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Getting in a (Brain-wave) State through Entrainment, Meditation, and Hypnosis

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Having discussed the basis, philosophy and outcomes of mantra meditation practice, and introduced the background to the phenomenon of trance in this context [1], I now wish to turn to the modern “scientific” viewpoint on both of these. First we should be mindful that “The brain is an electrochemical organ; researchers have speculated that a fully functioning brain can generate as much as 10 watts of electrical power. Other more conservative investigators calculate that if all 10 billion interconnected nerve cells discharged at one time that a single electrode placed on the human scalp would record something like five millionths to 50 millionths of a volt. If you had enough scalps hooked up you might be able to light a flashlight bulb. Even though this electrical power is very limited, it does occur in very specific ways that are characteristic of the human brain” [2]. This is measurable through “Electroencephalography (EEG) [which] is a study of changing electrical potential of the brain. The apparatus used to measure this electric potential of the brain is called electroencephalograph, and the tracing or the printout of the measured brainwave forms is electroencephalogram” [3]. Now, this is linked to thought and emotion in the following way, for “If you are in a particular state, for example, very anxious, then you will produce a unique ‘signature’ of brainwaves. This applies equally to other states, such as learning and the focused concentration of competitive sport. These are states that can take a long time and a lot of physical effort to attain. It is an appealing idea that all that hard work and application could be bypassed and the perfect mental state produced through rapid artificial means” [4]. The “pseudo-drug” effects of various brainwaves, as taken from [5] is detailed in Table 1. We can then go on to present a summary of the range of brainwaves (arranged in order of decreasing frequency), which can be measured in a living human brain with the technology described above. These are normally labelled with letters of the Greek Alphabet, and here these have been transliterated into English for convenience. In order to distinguish the special use of this terminology in this context, the Greek words have been editorially capitalized in English throughout, without further annotation. These brainwave ranges are to be correlated with experiences reported in “meditative” and “trance” states of consciousness, either in a waking or in a sleeping subject.

Table 1: Pseudo-drug effects of various brainwaves

<i>mimics effect</i>	Delta	Theta	Alpha	Beta
adaptogenic			X	
analgesic	X	X	X	
anaphrodisiac	X	X		X
anaesthetic	X	X		
antianxiety		X	X	
antidepressant			X	
antispasmodic			X	
antipsychotic			X	
aphrodisiac			X	
bittertasting			X	
cardiotonic			X	
circulostimulant			X	
depressant	X	X		
diaphoretic		X		
hallucinogenic		X		
hypertensive				X
hypnotic	X	X	X	
hypotensive	X	X	X	
mydriatic	X	X		
narcotic	X	X	X	
nervine	X	X	X	
photosensitive			X	
rubefacient			X	
sedative	X	X		
spasmolytic	X	X	X	
stimulant				X
vasoconstrictor				X
vasodilator			X	

We start with Lambda waves, with a frequency of about 200 Hz. At these frequencies we are said to attain "Self awareness, higher levels of insight and information. Tibetan monks that walk barely clothed for days through the snow have exhibited high levels of these. They are difficult to measure and little is known about them. They are carried on the very slow moving Epsilon waves (< 0.5 Hz)" [4]. In "non-sleep" states hyper-Gamma waves (100 Hz and above) can be characterized as generating states that are "Hyper-aware. Extreme concentration. Above 100 Hz, higher-level

