Mysticism and cognitive neuroscience: a partnership in the quest for consciousness

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Resumo

Neste artigo são integrados os conhecimentos neurofisiológicos com um modelo de processos perceptuais e de memória, baseado no misticismo da linguagem Sufi e judaica, e com a análise do pensamento fundado em textos do Budista Abhidhamma. Os estados místicos promovidos nestas tradições parecem envolver consciência, sugerindo-se que são estes estados de pré-consciência que produzem a consciência de algo mais que William James, Rudolph Otto e outros classicamente associaram no sentido do espiritual, em particular a asserção principal, dos textos místicos Judeus de que o impulso de baixo activa o de cima é comparável com a neurociência da consciência. Neste sentido, o impulso de baixo, compreende o nível mais baixo de análise do *input* sensorial, e o de cima – em paralelo com o papel dos percursos mencionados – gera o significado do *input* e a consciência.

Neurotheology and experience of the 'Absolute'

In the wake of the "decade of the brain" of the 1990s, neuroscience has taken a central position in relation to those profound questions about the nature of mind and our spiritual potential that continue to challenge us. Eugene Taylor (1999), for example, has referred to the "neuroscience revolution", and rightly asserts that neuroscience is today the anchor

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discipline within a network of diverse approaches to humanistic issues. Taylor writes that,

> We stand at the threshold of a new era in modern science … with the coming of the neuroscience revolution. Before, pure science was able to brush the philosophical questions aside and, indeed, banished all but the most positivist rhetoric from the discussion of what constituted scientific reality. Now, the neuroscience revolution, with its inter-disciplinary communication between the basic sciences, its cross--fertilization of methods, and its focus for the first time on the biology of consciousness, appears to have important humanistic implications far beyond the dictates of the reductionistic approach that spawned it. (p. 468)

An indicator of the importance of neuroscience may be observed in the various hybrid disciplines that have been spawned over recent years, each of which includes the prefix 'neuro-' as an emblem of authority, as it were. Illustrative of this trend are *neurophenomenology* (Varela, 1996, 1999), *neuro-psychoanalysis* (Kaplan-Solms & Solms, 2000; Solms, 2000), and the topic of my paper, *neurotheology* (Ashbrook, 1984; d'Aquili & Newberg, 1999). In each of these cases, a two-way relationship is proposed between the component topics. The role of neuroscience is to ground its partner topic in the physical and functional properties of the brain. The experiences to which phenomenology might be applied, or the dynamic complexes postulated by psychoanalysis, are to be explained in terms of brain systems. As Freud remarked, 'The theoretical structure of psycho-analysis that we have created is in truth a superstructure, which will one day have to be set upon its organic foundation.' (1916-17/1963, p. 389). Solms, amongst others, would hold that recent developments in neuroscience have enabled us to rise to Freud's challenge.

As I have already stressed, however, the relationship between the component topics in these hybrids is two-way. For example, Varela (1999) discusses neurophenomenology in relation to the human sense of time. He illustrates the importance of subjecting aspects of temporal experience to sophisticated phenomenological analysis before we can begin to make sense of neural data relating to time. The fact is that the data made available by the methods of neuroscience are never transparent; they always need to be interpreted in relation to insights into the detailed structure of the experiences to which they relate, and an untrained mind may be inadequate

for this challenge. Mere hunches or intuitions may be misleading, and, as I have argued elsewhere (Lancaster, 1997; see also Wallace, 2000), training in neuroscience does not in itself result in the level of introspective skill found amongst phenomenologists or those trained through meditative disciplines. Most spiritual traditions are adamant that an untrained mind is inevitably deluded over the real nature of mind and consciousness. Wallace (2000), accordingly, argues that progress towards understanding consciousness must entail a partnership between neuroscientists and those trained in one or more spiritual tradition. Varela (1999), similarly, emphasises the need for an '*active* link' between neuroscience and phenomenology, through which both partners may be modified 'in a fruitful complementarity' (p. 137).

In the case of neuro-psychoanalysis, Solms (2000) argues that deficits observed following brain damage may remain enigmatic without sophisticated psychoanalytic understanding. He gives the example of patients with damage in the perisylvian region of their right hemispheres. A superficial examination of these patients' problems indicates disturbance to various psychological abilities—spatial perception, emotional expression, and attention. However, rather than infer that the right hemisphere is responsible for these specific functions, Solms argues that a more fundamental problem underlies these specific psychological symptoms. The patients are suffering a regression, best understood in psychoanalytical terms, on account of the loss of their normal relationship to external objects. A realistic understanding of the function of the damaged brain region requires a psychoanalytic model, which is why the hybrid approach is favoured. Bringing classical psychoanalytical terms to bear on the problem, Solms concludes that the region damaged in these patients is normally responsible for transforming primitive, narcissistic ways of relating to objects into the mature and realistic orientation of a healthy person.

