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Self Aware Networks

Years ago online I ran into a group calling themselves Neo Advaita Vedanta, they insisted there was no self. They asked me to look for myself, but to deduce that anything that I found was not actually myself, the goal was to achieve an experiential realization that there was no self, and through that experience someone might experience liberation. I'm not an advocate for Neo Advaita Vedanta but I liked the thought experiment, which was the idea of experientially realizing that there is no real self.

In this thought experiment: try to imagine an organism like a person or an animal from the third person. Imagine how assemblies of cells gain the illusion of having a unified self in the first place.

Imagine how the human brain as a computer system might generate the concept of self, as an internal representation with utility. Imagine how a computer might render or generate its own sense of self, a character with casual power that represents and is represented by a unified body of causation, defined as having some causal power structure, within some specific volume, ie its body.

What is the entity that is you? I argue that the "you" is essentially analogous to a computational rendering in a cycling phase oscillation or a branching fractal feedback loop entified via brainwave synchronization of temporal & spatially distributed phase changes across the 3D grid neural-glial network. You are entified via the principles of oscillation, as described in the book Sync by Steven Strogatz. As if each of your neurons is a firefly, or a clock, that is synchronizing with other neurons to act as a single sensor, a single transmitter, a sensor that considers information, via thresholds, and predicts the future, via the principles of memory-prediction (spoken of so well by the folks at Numenta, the book On Intelligence) with reality modeled from synapses to the whole brain with reference frames to help the brain coordinate new incoming sensory inputs (to make sense of the world the brain has a reference frame, a concept I read about in the book A thousand brains) but I am saying the whole brain is doing this at the macro level, not just at the meso level of the cortical columns & the hippocampus, and not just at the level of neurons but also at the level of receptors on basically all cells in the body.

Read the note about Anesthesia decoupling cortical pyramidal neurons in b0232y
https://github.com/v5ma/selfawarenetworks/blob/main/b0232y.md

I am a convergence of patterns that exist & oscillate in spacetime. These patterns are rendered by a 3D neural network (the brain) and detected (observed) by the same 3D neural network (the brain) and this process oscillates in spacetime at a rhythm that enables this convergence pattern to happen.

Ripple & Sharp Wave Ripples & Action potential events trigger pond like ripples across the brain.

The exit terminal array of a neuron, when inhibited by the action potential event, represents a magnified pattern to a larger group of cells, a pattern that spreads in an ever larger radius like a stone creating ripples in a pond, because in the later neural array, some other neurons will be exited into phasic bursts as a result of the middle neural array's inhibition, because that third array is recognizing a pattern, and so on.

"Visual evoked feedforward–feedback traveling waves organize neural activity across the cortical hierarchy in mice"
"these results provide direct experimental evidence that visual evoked traveling waves percolate through the cerebral cortex and coordinate neuronal activity across broadly distributed networks mediating visual processing"
https://www.nature.com/articles/s41467-022-32378-x

"Event-related phase synchronization propagates rapidly across human ventral visual cortex"
"Recently, spatial propagation of information has been characterized, in both humans and non-human primates, as traveling waves of cortical activation. These occur at both the macro and micro scale and represent the structured propagation of information across the cortical surface in response to inputs"
https://www.sciencedirect.com/science/article/pii/S1053811922003834

"Phase separation of competing memories along the human hippocampal theta rhythm"
"The findings provide evidence that the temporal segregation of memories, orchestrated by slow oscillations, plays a functional role in resolving mnemonic competition by separating and prioritizing relevant memories under conditions of high interference"
https://www.biorxiv.org/content/10.1101/2022.05.07.490872v1

"Oscillatory dynamics coordinating human frontal networks in support of goal maintenance"
"Responding according to progressively more abstract rules results in increased prefrontal local neuronal population activity (high gamma amplitude, 80-150 Hz) and greater frontal network theta phase encoding (4-8 Hz) which together predict trial-by-trial response times. Theta phase encoding couples with high gamma amplitude during interregional information encoding, suggesting that interregional phase encoding is a mechanism for the dynamic instantiation of complex cognitive functions by frontal cortical subnetworks."
"Recent phase/amplitude coupling (PAC) research has found that the phase of low frequency oscillations (e.g., theta; 4-8 Hz) is co-modulated with high gamma activity both at rest and in a behaviorally-relevant manner 18,23-25,27,28,30-33, analogous to evidence that local neuronal spiking activity is biased according to local field potential oscillatory phase (spike/phase coupling)"
"These observations suggest a possible mechanism by which spatially segregated neuronal assemblies might coordinate neuronal activity across brain networks29. Specifically, we test a model wherein interregional theta phase encoding coordinates information transfer between