awareness of unity; higher mental activity, including perception and consciousness. Cortex synchronize themselves together in a more holographic manner during extraordinary states of consciousness associated with 'Shamanic' and 'Mystical' experience" [6]. We next meet Gamma waves which are present in trance states, and encompass frequencies from 38 – 90 Hz. These are "Important in harmonizing and unifying thoughts processed in different parts of the brain. Combine different perceptions. Suppressed totally by anaesthetic. Found in all parts of the brain." They are crucial for "Self awareness and insight" [4]. At the lower end of Gamma waves 40 Hz is "The core frequency. Important in cognition, especially coordinating simultaneous processing in all parts of the brain. Deficiencies exhibit learning difficulties. Produced during hypnotic states" [4]. We next observe the Gamma-Theta transition. We can understand this by trying to answer the question "Has your perception of time ever slowed down during an emergency? Have you ever had minutes or hours worth of experiences in a moment? That's your mind cycling between the Theta and Gamma brainwaves. The Theta-Gamma state is most conducive to instant healings" [7]. We will return to this question of brainwave-induced healing later. Next down the ladder of frequencies come Beta waves ranging in frequency from 14 Hz – 30 Hz and representing a normal, waking state, where one is "Wide awake, alert, focused, analyses and assimilates new information rapidly, complex mental processing, peak physical and mental performance, cannot be sustained indefinitely otherwise exhaustion, anxiety, and tension result" [4]. In this range of brainwaves we show "High levels of concentration and focus" [6] characterized by "Externally-directed linear thinking and mental activity" [6]. They are "Generally associated with left-brain thinking activity – conscious mind" [3]. We find that "Beta waves are characteristics of a strongly engaged mind. A person in active conversation would be in Beta. A teacher, or an engineer would all be in Beta when they are engaged in their work" [2]. This range can be further partitioned into midrange-Beta waves from 15 Hz – 18 Hz measured in "Neurofeedback training that produced alert behaviour, useful in depression cases" [4]; and low-Beta waves from 12 Hz – 15 Hz which are "Also known as Sensory Motor Rhythm (SMR) – [evidenced by] vigilance, reduced mobility, shallow breathing, less blinking, fixed attention and eye focus, enhancing through neurofeedback reduces epileptic symptoms and has a calming effect (ADHD [Attention Deficit Hyperactivity Disorder] sufferers)" [4]. These actually have the lowest amplitude of Beta, Alpha, Theta, Delta waves [2]. Next we observe the Beta – Alpha transition at about 12 Hz. Alpha waves at frequencies from 8 Hz – 13 Hz characterise the trance state and REM sleep. Alpha waves have larger amplitude than Beta waves [2]. In general, Alpha state is "Hyper-efficient in processing single tasks as it can focus on the details as well as the overall task at the same time" [4]; in trance this equates to "Inner mental pondering. Typical meditative state" [6] – and in sleep, to "Internally-directed non-linear mental activity" [6]. Alpha state can be represented as "Relaxed, Daydreaming. Generally associated with right-brain thinking activity – subconscious mind – a key state for 'relaxation'" [3]. In Alpha state individuals show "Mental coordination and resourcefulness, relaxation, alert but not mentally processing anything, inward focus, calmness, at ease, deep breathing and closed eyes can amplify Alpha production, peak around 10 Hz" [4]. We make a link here with the meditation practices described above in observing that "A person who takes time out to reflect or meditate is usually in an Alpha state. A person who takes a break from a conference and walks in the garden is often in an

Alpha state ... [It has been] Suggested that it is a light state of hypnosis" [2]. In terms of hypnotherapy we can conjure up a useful metaphor here since "The Alpha brainwave forms a bridge between the conscious (Beta) and unconscious (Theta) mind. It is associated with creativity and rapid learning. For this reason, energy healing techniques, such as Reiki, use this frequency. And guided meditations bring participants into Alpha to promote relaxation and healing. The Alpha state is especially effective for relieving pain. Those who don't function well at this frequency find it difficult to remember details of even powerful dreams, guided visualizations, and meditations. In short, that bridge between conscious and unconscious mind is weak" [7]. Next comes the Alpha – Theta transition measured at 7.48 Hz which is the "Primary ionospheric resonance (Schumann) frequency. Stimulates retrieval of memories from the subconscious" [4]. We are now in the Theta wave state ranging in frequency from 4 Hz – 7.5 Hz. In its trance manifestation we find Theta state engenders "Original, creative inspiration, problem solving and visualization. Out-of-body or astral meditative forms; great spiritual insights associated with visions and sounds. Classic 'Shamanic Journeying'" [6] – and in sleep mode we have "Dreaming sleep, emotional elements and experience. We now recognize REM [Rapid Eye Movement] as the dreaming sleep state, somewhere in deep Alpha to light Theta" [6]. Theta waves are higher in amplitude than Alpha waves [2]. In Theta state we are "Deeply Relaxed, Dreaming. Generally associated with right-brain thinking activity – deeper subconscious to superconscious. Access to insights, bursts of creative ideas – a key state for 'reality creation' through vivid imagery" [3] – this is very useful for "Memory access, learning, deep meditation, sensations, emotions, the threshold of the subconscious, dreaming" [4]. It is useful to characterize Theta state by the fact that "A person who has taken time off from a task and begins to daydream is often in a Theta brainwave state. A person who is driving on a highway, and discovers that they can't recall the last five miles, is often in a Theta state – induced by the monotonous process of freeway driving. Individuals who do a lot of driving, jogging, commuting often get ideas during those periods when they are in Theta. This can also occur while you are in the shower or brushing your hair. It is a state where tasks become so automatic that you can mentally disengage from them. During this awakening cycle it is possible for individuals to stay in the Theta state for an extended period of say, five to 15 minutes – which would allow them to have a free flow of ideas about yesterday's events or to contemplate the activities of the forthcoming day. A person in a hypnotherapy session experiences a Theta state of relaxation and allowing the mind to disengage from tasks, just following the voice of the therapist inducing positive suggestions. This time can be an extremely productive and can be a period of very meaningful and creative mental activity. The ideation that can take place during the Theta state is often free flow and occurs without censorship or guilt. It is typically a very positive mental state" [2]. Indeed in terms of therapy "This is the state of medium state of hypnosis" [2]. Further subdivisions of Theta state are possible and frontal-midline-Theta from 6.2 Hz – 6.7 Hz is important in "Cognitive activity, maths problems, sustained attention, extrovert personality, low anxiety" [4]. At lower frequencies around 4.5 Hz Theta we find that "Shamanic trances, Tibetan mantras, Buddhist chants all use this frequency to access altered states" [4], and slightly lower still at about 4 Hz Theta we have "Object naming" [4]. In terms of hypnotherapeutic healing it is conjectured that "Through the Theta brainwave we gain access to our unconscious mind, namely, our deepest beliefs, traumas, and childhood learning. Even if long-