For d'Aquili and Newberg (1999), neurotheology entails the analysis of brain systems whose activity may correlate with mystical states. However, as in the above examples, my interest lies more in the impact that the other side of the hybrid – in this case 'theology'[1] – might have on the discipline of neuroscience. D'Aquili and Newberg argue that the mystical state of 'Absolute Unitary Being' (AUB), in which pure, contentless consciousness seems to be experienced, carries profound implications for our approaches to explaining consciousness. They speculate that it challenges the very basis of the normative neuroscientific approach to consciousness, since it implies

that consciousness, rather than external material reality, should be considered as the primary reality:

> [S]ince AUB or pure consciousness is not experienced as either subjective or objective, the subjective and the objective arise from it. This speculation would be tantamount to stating that from pure consciousness both the subjective local consciousness of individuals and the objective external reality are created. (1999, p. 201)

This radical speculation deeply challenges the scientific study of consciousness. Most neuroscientists believe that research into the material reality of the brain will someday bridge the 'explanatory gap' (Levine, 1983, 2001), i.e., the gap between physicalist explanation and the seemingly non-physical phenomenon of consciousness. In other words, the primary assertion of most neuroscientists is that consciousness is *caused by* the machinery of the brain. Clearly, d'Aquili and Newberg challenge this assertion, since they speculate that the objective reality of the brain is actually a derivative of pure consciousness.

Whilst I have no immediate difficulty in accepting d'Aquili and Newberg's position – indeed I have argued for the primacy of consciousness over many years (see, e.g., Lancaster, 1991) – I am of the opinion that exploration of the *content* of mystical states of consciousness leads to a more fruitful dialogue between neuroscience and mysticism than does this emphaisis on supposedly contentless consciousness. More specifically, as I will demonstrate in this paper, analysis of *preconscious processes* seems to offer a generative bridge between the two spheres of knowledge.

The radical nature of d'Aquili and Newberg's speculation necessitates a careful examination of the evidence on which it is based. The evidence primarily derives from two sources:

1. Commonalities in the AUB experience across diverse spiritual and non-spiritual contexts;

and

2. Imaging of brain changes in meditators during the subjective peak of meditation.

As I shall demonstrate, on both counts there are grounds for exercising caution.

In line with the school of thought known as *perennialism*, d'Aquili and Newberg posit a 'megatheology' which holds that all religions have at their core the experience of 'hyperlucid unitary states', such as that of AUB. According to this view, cultural accretions mask what is, at heart, a common spiritual heritage. However, such a perennielist position has been subject to considerable scholarly attack over several decades, and it is doubtful that the appeal to neuroscience can legitimise the position. In a recent, thorough review of the debate, Ferrer (2002) concludes that, 'The esotericist claim that mystics of all ages and places converge about metaphysical matters is a dogma that cannot be sustained by the evidence' (p. 93).

A critical aspect of the debate over perennielism has centred on the experience of pure consciousness (Forman, 1990, 1998; Katz, 1978, 1992; Lancaster, in press 1). In brief, the fact that people may *claim* to experience contentless consciousness may be an inadequate basis for presuming the reality of pure consciousness. To take the case of one proponent of the perennielist view, Bob Forman, it is at least feasible that his own experience of pure consciousness was constructed on the basis of religious teachings that he was following and the context within which the experience occurred. As he describes it, he was on a nine-month retreat following a neo-Advaitan path, a tradition which clearly advocates this kind of an experience (Forman, 1993, p. 708). In the climate of postmodernism, it has been argued that all experience is mediated and constructed on the basis of expectation. In the mystical sphere, Katz (1978) asserts that '*There are NO pure (i.e., unmediated) experiences*' (p. 26, emphasis original). Taking the specific example of a yogic state of apparent emptiness, he argues that, '… properly understood, [it] is not an unconditioning or deconditioning of consciousness, but rather it is a reconditioning of consciousness, i.e., a substituting of one form of conditioned and/or contextual consciousness for another...' (p. 57).

Given the controversy over the kinds of generalisations that d'Aquili and Newberg make regarding unitary experiences, the role of their brain imaging data is critical. The fact is, however, that the images are inadequate to counter the criticisms of perennialism already mentioned. The images show marginal changes in brain regions which cannot, by any stretch of the imagination, be construed as giving 'strong support' (d'Aquili and Newberg, 1999, pp. 118) to their model (see Newberg *et al*. 2001). Space does not permit a full treatment here, but the assertion that the brain imaging data demonstrate that, 'a state of pure consciousness can be achieved in intense

meditation by deafferentation of a certain part of the parietal lobe bilaterally' (p. 184) is, frankly, an interpretation too far.