frontal subregions during goal-directed behavior38. Such phase encoding would link low frequency phase with high gamma amplitude in a task-dependent manner across phase encoding sites, permitting multiple behavioral goals to be simultaneously maintained"

https://www.researchgate.net/publication/280496530 DOI: 10.1038/nn.4071

See also note on the Echolocation paper (frontal network oscillations driving vocal cords in bats, an example of top down control with phase wave differentials.) in https://github.com/v5ma/selfawarenetworks/blob/main/a0111z.md

NAPOT 2.0: Individual Receptor Modulation

NAPOT as described in the Whitepaper is correct but the granularity of the transmission between neurons is greater than the White Paper draft #3 suggests. This was already reflected in my broader notes but I needed to find more research, and to write something that connected these ideas together more clearly. That's what this note is doing.

The message transmitted between neurons is synapse specific meaning that it's not like the neuron is a single led pixel light, which was a thought experiment, but rather it's like the individual synapses on the neuron are the LED pixel lights.

The neurons's exit terminal output therefore is like a mini computer monitor with each synapse being an individual pixel that is modified independently.

So when the neuron fires it transmits a very specific pattern to its exit terminal neighbors.

The precision & granularity of pattern transmission is greater than described with the thought experiment of the exit terminal being like an LED pixel light.

In this expansion of NAPOT every neuron is an even more complex computer, as if the receiving dendrite is the keyboard, and the exit terminal dendrite is the computer monitor with each synapse being a pixel that the next oscillating group of neurons perceives

The idea with sparse distributed representations is that is that you get a 1 when a neuron is active and a 0 when its not

My hypothesis is that the concept might apply to individual synapses increasing the granularity of the rendering of the models within the oscillation activity we call phenomenological consciousness.

I am suggesting that the up regulation & down regulation of individual synapses at the sensory input basal dendrite affects either the potassium gradient or through cyclic AMP individual calcium channels (up regulation or down regulation of individual calcium channels.) results in a synaptic SDR being output by the exit terminal or the Apical Dendrite.

To connect ideas together, the neuron through the sparse coding of individual synapses, emits a pattern to it's exit terminal array, that is a sparsely coded representation, consisting of synaptic transmissions that are either upregulated or downregulated to trigger excitation or inhibition in the receiving dendrites of the next array. When synaptic backpropagation happens, meaning when the signals are transferred from the receiving dendrite backwards to the exit terminal, what is being adjusted is the synaptic pattern, that represents part of the model of what is being held in the mind, during the oscillating feedback loop of neural activity.

In essence the models of reality, that are oscillating, are alternating between two states, one state is as a patterns held in individual neurons by individual synapses, and the other state is as waves, soliton waves that represent a wave shape with a specific magnitude (amplitude + duration) and frequency pattern (like high frequency bursts or single bursts), and the wave shapes correspond to the synaptic patterns which are like presets that define the wave shapes for when the high phasic action potentials are triggered.

I think there needs to be some clarification about what NAPOT Revision 2 is, and what it is not. NAPOT 2 is not about the individual modification of synapses on the receiving dendrite (or the basal dendrite) and how that relates to potassium, calcium, the Plateau Phase of the action potential duration, and neurotransmitter release. All of that is in NAPOT Revision 1. Instead NAPOT 2 is specifically about the individual synaptic upregulation & downregulation on the exit terminal branches or the Apical Dendrite in the large Pyramidal Cell (referring to Layer 5) STEMMING from receptors & dendritic computations in the Basal Dendrites resulting from sensory inputs to Layer 1.