forgotten, they influence our decisions daily. *ThetaHealing* aids us in discovering the fears and beliefs that drive us and in changing them into life-affirming ways of being. Theta is also the state of deep spiritual connection. Have you ever experienced the sublime? For instance, have you stood on a mountain top, feeling at one with your surroundings, and absolutely known that you are connected to everyone and every thing – past, present, and future? Known that God, the Creative Life Force, is? That's the kind of knowing the Theta brainwave engenders" [7]. The Theta-Delta transition occurs at about 3.5 Hz, allowing "Long term memory access" [4]. The Delta state ranges in frequency from 0.5 Hz – 3 Hz. In its trance manifestation we have "Deep physical relaxation. Meditative states associated with being in the 'void' or 'white-light.' Deep-level Yogic adepts can slow respiration and heartbeat to virtually undetectable" and "This is the very deep level of trance, of hypnosis" [2] – whilst as a sleep state Delta is the "Deepest and most physically restorative sleep" [6], being "Dreamless. Generally associated with no thinking – unconscious / superconscious. Access to non-physical states of existence – a key state for healing, 'regeneration' and 'rejuvenation'" [3]. Both of these manifestations are characterized by " ... human growth hormone release, low blood pressure, low respiration, low body temperature. No muscle movement – Reticular Activating System (RAS) shuts this down" [4]. Delta is state of greatest amplitude [2]. The Epsilon trance state occurs for frequencies below 0.5 Hz and is characterized by "Extraordinary states of consciousness. Very high states of meditation, ecstatic states of consciousness, high-level inspiration, spiritual insight and out-of-body experiences" [6]. This is "The state Yogis go into when they achieve 'suspended animation' where no heart beat, respiration or pulse are noticeable" [4]. If we survey across the various brainwaves we find that in general, "Lower brainwaves (Delta, Theta, and low Alpha) may cause stupor and sleepiness. They tend to release serotonin while higher frequencies (Beta and Gamma) release more dopamine. Beta frequencies organize thoughts, helping you to remember things and concentrate. Withdrawal from Alpha Waves makes you remember childhood memories. Alpha waves relax the body and help blood flow to extremities" [5].

In terms of hypnotherapy there has been a change in our understanding of the psycho-biological nature of "trance," since, "For a long while it was thought that Alpha wave patterns were characteristic of hypnotic states. It is now understood that it is Theta and to some extent Delta waves and 40 Hz Gamma waves that are predominant. Other wave patterns occur, even active Beta waves, but these are due to the content of the suggestions and the images created by them" [4]. Now following on from this, we note that the sequence of brain states attained as a subject is hypnotized may be described thus – "As you relax and then close your eyes there is a brief build up of Alpha waves – As the induction ... develops there is an increase in Theta and to a lesser extent Delta activity and the Alpha activity drops away – This continues until the end of the hypnotic deepening – During the therapeutic suggestions the brain wave activity can vary depending upon the nature of these suggestions and the effect they are having. Generally during this period the Delta and Theta wave activity begins to slowly subside – Through the whole hypnotic process there is a gradual increase in 40 Hz Gamma wave activity – During termination the Alpha activity and finally the normal Beta activity returns" [4]. In terms of the sequence of states described above we find that "Some research has been done associated

with the activities and benefits of other brainwave frequencies, such as Super Beta, Gamma, etc. The lower your brainwave cps [frequency, cycles per second], the more is your awareness turned toward your subjective experience, toward your inner world and the more effectively are you able to use the power of your mind to create changes in your body. With each lower state you become more fully aligned with the source of power within you, with your unconscious, or if you prefer, with that part of you that is greater than you (your body)" [3]. So, "Generally in Beta state, your attention is focused outward. In Alpha it begins to turn inward, and in Theta and Delta it goes further and further inward. The deeper you go, the more effectively are you able to enter your subconscious. You can imagine that at the borderline between Beta and Alpha States is a doorway to your subconscious mind, and the doorway consists of what is hypnosis referred to as your 'critical faculty'" [3].