Does this lead us to dismiss the attempt at integration between neuroscience and mysticism? Clearly, I believe not – most of my writings over recent years have been directed specifically at this bridge between neuroscience and religion. I would argue, however, that experiences of the absolute are simply *too absolute* to advance the integral approach that I advocate. The vast majority of religious, and, indeed, mystical experiences, are full of content, and it is precisely the nature of this content that can enrich the science-religion interface.

The honour of kings

> We learnt, 'It is the honour of God to conceal a word' (*Proverbs* 25:2). What is a "word"? As it is said, 'The head of your word is truth' (*Psalm* 119:160); and 'The honour of kings is to probe a word' (*Proverbs* 25:2). What is a "word"? As is written, '[Apples of gold in settings of silver is] a word fitly [Hebrew *of'nav*] spoken' (*Proverbs* 25:11). Do not read 'fitly' [*of'nav]* but 'its wheel' [*ofanav*]", as in 'My presence will go' (*Exodus* 33:14). (*Sefer ha-Bahir*, para. 33 [orig. 12th century CE])

The foregoing is from one of the foundational texts of *Kabbalah*, the most distinctive phase of Jewish mysticism. It takes the form of a classical *Midrash* on biblical texts. Midrash draws on subtleties in the Hebrew text in order to support key teachings.[2] In this case, mystics (referred to as 'kings' in the extract quoted here) are enjoined to enter into the 'wheel' of a given word's meaning in order to penetrate to the 'apples of gold' – the level of mystical 'truth'. Psychologically, the 'wheel' may be understood to include various linguistic and semantic associations to the original word. The word's 'true' meaning is to be gleaned by probing into these diverse associations.

It is evident from a variety of related sources that the objective is not simply that of scriptural exegesis. The mystic is being instructed to enter into a distinctive state of consciousness in which the creative root of language becomes known. The 'wheel' in *Sefer ha-Bahir* hints at the 'wheel of letters' described in an older text (c. 5th century CE), the *Sefer Yetsirah*, whereby God formed all elements in creation:

> Twenty-two foundation letters. He [God] placed them in a wheel, like a wall with 231 gates. The wheel revolves forwards and backwards…. How? He permuted them, weighed them, and transformed them. *Alef* with them all and all of them with *alef*; *bet* with them all and all of them with *bet*. They continue in cycles and exist in 231 gates. Thus, all that is formed and all that is spoken derives from one Name (*Sefer Yetsirah* 2:4-5).[3]

God's work of creation is viewed here analogously to our contemporary view of the generation of biological forms. Certain key elements – in the one case, the letters of the Hebrew alphabet, and in the other, the bases in the DNA code – are permuted in order to generate the diversity of forms. Critically for my present purposes, the mystic is enjoined to engage *with God* in this arcane 'letter-working', and, indeed, Jewish mystical texts are replete with formulas and techniques for such activity.

It is not my intention to explore in great detail this poignant line of Jewish mystical activity (for more detail, see Lancaster, 2000, in press 1). Of relevance to the theme of my paper is the way in which these mystics appear to engage with processes of the mind that are normally *preconscious*. Research in cognitive neuroscience and depth psychology indicates that normal, mundane, consciousness arises from a complex stage of information processing during which diverse associations to the stimulus (be it a sensory object, a memory or a thought) are accessed preconsciously (Velmans, 1999). Preconscious processing addresses the *multiplicity of meaning* (Lancaster, 1991) inherent in all cognitive experience. Becoming conscious normally equates to a stage in which the multiplicity is inhibited such that a coherent and singular meaning arises. Put simply, mystical practice seems to entail a shift in the 'leading edge' of consciousness (Claxton, 1996) such that elements previously obscured (preconscious) enter the clarity of consciousness.

In terms of the goals of any attempt to bridge neuroscience and mysticism, we have here a rich vein of enquiry. It is not simply a question of assigning brain systems to mystical states (as in d'Aquili and Newberg's neurotheology), but one of exploring the precursors of everyday conscious mentation. Of course, there are neural correlates of preconscious and conscious processing, and their specification represents a major area of study, to be considered in the next section. Nevertheless, analysis of the functional dialogue between cognitive neuroscience and mysticism is probably of more value inasmuch as it can suggest ways towards self-transformation.

In brief, preconscious processing sets the *biases* of perception and thought to which we have become conditioned. Consciously entering into the normally preconscious level can re-set those biases and lead to potentially broadening transformation (Hunt, 1984; Lancaster, 2000). To use one of the favoured metaphors of Abulafia, a 13th century Jewish mystic: 'Man is [tied] in knots of world, year and soul [i.e., space, time and persona] in which he is tied in nature, and if he unties the knots from himself, he may cleave to He who is above them' (cited in Idel, 1988, p. 35.).

