# The Dynamic Soft Systems Theory of Hypnosis and the Unconscious Mind

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| **Acknowledgements** | N/A |
| **Abstract (<=250 words, no sub-headings, objective, methodology, key results, major conclusions) {57 wds)** | This unashamedly totally theoretical perspective on hypnosis and the unconscious merges together influences from the worlds of artificial intelligence, psychology and three-dimensional Euclidean geometry into a unique personal viewpoint for discussion purposes. |
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| **Target audience** | Anyone with a basic understanding of biology / therapists. |

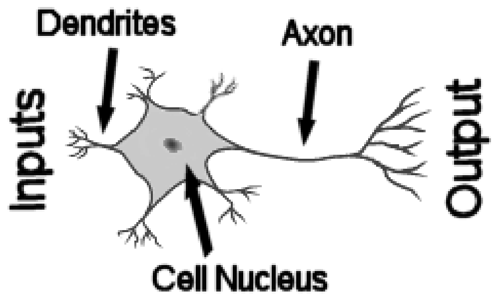
# Introduction

Over the years there have been a variety of theories to explain the nature of hypnosis and the unconscious mind. As I left-brained thinker I felt that these theories did individually not match with my understanding of how artificial neural networks and other complex systems operate. For my own purposes I therefore developed a way of understanding hypnosis and the unconscious that my logical left-brain could more readily accept.

# Back to basics

In order to understand the big-picture, it is first necessary to understand the detail. When applied to organic neural networks this means understanding how neurones work.

The diagram to the right shows a neurone, a motor neurone in fact. On the left hand side are dendrites, at the end of the dendrites are synapses that accept inputs from other neurones. Depending on the inputs received the cell then decides whether to fire or not. The cell nucleus is a major part of that process and is the round object at the heart of the cell. *(The nucleus contains proteins that "remember").*




If a decision to fire is made the cell generates a signal that is communicated by the axon on the right hand side to other neurones, or in the case of a motor neurone to specialised tissues on the surface of muscles.

This biological function can then be modelled mathematically as follows: (based loosely on the Perceptron model and other models from the world of Artificial Intelligence). (1-p30, 2-p17+).

Input 1 ➡ Weight 1
Input 2 ➡ Weight 2
Input 3 ➡ Weight 3
Input 4 ➡ Weight 4
Input .. ➡ Weight ..

$$\left\{ \begin{array}{l} (i1*w1) + \\ (i2*w2) + \\ (i3*w3) + \\ (i4*w4) + \\ (i..*w..) \end{array} \right\} = i$$

If i >= t then FIRE
O = Ø or 1

NB This is about as un-mathematical and simplified as AI technology gets!

*Assumptions:*

*(1) The more a particular synapse is activated the more easily and forcefully it responds to inputs (i). This I will refer to as the "weight" (w) of the input. The weight is therefore variable over time depending on historical trends of activity or inactivity. Inactivity is assumed to reduce the value of the weight, activity is assumed to increase the value of the weight, upper and lower limits for w are also assumed.*

*(2) For the purpose of this model all of the inputs are multiplied by their respective weights and then accumulated into a single value for all of the inputs at that instant.*

*(3) When the sum of the weighted inputs equals or exceeds (>=) a threshold value (t) then the neurone fires (generates an output signal (O)). The threshold value is probably also variable over time. To simplify the model the threshold / output is assumed to be constant and binary i.e. Ø or 1.*

Perhaps simplistically, a neurone is therefore a logical switch that individually does little more than switch "on" when specific complex conditions are met.

# Learn mode V work mode

If you have ever used speech recognition software you will be familiar with the concept of the “learn mode”. Artificial neural networks generally have two discrete modes of operation – “learning” (training) and “working”. In “learn” mode the network is flexible and adaptive, it is being trained to configure itself in order to behave in a way that the user expects when a specific input is present.