Let us now move from mystical meditation, through hypnotherapeutic trance, to pure technology, whereby "Brainwave synchronization ... provides a shortcut to experiencing deeper states of mind giving you an opportunity to access higher states of consciousness and extraordinary abilities in very short time through brainwave entrainment. This way you can experience almost immediately the effects that took someone years of meditation to achieve ... Entrainment is the process of synchronization, where vibrations of one object will cause the vibrations of another object to oscillate at the same rate. External rhythms have a direct effect on the psychology and physiology of the individual" [8]. The mechanism by which this is perceived to work is that "If slightly different audible tones are played to each ear through stereo headphones then as the brain puts these two sounds together it creates brain waves of a frequency equal to the difference of the two tones. For example, if the left ear was played a 200 Hz tone and the right ear a 210 Hz tone the brain will respond with a 10 Hz brain wave (termed a frequency following response)" [4]. This frequency-following response is a general physical phenomenon: the technological breakthrough is that now " ... this process has gone digital through the use of binaural beats. This is accomplished by sending two different sounds (tones) to each ear through stereo headphones. The two hemispheres of the brain then work in unison to 'hear' the third signal, which is not played, but rather produced as a result of difference in frequency between two beats that are heard. Sending specific frequencies to each ear entrains the brain to enter effortlessly a specific state of mind. If the left ear is presented with a steady tone of 400 Hz and the right ear a steady tone of 407 Hz, these two tones combine in the brain. The difference, 7 Hz, is perceived by the brain and is a very effective stimulus for brainwave entrainment. This 7 Hz is formed entirely by the brain. When using stereo headphones, the left and right sounds do not mix together until in your brain. The frequency difference, when perceived by brain this way, is called a binaural beat" [8]. So, this is the scientific basis of the entrainment process – but what does it actually *do*? Well, "The significance of this is that with a careful choice of frequencies, you can rapidly alter your state. For example, you can reproduce the patterns of brainwaves associated to falling asleep as the activity descends rapidly through Alpha into Theta and Delta waves. Many other states have been induced by the method such as learning, meditation and creativity. You can stack and overlap different binaural tones to produce quite complex states. Where somebody shows abnormal brainwave patterns, such as ADHD (Attention Deficit) or psychotic episodes, it is possible to train the

brain back into a more normal pattern. The possibilities are enormous, and though research is still in its infancy, you can see how useful this could be both therapeutically and for self improvement” [4]. We now see that it is possible to integrate the ideas of brainwave entrainment with “traditional” hypnotherapy and meditation by using a sequence of frequencies – “A period of Alpha waves at the start behind the pre talk, at say 10 Hz, a frequency known to stimulate serotonin and produce relaxation – A gradual build up of Theta which will remain the dominant wave pattern, at perhaps a frequency of 4.5 Hz. This is the frequency used by Shamanic drummers to induce trance states – A gradual build up of Delta waves – Towards and during the reinforcement phase and termination introduce a 'learning' Theta frequency at around 4 Hz – You can try a short period of Alpha during termination – If the final aim is to feel refreshed and revitalised then end with a Beta wave wide awake frequency depending upon the nature of the therapy, for example around 13.8 Hz (calming for ADHD) or 17 Hz (alert for depression)” [4]. In terms of the usefulness and efficacy of such entrainment protocols we find that “These are quite powerful products and have the ability to cause quite significant changes in personality and behavior, over time. Please follow the instructions provided. I have noticed a worrying trend on a number of brainwave entrainment message boards where individuals have been experimenting randomly, for example, by hooking themselves up to ... [an entrainment computer programme] all night at some inappropriate frequencies. This neurologically on par with shooting up heroin ... It seems that due to the complex nature of wave interaction in the brain, simple frequency overlaying is a pretty random exercise. Best to emulate an already existing pattern rather than go wild with the impressionists brush” [4]. One commentator notes that in fact “I am also coming to the conclusion that it is not only the actual frequencies that are important but the sequence and timing that is most significant. Very little is known about this ...” [4].