Abulafia describes techniques of breath control and visualisation that accompany the esoteric letter-working itself. Such techniques are known to promote an altered state in which preconscious material is more likely to enter consciousness. His method entails 'revolv[ing] the languages until they return to their prime material state' (cited in Idel, 1989, p. 10). I assume that the meaning attaching to individual words would be *deconstructed* by this device of returning the words to their elemental letters; the 'knots' binding the 'soul' would be loosed. I have argued that the deconstruction of words in this mystical practice entails deconstruction of the structures through which our personal reality is normally preconsciously filtered, since language is very much the instrument of meaning (Lancaster, 2000, in press 1). These practices of language mysticism become a means for extracting oneself from personal biases, with the aim of reformatting the mind in attachment to God.

James Austin (1998) views the three major tasks of Zen, namely 'openness, revision, and restructuring' (p. 281), in similar, albeit non-theistic, terms. Using the term '*preattentive*' instead of the term I have been using, 'preconscious', he argues that these tasks are achieved through shifting forwards the 'leading edge of awareness' (p. 280):

> At ordinary levels of being, we keep paying … [a] hidden price to be sheltered by all our preattentive layers. For we constructed these layers to admit only those things that our conditioning led us to believe were relevant. Sheltered by our biased preselection process, we mindlessly perpetuate old unfruitful habits and prejudiced attitudes…. Can Zen become "sensitivity training?" Can it actually reshape what finally enters our brains? (p. 280)

It is clear that Austin believes the answers to these questions to be "yes"; Zen training opens us to normally automatic preattentive/preconscious processes.

A sophisticated analysis of preattentive/preconscious stages in perception and thought is found in the Abhidhamma literature of Theravadin Buddhism. Figure 1 illustrates my proposals for relating the stages recognised by the Abhidhamma to the presumed neuro-cognitive equivalents (Lancaster, 1997). Again, a detailed exposition is not my intention here. It is sufficient to note that both partners in this hybrid approach – the practitioner of Buddhism and the cognitive neuroscientist – can benefit from the attempt to marry the disciplines.

I wish to single out one feature in particular from the Buddhist perspective that might beneficially impact on the contemporary neuroscientific quest to understand the nature of consciousness. This feature derives from the fact that all the stages in the Buddhist texts are described as 'conscious'.[4] To illustrate the point, I will simply cite a range of translations of the original *Pali*. In Pe Maung Tin's (1921) translation of Buddhaghosa's classic, *Atthasalini*, the stages of perception are referred to as 'kinds of consciousness'. According to Govinda (1975), they are 'classes of consciousness', and for Rhys Davids (1914), 'moments or flashes of consciousness'. Harvey (1995) prefers the term 'discernment', but accepts Horner's 'discriminative consciousness'. Finally, Cousins (1981) considers all the stages as contributing to the 'process of consciousness', with each being itself a consciousness element.

I should stress that there can be little doubt that the Abhidhamma intends its stages to correspond to what we would normally describe as 'preconscious' stages. It is quite clear that the early stages it describes in a perceptual or thought process would not normally be noticed by the untrained mind. Indeed, according to Collins (1982), the Buddhist commentators calculated a figure of 1/74,642 second per moment of consciousness![5]

The point I wish to make concerns the confusion that characterises the neuroscientific approach to consciousness. It is generally assumed that in perception the end-stage is conscious, but that preliminary stages are not (hence *'preconscious'*). Now, one might be tempted to dismiss this issue as *merely* terminological. However, I believe that to do so would be a profound mistake. The Buddhist perspective can bring two critical insights into the neuroscientific study of consciousness. The first of these insights concerns definitions of consciousness. The Buddhist perspective suggests that mental stages which are not normally accessible are nevertheless *conscious* (see also, Block, 1995). From the Buddhist point-of-view, for example, it

would be a mistake to regard subliminal perception as pre- or un-conscious. Interestingly, Kunzendorf (2000) has argued from a strictly cognitive and experimental perspective, that subliminal images are indeed *conscious*. In Kunzendorf's model, these images are conscious but wrongly attributed as deriving from *internal*, rather than external, entities.

To return to an earlier theme, this perspective, suggesting that all mental processing is conscious, can be developed to support the idea of the primacy of consciousness. We may note in passing that it is not necessary to insist on the accuracy of reports of pure consciousness in order to support this idea. Nixon (1999), dismissing the validity of such reports, argues instead that they may be indicative of 'pure pre-conscious experience' (p. 264). If this were so, then it does not contradict the speculation that the 'purity' of the experience intimates a level of being that is transcendent to normal brain function.

The second insight that study of the Buddhist Abhidhamma perspective can bring to neuroscience concerns our notion of *control*. When some process is described as pre- or un-conscious it suggests that 'I' am not able to control it. Without going into the detail of the Buddhist doctrine of 'no-self' (which, it should be noted, is critically relevant in this context), let me simply note that, by emphasising that preliminary stages of processing are indeed conscious, Buddhism is asserting that they may be subject to the will.