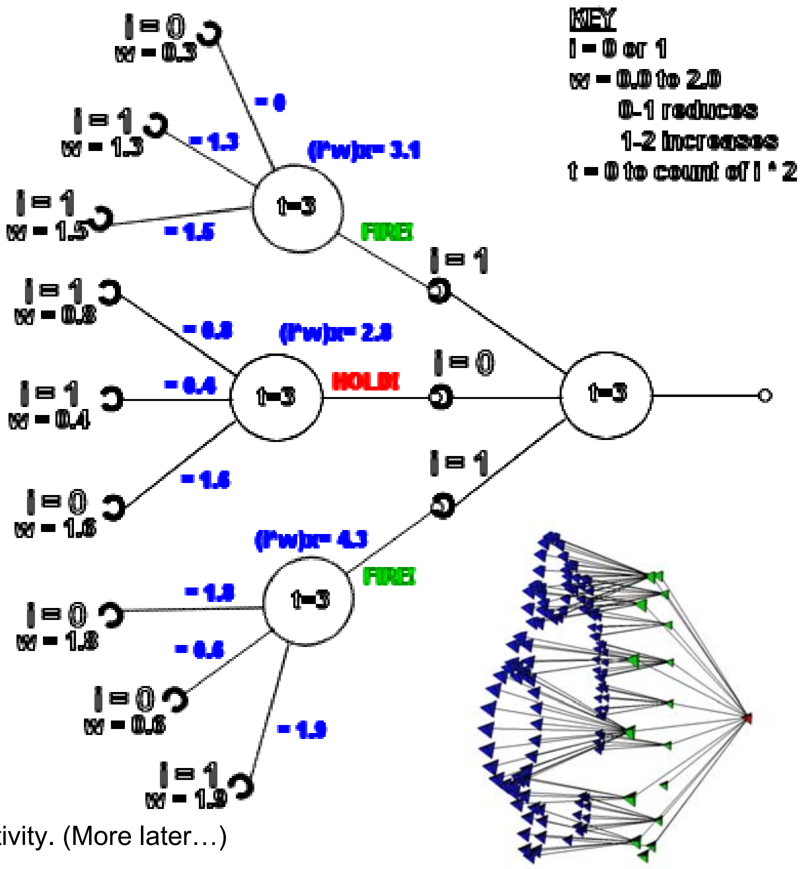
When this is applied to our general model we get:

Mode = LEARN — w = w + 1 over time (Recent activity)
w = w - 1 over time (No recent activity)

| | | | |
|---|---|---|---|
| Input 1 ➡ Weight 1 | (i1*w1) + | | |
| Input 2 ➡ Weight 2 | (i2*w2) + | | If i >= t then FIRE |
| Input 3 ➡ Weight 3 | (i3*w3) + | = i | O = Ø or 1 |
| Input 4 ➡ Weight 4 | (i4*w4) + | | |
| Input .. ➡ Weight .. | (i..*w..) | | |

So, in “learn” mode the neurone is adaptive over time. In “work” mode the neurone is more or less static and stable – simply reacting without much adaptation over time.

# Zooming out




Now let’s move away from the low level detail and take a look at how neurones interact.

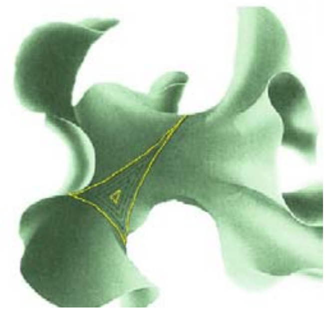
In the example to the right you can see how one neurone’s output is the input to another neurone and so on.

In artificial neural networks neurones are sometimes arranged in layers (as is the case with the neurones in the retina).

In more complex neural tissue such as is found in the brain interconnection is more complex and three-dimensional.

When a few neurones fire this could be described as a low level pathway. What we would recognise as a function would be the effect of millions or billions of pathways interacting in waves of near simultaneous or near simultaneous activity. (More later…)

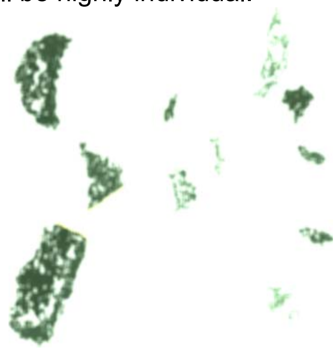
# Morphing patterns



Artificial neural network technologies left the functioning of individual neurones behind long ago. The modern emphasis in artificial intelligence modelling is to replicate the behaviour of large groups of neurones mathematically (to get around limitations of serial processing!) This deviation means that most modern AI networks are evolving away from us and cannot be easily compared to us.

What happens when we look at the bigger picture in the biological model is that the influence of a single synaptic interaction is negligible even though every interaction will have <u>*some*</u> role to play, even if this is simply to block the communication of a wave / signal to another area.

If we could see what was happening inside the model as it was processing inputs it would probably look like a rapid series of complex, convoluted three-dimensional waveform patterns that would ebb, flow, morph and then stabilise almost instantly (3D Euclidean geometry (3)). Although some similarities may exist between people it is probable that the series of patterns will be highly individual. *(NB I suspect that what I am describing here is at a much lower level that NLP rep system strategies).*



So a neural pathway as far as psychotherapy is concerned is really how billions of synaptic pathways are interacting as patterns within a dynamic, complex, three-dimensional, near real-time environment.