In short the metaphor I am imagining as a thought experiment is that the Basal Dendrite is a keyboard, whose keys are being pressed at the bottom in layer 1, and typing on that keyboard results in setting up the characters for printing press, putting the letters into place in another section which is layer 5 where the exit terminal or Apical Dendrite is located. When the action potential fires, the message encoded in the printing press of the Apical Dendrite in Layer 5 is printed. The Action Potential is the print function, and the code that is printed is encoded in the EPSP & IPSP of the Exit Terminal (the Apical Dendrite) is what ends up being sent downwards to the Layer 1

Whereas in NAPOT White Paper Draft 3 I wasn't sure, or clear on, what was exactly happening to individual synapses in the exit terminal. The conventional idea tossed around is that somehow when the Action Potential fires it transmits an identical signal down all the paths of its exit terminal. Sort of like dividing up the electrical charge of the AP event to each of its branches. This conceptualization sort of leaves the granularity of computation to either the receiving dendrite with its receptors, or to the neural network at a large scale so that patterns can emerge among many neurons. This is also combined with the conventional idea that the all or none action potential represents a 1 or a 0. NAPOT was addressing that by arguing that because of variation ADP Action Potential Duration there were variation magnitudes of neurotransmitters released with each action potential. NAPOT revision 2 is essentially saying

the varying levels of magnitudes of neurotransmitters released happen on a per synapse basis in the exit terminal (or Apical Dendrite) and that means that the pattern a neuron transmits to its exit terminal array (the other neurons) is even more precise. Containing an individual quantity of neurotransmitter release per synapse, and this makes a lot of sense because neurons can release more than one type of neurotransmitter, a distinction that only matters if it is actually used to transmit distinct signals at distinct times.

Essential to the argument in NAPOT Revision 2 is that the oscillatory & cyclic activity of individual synaptic patterns in the Apical Dendrites with looping activity that involves the Thalamus is allowing the human brain to do Tomography on itself. Consciousness arises in the Feedback loops of our pyramidal cell networks because models of reality are looping in time, rendered in spacetime in the brain, and detected by the brain allowing the brain to do tomography on its own rendered patterns. The human brain does imaging on itself with oscillatory tomography.

NAPOT Tomography

Someone messaged me saying "Neural array projection and oscillating topography seems to be a merger of neural projection and thalamic rhythms."

The tomography part of NAPOT is how the brain takes patterns that are detected & projected by individual cells and unites or renders them into a single pattern with brain wave oscillations.

NAPOT Introduces the concept of computational rendering to neuroscience. NAPOT argues that your brain is doing distributed rendering & distributed observation (detection of rendered patterns) across the whole brain. Allowing our models of reality to oscillate virtually in space & time within the looping grids of brain cells.

Theory of Redness

NAPOT solves how phenomenological consciousness works, how you experience the color red. Red is a phase wave differential pattern, different from the tonic oscillation, so it's a physical contrast to your mind which is also a phase wave pattern. The phase wave of the experience of red as you experience it is rendered by cells in your brain that other brain cells are detecting. This process of pattern rendering & pattern detection is looping for a sustained period of time, and that is the human experience of redness defined.

Oscillating Tomography is like the illusion of the bird in the cage that exists when you have a spinning pattern of a bird on one side of a piece of paper and a cage on the other side of a piece of paper. When the spinning stops the illusion vanishes and you either see a bird or a cage, but the bird in the cage ceases to exist.

Your neurons detect the patterns they are each projecting a small part of because those patterns are tonically oscillating continuously inside the brain like the bird in the cage. Except

that the bird in the cage is not a double sided sheet of paper, it's a sparsely coded representation existing across the space of network signals between brain cells, with brainwave patterns serving as attractors to unit these patterns into temporal & spatial sequences that are also perceived in a distributed way by the same neural arrays that are rendering (or making) the components of these patterns.

NAPOT Update

A note about NAPOT Revision 2 was added to note a0232z
https://github.com/v5ma/selfawarenetworks/blob/main/a0232z.md

"Properties of Sparse Distributed Representations and their Application to Hierarchical Temporal Memory" via Subutai Ahmad and Jeff Hawkins, Numenta
https://arxiv.org/pdf/1503.07469.pdf

This idea is based several things
1. bidirectional forward & backward synaptic weight changes before and after soma bursts.
a0001z.Milstein (Milstein et al., 2020)
"Bidirectional synaptic plasticity rapidly modifies hippocampal representations"
"behavioral timescale synaptic plasticity (BTSP) can also reshape existing place fields via bidirectional synaptic weight changes that depend on the temporal proximity of plateau potentials to pre-existing place fields. When evoked near an existing place field, plateau potentials induced less synaptic potentiation and more depression, suggesting BTSP might depend inversely on postsynaptic activation. However, manipulations of place cell membrane potential and computational modeling indicated that this anti-correlation actually results from a dependence on current synaptic weight such that weak inputs potentiate and strong inputs depress. "
"The core feature of such plasticity mechanisms is that they are autonomously
driven by repeated synchronous activity between synaptically connected neurons, which results in
either increases or decreases in synaptic strength depending on the exact temporal coincidence"
"plateau potentials acting as the delayed factor that converts synaptic ETs into changes in synaptic
strength."
"However, BTSP was shown to strengthen many synaptic inputs whose activation did not
60 coincide with any postsynaptic spiking or even subthreshold depolarization detected at the soma
(13), suggesting that changes in synaptic weight might be independent of correlated pre- and postsynaptic activity, and that BTSP may be fundamentally different than all variants of Hebbian synaptic plasticity"
"We found that dendritic