This last point is highly significant, not least in relation to the notion of responsibility, since it suggests that our society is mistaken in regarding 'unconsciousness' as giving mitigation in relation to culpability. But this is to digress from my primary point. In mystical and psychological terms, recognition that preliminary stages of processing are *not* beyond volitional influence is the key to self-transformation. The mistake we make is in thinking that there is no effective consciousness other than the everyday 'I'-centred consciousness which arises as the normal end-stage of mental processes. The Buddhist perspective suggests that when one fully realises the false sense of control associated with the illusory 'I', then preliminary stages become knowable and controllable. As discussed above, mystical practices such as those found in Kabbalah or Zen, as well as those of Thearvadin Buddhism, re-orientate the mind away from 'I'-centred consciousness and towards normally preconscious processes (figure 2).

The kabbalistic term, *kadmut ha'sekhel*, found in the writings of the 18th-century Rabbi Dov Baer, the Maggid of Mezeritch, suggests a parallel

idea. This term is translated by Hurvitz (1968) and Matt (1995) as 'pre-conscious', but it certainly does not imply that the sphere of mentation that it depicts is intrinsically beyond our grasp. Spiritual advancement is viewed by the Maggid as requiring an *ascent* to the level of the preconscious, experienced as 'a creative pool of nothingness' (Matt, 1995, p. 87). In the Maggid's words: 'For thought requires a preconscious which is above the thought that thinks. Hence we find it written (*Job* 28:12) that "Wisdom comes from nothing"' (cited in Scholem, 1975, p. 355). The preconscious (*kadmut ha'sekhel*) is understood as a sphere in the Godhead, whose activity is mirrored in the human psyche. It is designated as *Wisdom*, and is witnessed in those flashes of insight that bring knowledge that was previously concealed:

> Whatever exists in specific form has its roots in the universal, namely in the preconscious which is *hylic* in nature. As when a person has been pondering some matter and there suddenly falls into his mind an idea or aspect of knowledge, for this sudden illumination is drawn from the preconscious. (Maggid of Mezeritch, cited in Scholem, 1975, p. 354)

Meditation and Re-entrant neural systems

Earlier I noted that a challenge for neuroscience concerns specification of the brain systems which are involved in preconscious processing. In this section I turn my attention to that challenge, and I shall emphasise its relevance to meditative and mystical perspectives.

The immense complexity in the brain's systems may be simplified by recognizing three forms of connection:

1. Feed-forward connections bring information from the sensory receptors into the brain and through a hierarchical system that functions primarily to detect the presence of feature elements in the sensory array. In the case of vision, for example, nerve fibres originating in the retina, travel via the thalamus into the visual regions of the cerebral cortex. The feed-forward system continues from the first visual area of the cortex (V1) through a succession of areas (V2, V3, V4, etc), each specialized for detection of differing aspects of the input. The feed-forward system runs via two streams towards 'higher' regions of the cortex. The term 'higher' in this context is applied to a region that includes considerable non-sensory activity. 'Lower' regions are driven mainly by sensory input; whereas the activity of 'higher' areas involves memory and other cognitive functions.

2. Horizontal connections are found between neurones at the same level in the hierarchy. They function to sharpen responses via inhibitory interconnections. In the visual system, for example, such *lateral inhibition* can increase levels of contrast, thereby facilitating object recognition at higher levels in the system.

3. Re-entrant connections consist of fibres originating in higher areas and projecting back onto the feed-forward activity at lower regions. The term '*recurrent* processing' refers to the influence of re-entrant pathways on the feed-forward system. The presence of re-entrant pathways enables the brain to operate as a dynamic, interactive system. The re-entrant pathway is extensive, with, for example, a larger number of fibres heading from the cortex to the thalamus than in the opposite (feed-forward) direction. Re-entrant fibres are found extending to the level of receptor neurones. It has been demonstrated that re-entrant pathways function to modulate the responses of the feed-forward system.

A growing body of evidence suggests that consciousness is dependent on recurrent processing (Edelman & Tononi, 2000; Lamme (2003). The evidence largely comes from studies of the timing of events in the brain's perceptual systems. In the initial feed-forward responses to a visual stimulus, area V1 is activated after about 40ms. However, research using transcranial magnetic stimulation (TMS) indicates that it is the V1 activity at significantly later latencies that is critical for consciousness. TMS is used experimentally to silence activity in precise brain regions in order to ascertain the regions' contributions to psychological functions. TMS applied to the area of V1 up to 50 ms after stimulus onset disrupts perception of the stimulus. Obviously, such TMS interferes with the feed-forward signals, rendering perception impossible. What is more striking, and relevant to my discussion, is that TMS administered to V1 between 80 and 120 ms after stimulus onset also disrupts perception. Given that re-entrant pathways from higher cortical areas to V1 become active during the 80 – 120 ms time window, the data suggest that recurrent processing involving V1 is necessary for visual consciousness.