*(As an aside, modern functional magnetic resonance imaging methods are probably only able to "see" the most intense areas of activity because these patterns are likely to be very subtle (see emulation to the right). Also current measurement technologies are probably too slow to record what are likely to be only very fleeting ethereal patterns).*

# Conflict and harmony

The neurological landscape can be likened to the Serengeti plains because in both environments a Darwinian struggle for survival and dominance is in place at all levels. In the Serengeti this takes place from the microbial level right the way up to mammals.

In neurological systems individual neurones can be in conflict and overall patterns of activity can be in conflict. One possible conflict is that two sets of input can result in the same output.

In the following two very different inputs result in the same result – the neurone simply cannot distinguish between the two patterns of input:

$$\left\{ \begin{array}{l} (i1=0*w=1)\ + \\ (i2=0*w=1)\ + \\ (i3=1*w=1)\ + \\ (i4=1*w=1) \end{array} \right\} = 2 \qquad \left\{ \begin{array}{l} (i1=1*w=1)\ + \\ (i2=1*w=1)\ + \\ (i3=0*w=1)\ + \\ (i4=0*w=1) \end{array} \right\} = 2$$

To overcome these conflicts the network will strive to achieve some form of positive balance or harmony, even if this results in negative behaviours. The most likely pathways to become dominant are those where the path is of least resistance and / or the path that has been historically "activated" most over time (i.e. habitual safe, known responses).

# Subs and doms

What happens at the micro level probably also happens at the macro level of overall patterns of neurological activity. At the macro level several patterns may be interacting at the same instant, one pattern alone may become dominant, or there may be a knife-edge scenario with dominance being periodically shared between several patterns. It is also conceptually possible for two patterns to be active at the same instant (even if only one is perceived).

How many times have you heard someone combine two very different emotional reactions "A curious combination of revulsion and attraction", "Love, hate", "Sickly sweet". Perhaps these situations are where one input generates two active patterns at the same instant and where over time neither pattern becomes dominant unless further input (external or internal information) is sought.

Neural networks are therefore hard-wired to "think" in grey, ambiguous terms and the presence of one pattern may mean that almost all other possible pattern combinations also have the potential to exist.

It is probable that some patterns inherently have more "power" or influence within the network because of their spatial positioning. The pre-existence of one pattern may physically block the formation of another pattern. This could perhaps be the mechanism that drives reciprocal inhibition e.g. you can't feel anxious and relaxed at the same time.

# Living in the moment

Biological neural networks are parallel real-time systems. Nothing ever manufactured exists (*in the commercial / public world*) that is even vaguely comparable – ***yet***. The computer used to write this document operates in series. Each of the Windows open on my desktop is given a millisecond or so of processing time, but only one thing is ever done at the same time. *(Systems with parallel processors are able to process e.g. two times one thing at any one time).*

In theory true neural-networks process information in a totally parallel way i.e. at **more or less the same instant. A more probable way for neural nets to operate is in the form of a series of cascading waves of activity similar to waves formations on an ocean or weather patterns. These are examples of chaotic systems where complex trends only become evident with the passage of time. Our own neurological patterns probably obey equally chaotic trend-generating rules!

*(**Unless you buy into the idea of quantum events there will always be delays because of the time it takes for a signal to propagate – or get from one place to another. Setting the subject of 'telepathy' to one side, there may however be quantum-like effects within the brain itself whereby one pattern may trigger another pattern elsewhere without a direct physical link being present, but if it does exist this is likely to be the result of "field" communication rather than a true quantum effect. It is also clearly possible for two patterns to exist independently at the same instant as a result of the same source input. This type of activity is indirect real-time processing).*

This probably means that our reactions to the world around us are less speedy than we perhaps like to imagine. It takes time for the system to accept all available inputs, process raw external / internal data into initial patterns, to then generate a series of cascading, bouncing patterns and for a dominant pattern to then emerge (or not). The speed at which signals are transmitted is approx 130 meters per second, which is slow given that electrons travel almost at the speed of light. So every time we perceive anything at all we have the potential to react or respond in a different way, because each time we react to something we are engaging a very rapid semi-chaotic sequence of loosely associated patterns.