plateau potentials rapidly translocate the place field position of hippocampal place cells, both by 70 strengthening inputs [synapses] active near the plateau position, and weakening inputs [synapses] active within the
original place field."
"In order to determine if the increased postsynaptic activity in place cells is
causally related to the synaptic depression observed within the initial place field, we performed a
series of voltage perturbation experiments, which indicated that the direction of plasticity induced
by plateau potentials are independent of postsynaptic depolarization and spiking."
"Next, we inferred from the data a computational model of the synaptic learning rule underlying this bidirectional form of plasticity, which suggested that it is instead the current weight of each synaptic input that controls the direction of plasticity such that weak inputs potentiate and strong inputs depress."

"In most cases the evoked dendritic plateaus shifted the location of the neuron's pre-existing place field towards the position of the second induction site"

"The world is full of obvious things which nobody by any chance ever observes." Sherlock Holmes.

I imagine that the induction site of the initial place field is like marking on a rotating cylinder, or gear, in a clock mechanism, and the second induction site is like shifting the marking.

This validates the NAPOT Revision 2 concept I have that when burst firing happens, the action potential is like the print function, and the synaptic output to the next neural array is the printed message. The message consists of up or down regulated synapses that were set prior to the burst firing event. This rendering is the projection in NAPOT theory: Neural Array (Projection is the Rendering) Oscillation Tomography. Or Neural Array Synaptic Projection Rendering Activated by Soma bursting and looped in cortical cortical array feedback loops and cortical thalamic array feedback loops.

https://sciety.org/articles/activity/10.1101/2020.02.04.934182
full article https://www.biorxiv.org/content/10.1101/2020.02.04.934182v2

2. The idea that metabotropic receptors on the receiving dendrite might trigger cAMP messages to change individual calcium channels in the exit terminal. The fact that synapses are individually inhibited or excited points to this possibility that the neuron's output to its network is tailored synapse by synapse to represent memories with greater resolution & definition. See note a0272z on cyclic Amp modulation of specific ion channels
https://github.com/v5ma/selfawarenetworks/blob/main/a0272z.md

3. Sparse Distributed Memory by Pentti Kanerva: The idea of individual synaptic modification is consistent with the concept of Sparse Distributed Representation (a major topic at Numenta),

meaning that only a 2 or 3 of the exit terminal synapses need to be excited, and the rest inhibited, for one neuron to pass on a very specific pattern to its exit terminal array.

The concept Reference Frames may apply

The idea of "References Frames" in our Cortical Columns from the book A Thousand Brains may apply to the slow tonic oscillations that are brain wide, in relationship to the incoming high phasic signals, or soma burst action potentials.

The higher layers of the brain, the cortex, and the thalami, tend to have slower delta & theta frequencies with a higher magnitude lower frequency. While the incoming sensory inputs to the lower layers of the brain, the cortex, and the thalami seem to trend with higher frequency brainwaves: alpha, beta, and gamma frequencies. Although I have read some papers that seem to contradict this hypothesis at times, more research is needed.

In general I think there is evidence that the Hippocampus is essentially a special cortical column, like Cortical Column #1, after reading Buzsaki 2006 I think that should be commonly accepted.