This interpretation accords with the results of *masking* studies. If a visual stimulus is shown very briefly and followed after about 40ms by another that masks it, conscious perception of the original is lost. Such *backward masking* has been used extensively in cognitive studies of perception. The original stimulus, although not consciously perceived, continues to have nonconscious cognitive effects. In researching neural systems to explain masking phenomena, studies have attempted to detect the specific brain regions that differentiate between unmasked and masked stimuli, i.e., regions that become active only when a stimulus is consciously perceived. However, no such regions have been located: identical regions are activated by unmasked, as by masked, stimuli (Dehaene *et. al*., 2001). In consequence, it is now thought that the explanation of masking is to be found in terms of a mismatch between feed-forward and re-entrant data. According to this explanation, by the time re-entrant activity related to the original stimulus reaches V1, the activity in V1 is being driven by the mask and is no longer related to the original stimulus. Dehaene *et al*. conclude that the data 'are consistent with theories that relate conscious perception to the top-down amplification of sensory information through synchronous co-activation of distant regions' (*Ibid.*, p. 757).

These conclusions about the importance of recurrent activity for consciousness can be supported by recent research into neurological conditions such as unilateral neglect and blindsight, in which residual cognitive functioning is sustained in the absence of conscious awareness. Blindsight describes a condition in patients following extensive damage to V1 over one half of the brain. In brief, these patients have no conscious perception for material presented in the affected areas of the visual field, but they are nevertheless able to make successful guesses about various features of the content. For example, patients can detect the direction of movement in their blind field, can distinguish different colours, and can analyze the meaning of words. Clearly, a degree of nonconscious perception is sustained in the absence of conscious perception. There is considerable evidence to support the argument that the deficit in consciousness is due to the failure of recurrent processing in these patients (Lamme, 2001). On this analysis, the condition is caused by the failure of the re-entrant pathway to V1 to intersect with the feed-forward stream. There can be no interaction in V1 on account of the simple fact that V1 is not functioning.

In conclusion, there exists strong evidence from a variety of sources to suggest that, 'visual processing mediated by the FFS [feed-forward sweep],

however sophisticated, is not accompanied by awareness. Recurrent interactions are necessary for visual awareness to arise' (Lamme, 2003, p. 16).

These neurophysiological data suggest a model of perception along the following lines. It is likely that the feed-forward system simply detects the presence of basic features in the visual input. On the basis of these features, higher cortical regions initiate a search of memory in an attempt to find structures (memory traces, or *schemata*) that might 'match' the input. The re-entrant system then modulates the responses of the feed-forward system in an attempt to establish whether or not the hypothesized match actually does match the current input. The perceptual system, 'actively searches for a match between a descending code, representing a perceptual hypothesis, and an ongoing pattern of low-level activity. When such a match occurs, the neural ensemble is 'locked' onto the stimulus' (Enns and di Lollo, 2000 p. 348).

Of what relevance to mysticism is this analysis of the role that recurrent processing plays in relation to consciousness? Consider the following:

> [Y]ou only have to make the light circulate: that is the deepest and most wondrous secret…. [A]s soon as the light is circulating, heaven and earth, mountains and rivers, are all circulating with it at the same time. (Wilhelm, 1962, pp. 22 and 33)

The extract is from a Taoist text, the *Secret of the Golden Flower*. The text informs us that the golden flower *is* the light, and is 'the true energy of the transcendent great One' (p. 21). The text describes a mystical practice which seems to have considerable relevance to our discussion of re-entrance. The key to this practice is the '*backward-flowing method*':

> In the midst of primal transformation, the radiance of the light is the determining thing. In the physical world it is the sun; in man, the eye. The radiation and dissipation of spiritual consciousness is chiefly brought about when it is directed outward (flows downward). Therefore the Way of the Golden Flower depends wholly on the backward-flowing method. (p. 31)

One dimension of the 'backward-flowing method' entails conservation of seed, as in *tantric* practices. The outward flow of sexual energy is to be constrained, the energy being directed instead inwards and transformed. But, the *Golden Flower* text is clearly focused on what seems to be construed as a parallel to the control of sexual energy—the energy pervading the senses.

'The seed is … the light in crystallized form' (p. 40). When one strikes the correct balance between outward-directed, and inward-directed, vision, the light is seen and its circulation commences. The text explains that, in the appropriate meditative state, the eyes should be focused on the tip of the nose in order to encourage the desired balance—neither fully engaged with the outer world nor cut off from it entirely.