Somewhat more instantly reactive functions also exist in order to protect survival where "thinking" or more complex evaluative processing is not appropriate as such e.g. when stepping out of a road to avoid an oncoming car. In this circumstance the amygdale within the limbic system may very rapidly learn to generate a system wide over-ride by generating an instant stress response when near moving vehicles. This is an example of the modular construction of our brains whereby specific areas of tissue have evolved to perform a specific neurological task

# Stress and learning

When we are faced by danger we are flooded by stress hormones and our ability to perform more complex cognitive tasks reduces (4, 5). Our nervous system is immersed in a hormonal soup that is rich in biochemical broadcast-communications. So when we are stressed we may become more binary, less able to solve complex problems and less able to adapt, even though we are at a different level able to think more rapidly. When in this neurologically inhibited mode it is likely that only the more dominant patterns will be primarily active, or perhaps the role of the recessive patterns is weakened. Either way adaptation or learning may be more difficult.

We are however also able to learn very quickly when very stressed for example that something is dangerous and to be avoided in the future. I would therefore suggest that there is a zone within being "stressed" where for perhaps only a brief period of time learning is accelerated and new patterns can emerge and become dominant very quickly. This probably occurs at the level of primitive patterns in the amygdale as well as in the higher cognitive functions and / or any combination of higher / lower configurations:

- an instant reaction to a stimuli via the limbic system + a strong higher function belief that a stimuli is a threat OR
- a strong higher function belief that a stimuli is a threat + no encoding by the limbic system OR
- encoding by the limbic system + no higher function belief that the stimuli is a threat

No matter what else happens the system will tend to re-stabilise after the threat has passed, although perhaps with a new set of dominant pathways for that stimuli.

However, not all of our learning is done when highly stressed. When we are relaxed there is another window of opportunity for adaptation. But simply being relaxed will not necessarily generate substantial changes in the more dominant patterns and pathways. If this were true being heavily sedated or deep asleep would generate fantastic levels of change – which is clearly not often the case.

# Learning mode V trance states

As mentioned earlier some artificial neural networks learn only when in "training" mode. In the same way perhaps "trance" is our way of entering into the human equivalent of the "training" mode. Trance could be a physio / psychological state whereby the distinction between dominant and recessive pathways / patterns becomes less well defined. This may allow recessive patterns to be become more dominant or allow new dominant patterns to emerge when a series of individually recessive patterns are combined.

In the case of knife-edge balances where several patterns are competing for dominance this could result in spectacular levels of perceived change. In actual fact there may be no change at all as such in terms of new neural patterns being formed. But what will have changed is the balance between pre-existing learnings and in particular which pattern is dominant.

Trance would also be advantageous from a chemical perspective as well – clearly when we are relaxed we generate fewer stress hormones. In turn this provides our neurological systems with a positive chemical environment within which to operate and adapt.

# The unconscious mind

In my view the “unconscious” mind simply the summation of the entire neurological system i.e. both hemispheres and all neurological interactions regardless of location. This would include the dominant patterns, the recessive patterns, patterns in conflict / flux as well as the areas not involved when a group of patterns is active i.e. the space in between the patterns.

I would probably sub-divide the unconscious into two layers upper and lower – with the limbic system / reflex responses allocated to a lower more autonomous level. The conscious mind is simply what we are aware of at any given instant.

When accessing the human “learn” mode via trance we are able to make new associations between neurological patterns and internal/external stimuli (e.g. a feeling / thought or image) within the safety of the imagination.

When therapists trigger recessive patterns frequently e.g. via mental rehearsal they are directly encouraging recessive patterns to become more active. *(Pseudo orientation in time / rehearsal / …).* By engaging relaxation when in the presence of a previously feared stimuli they are perhaps encouraging the recessive patterns to more literally battle for dominance with the patterns responsible for the fear response. *(Systemic desensitisation / anchoring / …).* The results of therapy may mean the recessive patterns become dominant or perhaps enabling a number of patterns to merge into a new, more useful pattern that becomes dominant by default.

When therapists use parts integration techniques (based on the assumption that sometimes during e.g. a trauma a “part” of the psyche becomes dissociated and isolated) - perhaps the isolated part is simply an isolated sequence of patterns that when addressed forms a new sequence that enables the dissociated part to in effect return to the “whole”.

# Conclusion

This paper is designed to provoke thought. My personal feelings in relation to this theory is that part of me loves it, another part is ambivalent and another part again is hungry and wants to go get something to eat. I wonder which part will become domin….

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NB This article has been written as a result of original thought without specific reference to other works apart from those listed – overlap may or may not therefore exist.