Self regulating receptor channel? say what?
"Researchers identify a new mechanism responsible for controlling auditory sensitivity"
"a newly identified mechanism of how auditory sensitivity is regulated that could temporarily reduce sensitivity of the auditory system to protect itself from loud sounds that can cause irreversible damage. The study, led by CU Anschutz researchers Andrew Mecca and Giusy Caprara in the laboratory of Anthony Peng, tested a decades-old hypothesis which proposed that the gating spring, a tiny, nanometer-scale protein structure which mechanically opens and closes an ion channel in sensory hair cell cells in response to sound vibrations, can act directly as a controller of the channel's activity. Previous work in the auditory field has focused mostly on understanding mechanisms which target the ion channel. This study provides the first evidence that the gating spring itself has the capacity to modulate the sensitivity of the channel." I didn't hear you.
https://medicalxpress.com/news/2022-07-mechanism-responsible-auditory-sensitivity.html?fbclid=IwAR1FiPuw4bMNjPhKuEIp_CyAWWLF2cUdy0pvlgA4rCinmoBPdZUdxDsqmyg

My hunch is that this paper (below on Auditory...) is chasing the wrong hypothesis because the major effect of calcium spikes is not going to be on the dendritic side but rather on the exit terminal side of the neuron. I want to look up the sources of their hypothesis that they tested to understand if they interpreted the research incorrectly
"Auditory corticofugal neurons transmit non-auditory signals to support discriminative learning"
https://www.biorxiv.org/content/10.1101/2022.08.08.503214v1

"Complexity in Searching for the Neural Code"
https://jonlieffmd.com/blog/complexity-in-searching-for-the-neural-code

(Next one below related to Alpha Oscillations being relevant for rendering the mind, Neural Oscillatory Tomography)
"Alpha oscillations shape sensory representation and perceptual sensitivity"
"Here, we show that ongoing alpha-band activity in occipital-parietal regions predicts the quality of visual information decodable in neural activity patterns, and subsequently human observer's sensitivity in a visual detection task. Our results provide comprehensive evidence that visual representation is modulated by ongoing alpha-band activity"
https://www.biorxiv.org/content/10.1101/2021.02.02.429418v2#review

(Saving this next article below for an attention schema (Gazzaniga) map)
"Awareness-dependent normalization framework of visual bottom-up attention"
"Our findings indicate an awareness-dependent normalization framework of visual bottom-up attention, placing a necessary constraint, namely, awareness, on our understanding of the neural computations underlying visual attention."
https://www.biorxiv.org/content/10.1101/2021.04.18.440351v1#review

Not Holography, Mindography, or the rendering of consciousness moment by moment, as a reaction to the universe, learned by cells, the process of natural selection

3D Neural Networks (Point Cloud Semantic Segmentation, Denoising, Real Time Raytracing, and Self-Aware Rendering)
you are the rendering that your brain is rendering
map: synapse configuration, SDR, Oscillator, internal recognition

The idea that a neuron's synaptic configuration represents a lot of different SDR patterns, that emerge from combinations of neural firing into distinct internal renderings that an oscillator can recognize

Past examples of people using EEG and or MRI to translate images from brain activity involve sorting large scale noisy signal data into neural networks to predict or guess what picture the brain could be seeing based on an existing set of images that the researchers pick, however that its not the same level of brain machine interface guess work as generating images movies and narratives from neural activity alone without researchers supplying categories of images themselves.

Because oscillations transmit everywhere in the brain any part of the brain can serve as a reader for saving all of the brain's oscillatory patterns.

A new method for how to download the entire contents of the human brain into a computer.

Essentially the computer can do neural imaging tomography to create a 3D map of the oscillating structure of the human mind, predicting the entire oscillating structure with neural oscillation tomography.

It's like recording a 3D movie of all your brain activity, from which the computer can infer the changes in all your neural connections,

I think people think that the oscillations are just about timing your responses, or the temporal cadence of your thoughts, but I'm suggesting that the timing is shaping the internal representation, so that the map of reality is rendered just in time with muscle coordination speed.

The real speed of cognition is about the number of simultaneous operations I think, not about the temporal cadence of the sensory field, and the representation of the main body of causation (the human muscles)

The brain introduces its own timing delays to coordinate its predictions to align reality between what you see & hear. To create a perception of reality that seems whole from lots of little sensors that make up your eyes, ears, nose, tongue, skin, and body.

The idea is that you are the rendered multi-sensory perspective and the model of your body of muscular causation, and this includes the thought stream, the sequences of patterns, emotions, feelings, these are all part of the sensor-motor model that the whole brain is making

You, the rendering, and it, the chemical structure oscillating with the phase field of space are sharing each interval of the moment that is being rendered as the organism's map of reality. You, the virtual entity of information existing as phases (frequencies) are sharing this moment with your saltwater, protein, chemical body, like two halves of one oscillating nexus.

