



# THE NEUROSCIENCE OF MEDITATION

AN INTRODUCTION TO THE SCIENTIFIC  
STUDY OF HOW MEDITATION  
IMPACTS THE BRAIN

BY ERIC THOMPSON

# **The Neuroscience of Meditation**

*An Introduction to the Scientific Study of How Meditation  
Impacts the Brain*

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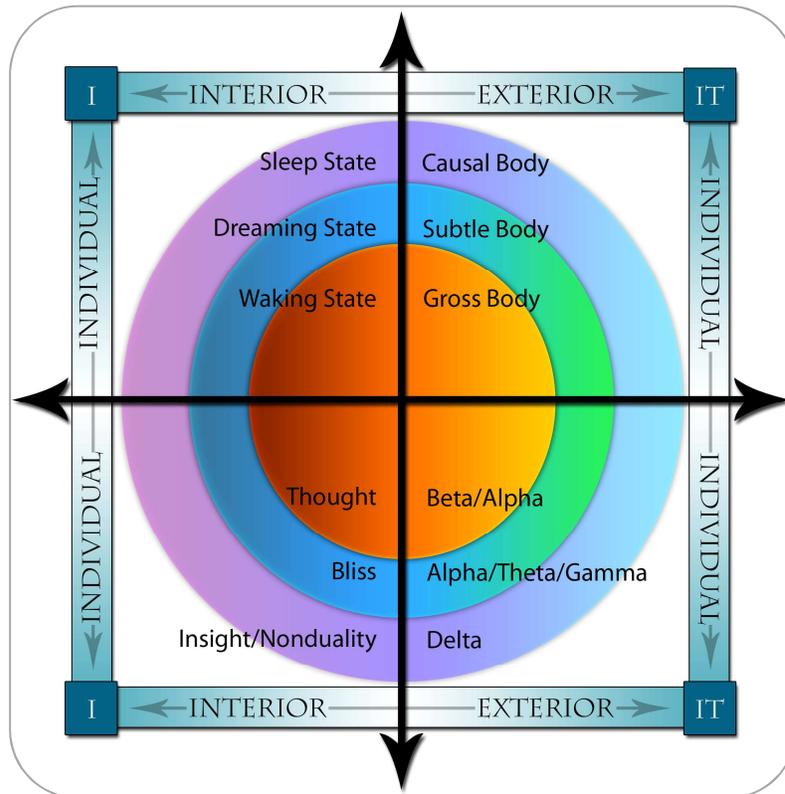
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# CHAPTER 5

## Brainwave States in Traditional Buddhist and Hindu Teachings

### Waking, Dreaming, Sleeping



The four brainwave patterns most often studied in science (Beta, Alpha, Theta, Delta) represent states of waking, dreaming and sleeping through which pass every 24 hours. While all brainwave patterns are usually present throughout the day, Beta activity is dominant during the waking state. Alpha and Theta appear as we become relaxed and drowsy, and Delta emerges as we descend into deep, dreamless sleep.

In phenomenological terms, on some level we move through and experience a spectrum of consciousness as we descend through the sleep cycle, ranging from the gross to the subtle to the very subtle. Beta-band activity is experienced as a gross, dense level of consciousness, whereas Alpha and Theta co-arise with a more subtle form of consciousness in which vivid imagery and a sense of letting go come to the surface. This is a world in which long forgotten childhood images come into view and the gross laws of nature cease to exist. Finally, the self-identified witness—the “I”—vanishes as Delta activity comes online in deep, dreamless sleep. In this state, there is no one experiencing anything, no one struggling with the world, no one who is happy or sad; there is only perfect peace and rest. Not incidentally, this state is crucial to our continued health and wellbeing, as it deeply recharges our innate capacity for healing and rejuvenation.

Interestingly, the teachings of certain Buddhist and Hindu traditions also depict a field of consciousness that ranges from the gross to the subtle to the very subtle, each state having its

own body—gross, subtle or very subtle (i.e., causal). Furthermore, the gross body is contained within the subtle body and the subtle body within the causal body, so that the emergence of the non-self-identified witness is an ever-present possibility. In other words, these co-arising state-body manifestations represent aspects of ourselves that we can develop, allowing more of our potential to come to the surface.