And despite very little being known about the exact nature of brainwave entrainment processes they are still employed frequently today, without supervision and foresight, and it has been reported that this can lead to side-effects such as dilated pupils and vivid dreams; as well as eye pains and seeing (purple) spots from a few days to weeks after using entrainment [5]. Potentially more serious effects reported are “eye explosions” (sudden pains in the eye), which may be due to aneurism and seeing “swirls of colours” or “psychedelic colours” [5]; sudden explosive head pains, headaches, migraines; “cloudy mind,” confusion, disorientation, emotional instability, irritability, lowered inhibition, manic depression, paranoia, disturbed sleep, nightmares, night terrors; convulsions; and addiction to entrainment [5]. Furthermore, with entrainment processes it is possible to “overload” the brain with waves of a particular frequency and there is some indication of the problems which can occur with overload of each type of brain state. Delta overload is characterized as bringing about a soporific state from which it is very difficult to awaken, and in which it is hard to concentrate. However it is reported that exposure to a few minutes of Alpha waves (12 Hz) can help to come up out of this overload state [5]. Theta overload is described as a “dreamlike state,” in which one has difficulty concentrating and shortened attention span, and where people often see “swirls” of colour. Generally Theta-overloaded individuals return to normal spontaneously after a few hours; once again a few minutes’ Alpha-wave therapy can help [5]. Alpha overload has the widest complex of symptoms,

many occurring one to two weeks after beginning entrainment. Some people report disturbed vision, with 30 – 45 minute periods where they experience seeing psychedelic colours. In this eventuality the individual is advised not to worry, but to stop using entrainment for a while, and that their vision should return to normal. Other people report disturbed sleeping patterns and feelings of exhaustion, but once again the circadian rhythm should return to normal if brainwave entrainment is stopped for two weeks. Paranoia, sudden stabbing pains in the back of the head, and sensitivity to light and sound are also common [5]. One commentator reports that on Alpha overload he recalled childhood memories and began to notice “similarities in people's faces with people that I know or used to know” [5], and states that this is very common, but suggests that one should stop using entrainment if any of these side-effects occur. Very rarely, people are said to develop a “photographic memory” from about a few days to a week after Alpha overload [5]. With Beta overload one can experience focused attention, agitation, mania, vivid dreams, rapid, pounding heartbeat, moodswings, paranoia, insomnia and obsessive-compulsive behaviour [5]. In this case a few minutes’ 8 – 10 Hz Alpha-entrainment is recommended to “help you calm down” [5].

One final application of brainwave technology is demonstrated in its coupling with artistic expression in the form of “Bio-music” [9]. Here, the practitioner is advocated to use a “bio-signal pre-amplifier” to “listen to and learn the rhythms of your system” [9] – Alpha waves are recommended since they engender a “contemplative state” where the “body system is quiescent” [9]. A keyboard system can be coupled with, and used to manipulate, the basic brainwave pattern, and used in improvisation according to recursive rules such as “1. play only while in Alpha; as you drift out of Alpha devote yourself to regaining that state. 2. relate the rhythms of your playing to the rhythm of the bio-signal being used. 3. generate your own rules” [9]. It is suggested that the bio-musician be constantly aware of images and events, especially those “thrown almost randomly together” [9] and select “patterns in the relationships of images via form, content, semantic juxtaposition, etc” [9]. This will lead the practitioner to “Develop ... integrating systems of thought and action processes and their dynamic interrelationship” as appropriate [9]. The motivation and rationale for this approach is that “In a sense the task is to explicate these interior processes and to demonstrate inner/outer correspondence leading to an understanding of the identity of nature – of the nature of identity ... “ [9] – in itself a form of almost-magical action [10],[11],[12]. We have previously elaborated the mechanism of hypnotic change in the context of “Psycho-chaotic Semiotics” and shown how the language used could be thought of metaphorically as exercising “magical” effects due to the intertwined nature of the mind’s neural nets, and our linguistic meaning-making processes [13]. The exact mode of operation of this mechanism is the Neuro-linguistic-hypnotic phenomenon of “Trans-derivational Search” and having made these first links between mantra and trance, further work is in progress to elaborate in detail the nature of the relationships in terms of language and brain function. We will thus be able to use our hypnotic Psycho-chaotic, and Neuro-linguistic, tools, to change core beliefs and values from those indoctrinated by the prevailing religious or scientific ideologies of our society, and fill the resulting “vacuum of choice” with empowering personal logo-myths which lead to true psychic freedom and

power [14]. We are then well on our way to building a “mascirelgic” framework for the reunification of scientific therapy, magic and religious practice [15].

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