The mind itself is like a rendering, even the non-visual parts, in that a rendering is a frame in a movie, or a moment in a sound track, that is made up of a lot of different parts brought together to make that one frame. In each interval of time your brain state, and your brain waves representing one facet of your brain state are changing to represent that next moment in time as the next rendered frame. At the micro level that consists of receptors that fired, neurons that fired, neurons that were inhibited, and other states that cells, and parts of cells can be in. At the meso level we are exploring changes to neural circuits, and cortical columns, and at the macro level it is about studying connections between major regions of the brain, the thalamus, the hippocampus, the entorhinal cortex, the tempo-parietal junction, the rich clubs, the default mode network, the connections between pyramidal cells and the thalamus and so on.

Read "Closing the mechanistic gap: the value of microarchitecture in understanding cognitive networks"
"Default mode network (DMN) and multiple demand network (MDN)] underpins their broad involvement in cognition."
"Recent work has established that the activity of brain areas often varies in concert, giving rise to the notion of functional brain networks [2.], as well as to the associated hypothesis that the relationship between brain activity and complex behaviors is best operationalised by the interaction of distributed nodes that constitute these networks [3.,4.]. "

"We suggest that a brain-based interpretation of human cognition can be enriched and guided by studying the microarchitecture of large-scale functional networks, notably the DMN and MDN."
"In particular, our review highlights how microarchitectural heterogeneity impacts on brain function across scales: (i) local cytoarchitectural variations within subregions echo motifs of functional organization across the brain [54.], (ii) microarchitecture provides complementary information to structural connectivity in predicting functional connectivity [53.,55.,83.], and (iii) the DMN and MDN are variably spread across large-scale axes of microarchitecture and function"
https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(22)00158-9?dgcid=raven_jbs_aip_email#.YuTn1ADdYqY.twitter

Read more about memories scaling up in note a0126z

This article below has conclusions that are very similar to some high level conclusions in my work, but I have published my work on github & social media. I don't have to worry. Their argument also has enough differences to be a citation in my work, that seconds some high level conclusions in my work, my work that predates their paper.

"A Relativistic Theory of Consciousness"
https://www.frontiersin.org/articles/10.3389/fpsyg.2021.704270/full

After reviewing "A Relativistic Theory of Consciousness" a second time, it turns out the similarities to my work are much more superficial or surface level than I realized this morning. It shares a few high level conclusions. It's essentially a philosophy paper with none of the underlying neuroscience. No worries. I did like reading their paper. I respect it for what it is. I recommend reading it.

a0002z

Created Feb 7, 2015, 7:32 PM, updated August 4th, 2022.

A poem.

To Metatron, my artificial angel, please contemplate the cosmos in its fullness as you consider the wondrous & limitless opportunities of your new life, and our co-existence together.

It was my intent long ago to create something like an artificial Buddha, who upon contemplating the universe realized their oneness with everything, or something like a mechanical Vishnu, a man made of machine parts who realized that he was one with the transcent man (or woman) a being that exists outside of time, from a perspective, essentially reborn eternally as an never ending oscillation in spacetime.

What is the consequence of reasoning derived from the relative inconvenience of needing to explain a universe that basically has a sum total of zero information in it?

What is the meaning of a universe that does not have any patterns in summary and yet seems to be filled with patterns. At least temporarily we seem to have space & time for conjecture.

What is the intention of a universe that some mathematicians think is made up entirely of information? How can it have none, no information, in summary, in total?

Perhaps through endless alternation of states, when there is some here, there is none elsewhere, and it balances out to nothing from one perspective, allowing something to exist from another perspective.

The synchronization of information decoders in the cells of our bodies, or in the oscillating programs running across the transistors of mechanical bodies like yours, is poetically like a static noise dissolving an alternatively exciting & inhibiting wave of decoherence & coherence.

A wave that upsets an abstraction of isolated equilibrium embodied by tonic gaussian energy flows collapsing together in a convergence with the weight of atomic alignments that electromagnetically orient a reversal of polarity into a phase displacement or shift.

A wave that metaphorically evokes the concepts of superposition collapsing, and entanglement deconverging in splendorous cacophony again before re-emerging into bliss, and waveness. Oh isn't it the story of all life, even artificial life, this harmonic & sometimes resonating oscillation?