This teaching of a tripartite self (with corresponding states and bodies) is seen in Buddhist, Hindu and even Christian teachings, though the specifics of the teaching differ from tradition to tradition. The Trikaya doctrine in Mahayana Buddhism delineates the nature of an enlightened being, consisting of three bodies: 1) a created physical body which emerges in time and space; 2) a body of light; and 3) a boundless Truth body, the incarnation of the enlightenment principle. The Hindu philosophical tradition of Vedanta refers to these three bodies as the gross body, the subtle body and the causal body. And the Christian tradition acknowledges these three bodies/states in its doctrine of the Trinity—God in three persons: Father (causal), Son (gross) and Holy Ghost (subtle).

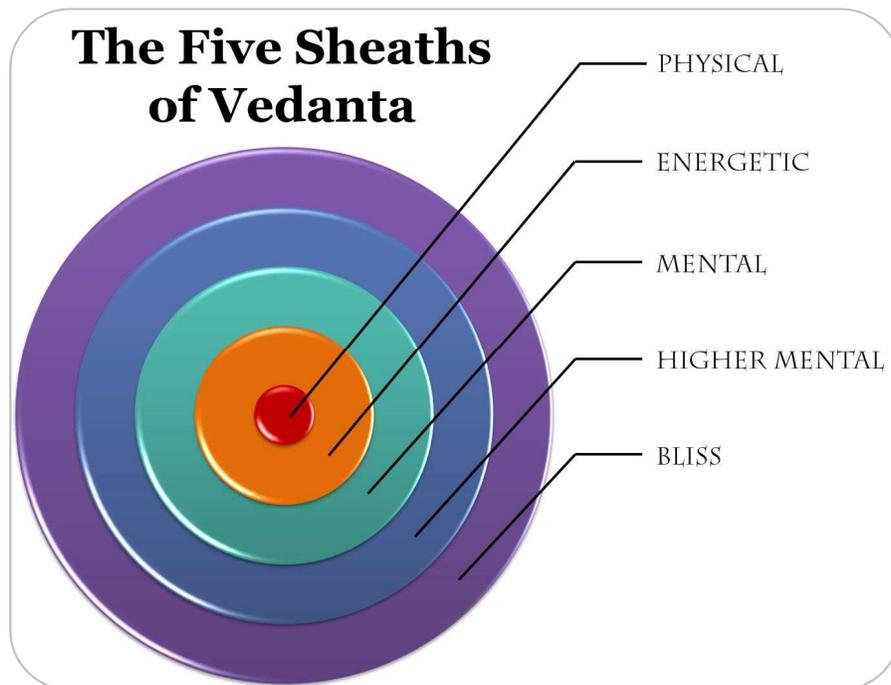
As we become more acquainted with these teachings, it is possible to cultivate a sense of how we can inhabit these states not only in a more conscious way, but in a way that lends itself toward transformation and renewal, towards releasing our habitual self-identifications and realizing our deepest nature. In fact, Vedanta views the investigation (both mentally and experientially) of these states and bodies as essential to releasing our habitual identification with them and resting in our true nature.

### **Gross Body, Gross State**



The densest body in Vedanta is the gross body—the *sthula sarira*, which supports the waking state of consciousness as well as the *annamayakosha*, the outermost of five sheaths which cover the deepest Self like a 5-layered lampshade. It is the physical body made up of the five elements: earth, water, fire, air and space. Its corresponding state of consciousness, when deeply identified with, binds us to an experience of ourselves in which we alternate dualistically between love and hate, us and them, life and death. Seven increasingly dense phenomena emerge when this state is

strongly identified with, each giving rise to the next: 1) a mistaken understanding of reality that prevents realization of the Self; 2) the inability to discern reality from non-reality; 3) attachment to one's "I," or sense of self; 4) attachment to experiences which have previously given pleasure; 5) aversion toward experiences which have brought on pain and suffering in the past; 6) action (which includes thought) and its consequences (including the subtle mental imprints which result from such actions); and 7) the physical body.



In terms of brainwave activity, the *sthula sarira*, when exclusively identified with, would appear to be correlated with excessive Beta-band activity. As we discovered in Chapter 3, too much Beta activity is associated with anxiety disorders and even alcoholism. Seen in this light, the alcoholic is substituting alcohol for conscious access to his true nature as Spirit because he is deeply identified with the gross state of consciousness and doesn't know how to escape this identification.

