURNING TO THE NATURAL WAY: VITAL REASON, WISDOM AND MEDITATION IN HUMAN DEVELOPMENT

Arguably, high forms of consciousness bring a return to the natural, direct consciousness of young children, but also to the use of vital reason (warm-hearted rationality applied to life and living) which young children often lack. As Alexander (Alexander *et al.,* 1990; Alexander *et al.,* 1994) might be suggesting, high consciousness differs from ordinary consciousness not only in its openness, its detachments from affect-laden difficulties, and its easy blending of positive affects with rationality, but also in its directness. Unlike ordinary consciousness, higher consciousness is postsymbolic (no distinctions between sign and referent, little mental effort), and phenomenologically exhibits no split between the knower and the known (Maharishi's "self-referral" process). These characteristics result, I believe, from mindful learning processes (Pascual-Leone & Johnson, 1999b) that move the person, effortfully at first (i.e., using the prefrontal mental attentional capacities), but rather effortlessly later, from the pursuance of a meditation path to the mindful automatization of this practice and way of living. In this mindful automatization,[12] the brain exhibits high arousal with minimized cortical activity, except some in quaternary areas and the limbic system (when subject is resting with closed eyes). This state, where the cortex is unified in its slow-wave activities (often indexed by high coherence in the waves) reflects, I believe, the emergence of a new, mindfully automatized, self-control organization (Pascual-Leone, 1990a, 1990b); an organization that is higher than the interpersonal self and functionally detached from the self's clinging to life world. This organization is the *transcendental self,* variously known in the literature as Self (with uppercase S), Existenz, transcendental or absolute consciousness, Spirit, meditative existence, non-self, "Void," etc.

As I wrote in "An Essay on Wisdom": "The transcendental self emerges after a developmental-structural transition in the self organization (Edinger, 1973; Jacobi, 1967; Jaspers, 1959, 1970, 1971; Jung, 1968; Pascual-Leone, 1983, 1990b). In this qualitative-structural transition the empathic *affects [. . .] come to blend inextricably with cognitions.* And thinking becomes so open to reality (the true concrete Others and the world) that in Heidegger's felicitous expression the nature of `thinking' becomes `thanking' (Arendt, 1981, p. 185; Heidegger, 1966, p. 85)—a grateful relaxed acknowledgement of reality as such and of the `letting-oneself-into its nearness' (Heidegger, 1966, p. 89). There is an intuition of the hidden reality concealed and also revealed by ordinary experience. This is a kind of *meditative thinking* (Heidegger, 1966; Pascual-Leone, 1990b) [. . .] constituted by *dialectical* and *transcendental operations* (see Pascual-Leone, 1983, 1990b)." (Pascual-Leone, 1990a, p. 263).

If this emergence in humans of a higher functional center for personal control, *the transcendental self,* is an optional developmental stage found across cultures, *it should be reachable from multiple paths*—although some may be better than others, and some paths may work better for some people than others. Any major modality/mode of human processing that can lead to *mindful* ritualization (and so to *attention-*

[12] Mindful automatization, which Pascual-Leone and Johnson (1999b) discuss in some detail, is an instance of what I call *LCLM* learning (Pascual-Leone, 1990b, 1995; Pascual-Leone & Goodman, 1979; Stewart & Pascual-Leone, 1992). This is the automatization (i.e., *LC* learning) of symbolic and mentally effortful scheme structures (i.e., structures that result from the sort of mindful learning that I call *LM* learning). It is in this sense of a mindful automatization, that one must concur with Alexander and associates in asserting that higher forms of consciousness are not symbolic but *postsymbolic.*

getting but *repetitive* practices that can be partly *automatized* and *habituated)* should, *when coupled to a suitable philosophy*, yield a way to wisdom and transcendental self development. History of spirituality confirms this intuition. Language, visual imagery, motor activity, sound, sex, affect and emotion, thoughtful reflection, self-clarification, empathic identification with Others or Nature, self-denial in work and service, persistent pursuit of ethical ideals, these and other modes of activity have been used as alternative paths to transcendence. Perhaps through any of them practitioners may attain the *silent music* (Johnston, 1974) of transcendental consciousness.

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