Zimmer (1960) proposes some physiological underpinnings of a practice such as this:

> In seeing, hearing, smell, touch, etc., the specific stimulus is transmitted centripetally from the peripheral organs, the eye, ear, etc., to the higher centres in the brain and finally to consciousness. In the production of optical, acoustical, and other hallucinations, one must learn to transmit the specific energy in the reverse direction from the higher brain centres to the periphery. (p. 51)

But, as our consideration of more recent research into perception has indicated, even normal seeing etc. entails both centripetal (feed-forward) and centrifugal (re-entrant) activity. The view of a one-way, centripetal, route to consciousness is fundamentally flawed. What, I believe, is conveyed by the *Secret of the Golden Flower* is the role of the centrifugal pathways in consciousness itself.

Given the dynamic two-way nature of our perceptual systems, understanding the basis of imagery and hallucinations is relatively straightforward. Whether I become aware of a percept of the outer world, or of an image that I know to be internally generated, or of a hallucination, is a matter of the *balance* in the system together with a marker of my *belief* in the source of the image (Lancaster, 1991, Kunzendorf, 2000). The practice of the 'circulating light' seems to entail a kind of controlled activation of re-entrant processes in vision, distilling their activity down to what is effectively the core visual experience, that of light itself.

Hunt (1984) understands the mystical experience of light as the result of a "turning around" of the normal process of perception. The mystic becomes aware of the more primitive aspects of cognitive processes which are normally obscured in a full perceptual or thought process. In mystical states, as discussed earlier, normally preconscious processes become available to consciousness. Hunt proposes that light is the experience of the abstract unity behind the cross modal form of schemata. The schema depicting a pen, for example, is not a structure dependent on vision alone; rather it

condenses all my experience with pens into a multi-modal conglomerate of 'pen-ness'. Hunt argues that the mystic experience of light is one in which the most primitive aspect of the schema—its *noetic* quality devoid of any form—is activated. Translating this into the more neurophysiological terms I have been considering, I am led to propose that the mystical experience of light arises when re-entrant pathways are activated without the intention of matching any specific form. A formless input is matched to a schema void of content. As Goethe put it, 'the inner light … emerge[s] to meet the outer light' (cited in Zajonc, 1993, p. 205).

In summary, we may speculate that these mystical ideas reinforce the view emerging from neurophysiological research to the effect that recurrent processing is a critical pre-requisite for consciousness. 'Backward-flow' may refer to the shift in the balance achieved between the feed-forward and re-entrant systems. In the non-mystical, 'normal' flow case, the driving force of perception derives from the sensory input, and the subject becomes conscious of the object when the re-entrant path effects the appropriate match. Under the 'backward-flow' condition, on the other hand, the re-entrant path is operative in a manner less constrained by activity in the feed-forward limb. Its mystical fruit is 'light', a term frequently synonymous with, or otherwise symbolic of, consciousness.

Neuroscience can provide evidence that activity in re-entrant pathways is likely to be necessary for consciousness of the external world. On its own, however, it is unlikely to furnish understanding of *why* this should be. What is this mystical 'light', and what may be the broader significance of the reflexive basis of its generation?

The light is manifestly considered to encapsulate a holistic dimension of the world. This is clear from the *Golden Flower* text cited above, '[A]s soon as the light is circulating, heaven and earth, mountains and rivers, are all circulating with it at the same time'. Bohm's (1980) postulate of a holistic implicate order from which the explicate order of things and minds unfolds may be helpful here. Bohm considers consciousness to be a property of the implicate order. As it unfolds into the explicate order, it becomes actualized as experience of some specific entity or feeling; but in its primary state, it is holistic. Accordingly, we might identify the circulating light with the closest we can come to experiencing the holistic, implicate order. In mystical works, light universally carries the suggestion of *spiritual* presence, intimating that some 'higher', more inclusive dimension to things is being experienced. 'The

Holy One, blessed be He is entirely light', states a Midrash. Wolfson (1994) insists that this is not 'a merely theological axiom, devoid of any experiential component. On the contrary, the Presence is so characterized because it is through the phenomenon of light that the divine is rendered accessible to human experience' (p. 44).

This last idea is, I think, especially poignant, and is worth expressing more generally. We are dealing here with a process whereby a higher actuality is 'rendered accessible' to a lower actuality. Whether we conceive of this in terms of higher cognitive functions impinging on the lower sensory analysis, or of the implicate order unfolding into the explicate, or of the divine becoming revealed to the human, the same principle is involved. And this principle may provide us with a useful approach to consciousness itself: consciousness may be understood as *the consequence of a higher actuality penetrating the domain of a lower*.