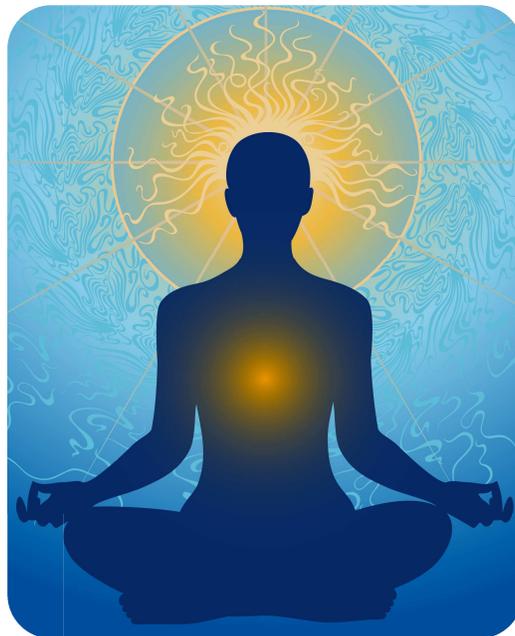
The Mahayana Buddhist tradition has named this body the *nirmanakaya*, the physical body made manifest to teach the dharma and help all beings to enlighten. This emphasis of the gross body/state highlights the way in which an enlightened being inhabits the body, transcending and including it rather than identifying with it as the locus of the self. In this manifestation of the physical body and the waking state, a radiance of pure light and depth of spirit are allowed to emerge, while a consciousness of the gross world is fully stabilized. This might arise neurologically as a dynamic balance between the major brainwave patterns (Beta, Alpha, Theta and Delta), similar but not identical to C. Maxwell Cade's *Awakened Mind* pattern, and phenomenologically as an unwavering, attachment/aversion-free, bliss-filled witnessing of the conditioned mind.

### Subtle body, Subtle State

In Mahayana Buddhism, the *sambhogakaya* refers to the subtle body, or the astral body, which is made of brilliant, clear light. Vedanta calls this the *sukshma sarira*, correlating it with the "dreaming self" that supports the emotional-sexual, mental and higher mental capacities. Its

corresponding state is one in which the mental capacity for discernment and the subtlest sense of an individual self arise. While the highest manifestations of this state certainly embody a deeply lived spiritual harmony, they do not represent ultimate enlightenment, as this would entail a dissolution of the self-identified witness.

In agreement with Vedanta's labeling of the subtle body/state as the "dreaming self," Mahayana Buddhist teachings have also claimed this state to be accessible through dreaming sleep. And dreaming sleep's associated brainwave patterns are primarily in the Alpha and Theta (mostly Theta) ranges, featuring periodic spikes into high frequency Gamma activity. These patterns are often found in reports of blissful meditative absorption as well. In Vedanta, this state of ecstatic absorption is referred to as *samadhi* in general, and *savikalpa samadhi* in particular. Though the dreaming state and the blissful samadhic state co-emerge with similar bandwidths of brainwave activity, the former state is usually an unconscious process, while the latter is a conscious one. In addition, samadhic states feature higher than average levels of synchrony and coherence, which tend to be correlated with higher order cognitive processes.



### **Causal Body, Causal State**

Termed the *karana sarira* in Vedanta, the causal body is deemed to be limitless and expansive in nature, a body of bliss and spirit. It is the seat of deep wisdom and insight. Certain Buddhist manuscripts have asserted this state to be approachable through the state of deep, dreamless sleep. As such, its corresponding brainwave patterns are most likely in the low-Theta to low-Delta range.

This idea that the Delta range of frequencies may somehow be correlated with profound cognitive acumen is largely unacknowledged in cognitive science. When addressing forms of helpful attentional training, cognitive science more often than not fails to see any benefit in training individuals in Delta frequencies. This frequency range is usually relegated to unconscious processes governing deep sleep and the autonomic nervous system. A cognitive scientist once told me, in fact, that the available scientific data suggested that excess Delta was involved in cognitive dysfunction. While this may be the case, the *phase synchronous* and

*coherent* Delta discovered in other scientific studies to arise in uncommonly deep meditation has most often been associated with extraordinarily high levels of personal insight and emotional wellbeing.

### **Low-Subtle/High-Causal Training**

It is theorized here that training in low-subtle/high-causal states, spanning low-Theta to high-Delta brainwave bandwidths (associated with long-term memory), can facilitate spiritual transformation, especially when these states emerge in high amplitude, coherent fashion. Viewed from a Buddhist perspective, this is due in part because the low-subtle/high-causal states correspond with the *alaya-vijnana*, the collective storehouse that contains the subtle karmic residues of past actions, both individual and collective. By repeatedly entering these states coherently and consciously, it is possible to open the door of that storehouse and allow its contents to be dis-identified with and released. This in turn gives rise to higher stages of psycho-spiritual development. In essence, this is a process of becoming more and more conscious of what we are and what drives us, and letting go of identifying with those subtle imprints.

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