Here I am drawing on a widespread mystical principle. In the words of the *Zohar*, the major text of Kabbalah:

> Through the impulse from below is awakened an impulse above, and through the impulse from above there is awakened a yet higher impulse, until the impulse reaches the place where the lamp is to be lit and it is lit ... and all the worlds receive blessing from it. (*Zohar* I: 244a)

A pillar of esoteric traditions holds that in creation there is an ultimate correspondence between levels. If, as the above extract implies, there is a principle whereby a 'lower impulse' awakens the 'higher', then we should expect to see its ramifications at all levels. This principle—which, it should be noted, is one of the most central in the whole of Kabbalah—primarily depicts the dialogue between 'earthly', and 'heavenly', realms, as in prayer. However, its application to the re-entrant paradigm examined above certainly accords with the tenor of kabbalistic speculation (Lancaster, in press 2). A number of kabbalistic texts refer to 'levels' of the brain, or the different 'brains' operative at successive levels of emanation from the Godhead. The nature of the dynamic interactions that operate between these levels is a major theme in kabbalistic literature, and the re-entrant paradigm fits aptly within this cosmic picture. The statement that the 'bottom-up impulse' awakens 'top-down influences' seems an accurate description of the microcosmic state-of-affairs discussed above in relation to recurrent processing.

What, then, is the 'top-down influence' that is awakened? In the text's own terms it is light and 'blessing'. With regard to 'blessing', the essential concept is precisely that of a higher influence descending to a lower level. The Hebrew, *berakhah* ('blessing'), is related to *bereikhah*, a 'pool', and quite specifically a pool situated at a higher level than the village which it supplies with water. I would, accordingly, see more than a slight connection between this notion of light and blessing spreading through the worlds and my above formulation of consciousness as a higher actuality penetrating the domain of a lower. Again, in the symbolic language of the *Zohar*, the 'supernal brain' pours its influence into the 'inferior brain'.

With this excursion into mystical regions we seem to have wandered far from the neurophysiological approach, not least because terms such as 'higher' and 'lower' are difficult to define. Nevertheless, the above formulation may indeed be relevant to my earlier discussion of re-entrant systems. The key point about the re-entrant pathway is that it conveys readout from memory. The pathway is the agent for bringing whatever is accessed at the cognitive level into the domain of the neurophysiological sphere. However, there is no less of an explanatory gap in this context of cognition and the brain as there is with consciousness. How does *meaning* arise from mechanism? It seems to me that the 'higher' regions that are accessed by neural systems cannot themselves be merely neural. Indeed, as suggested by the above passage from the *Zohar*, there may be further levels in this interactive hierarchy. In these terms, the interaction between 'lower' and 'higher' regions of the human brain may be just the initiating step in a cascade of interactions reaching beyond the physical plane. At all levels, the same principles of operation apply: activation in the feed-forward sweep, and receiving back via re-entrance. In this fashion, the brain would become recipient to the twin 'blessings' of meaning and consciousness.

Harth (1993) refers to the dynamic interplay between the feed-forward and re-entrant pathways as the 'creative loop', for he rightly sees in it the basis of imagery and other creative aspects of what it is to be human. But perhaps this does not go far enough, for the interplay as it operates in the brain may be merely a sub-routine of what we might think of as a *cosmic loop*. The 'impulse from below'—stimuli entering the brain from the outer world—becomes the trigger for an influx of consciousness from a higher source. Through consciousness, the world, otherwise meaningless, is transformed into a world of meaning.

Notes and References:

1. There is very little theology in d'Aquili and Newberg's approach, and the value of the term 'neuro*theology*' might be questioned. Their work is much more concerned with the nature of mystical experience than the more philosophical arguments generally associated with theology.

2. The vowel-less form of the Hebrew original means that a variety of divergent readings are possible. Midrash exploits this polysemy in the text in building its tapestry of meaning.

3. *Alef* and *bet* are the first two letters of the alphabet, and 231 is the number of two letter combinations which may be generated from the 22 letters of the Hebrew alphabet, ignoring reversals.

4. There is clearly a terminological difficulty here. Given that the stages are viewed as 'conscious' in the Abhidhamma it hardly seems appropriate to refer to them as *preconscious*, as would be typical in neuroscientific models. Moreover, since – as will be discussed – the Buddhist view asserts that the early stages can be brought under the control of the will, the term 'preattentive' would also seem to be misleading. Resolution of this matter demands a more sophisticated, *operational*, approach to defining differing dimensions of consciousness. See Lancaster, in press 1, for detail of such an approach.

5. Such a figure is clearly polemical. Indeed, from a neuroscientific perspective, even propagation of an impulse along the optic nerve takes longer than this. I assume that the authors were simply trying to indicate the extreme brevity of the moments, and the fact that they are obscured to an untrained mind. As for the question as to how such brief moments might be experienced, it seems that their duration may become prolonged during meditative training.

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