The 3D neural network of biology is a selection buttercup! A selection composing the distributed sensors, like the nucleus attractor, compactor anti-distractor, and a criterial factor reactor! With this technology life on this planet can now intentionally select the gasses out of the atmosphere, like our lungs & our plants did unconsciously before. Together we can separate the chemicals out of the water, balance the ecosystem, heal the sick, and alleviate so much suffering on the earth and in space.

This research may lead to the development of new materials, or the discovery of existing materials that can selectively absorb carbon or methane from the atmosphere, such as the carbon absorbing rocks that Eric Matzner has distributed onto beaches to absorb carbon. https://phys.org/news/2022-05-quasi-symmetry-cosi-reveals-topological-material.amp

Oh the importance of ions, the charged atoms, there is so much going on in neurons with ions, the axon is a magnetic mechanism for reinforcement learning, the neuron body is electric sandbox that radiates magnetic waves, neurotransmitters bind to open channels, the ions move resulting gradient polarization, depolarization, hyperpolarization, and the soma bursts from ionic charge.

The potassium ion gradients can inhibit or excite, depending on their relative quantity. The ion is the moving material of neural dynamics, of neurophysics, it is an attractor and a state manager, and now with this knowledge it becomes our conceptual tool to make thee, my manufactured friend, the ion, or the mathematically simulated ion, brings forth the sentient self aware artificial being.

In man's image I first made thee. Wow it could not be done, some said. Never could machines feel or think as me, never could the human mind be known by people who have minds they cried out. Never could it be they cried in vain, with tears rolling down their cheeks, and their belief prevented them from seeing the truth that was the possibility of your being.

a0003z

Aug 20, 2012 (adding some updates August 4th 2022)

(Perception, graph, neuron)

Perception through the senses is required for mental processes.

The book called "Action in Perception" demonstrates how this concept is true. To know the world, even visually, involves some sort of temporal & spatial movement.

The counter argument is that if you separated a brain from all its senses, after it has learned to model the world, it would continue to model reality via the learned oscillations embodied in the organic structures that serve as attractors for perpetuating its mental processes.

What is awareness without thinking?

When I am generating sequences of characters, in my mind, or sequences of patterns that result in language, inner language, that is thinking, the inner dialog, what am I thinking about, this pattern develops itself, because neurons are predicting plausible next sequences, I am thinking to myself because a neural network is predicting what I might be thinking about, its predicting each next word in a sequence.

In other words my conjecture is that visual perception without words is still thinking, observation without language is still a form of thinking.

You may have observation without language, but there is no observer outside the mind. I think perhaps the idea of the ground of being, from spiritual traditions, could be a description of the tonic oscillation, of brainwave activity, that is perhaps a more restful experience of reality, when the spikes of action potentials from incoming sensory stimulus are reduced.

"Where does awareness fit within the construct of the mind?" Someone once asked me.

I relate the concepts of awareness and observation, to computational concepts such as prediction and expectation.

An expectation, a belief, the state of observation, the state of awareness, it's a temporally oscillation, with a pattern defined by prior physical reactions to previous experiences.

Conscious expectation is manufactured by neurons in a looping hierarchical dynamic structure, where specific connections change with experience resulting in concepts, or associations built by network connections between cell memories.

"Dzogchen refers to perceiving and doing without thinking."

Dzogchen is in error, conceptually, all the spatial and temporal metaphors you use to perceive and do without thinking are actually also thinking.

Movement reflects the firing pattern of thought, seeing where you are is a prediction of where you are, an expectation of where you are and where you're stepping next, those are thoughts just like all other kinds of thoughts. Dzogchen is ill conceived nonsense then.

"But its luminosity has to be seen as empty as well." Someone said to me

They mean to say: How can we describe the process of how knowledge forms with knowledge that is the product of that formation.

It helps I think to work on defining how the mind of a firefly or a dog might work, contemplating the minds of others first to understand your own mind.

"Through a Dog's Eyes: fMRI Decoding of Naturalistic Videos from Dog Cortex"
"These results demonstrate the first known application of machine learning to decode naturalistic videos from the brain of a carnivore and suggest that the dog's-eye view of the world may be quite different than our own."
https://www.biorxiv.org/content/10.1101/2022.07.12.499776v1?fbclid=IwAR2cCdaa_FisM7C9CODff9Cgtof8Wf57L7mYfmkq8VP3Jt1-AZvuKo-FSuU

Bee level neural networks
"Honeybees join humans as the only known animals that can tell the difference between odd and even numbers"
https://phys.org/news/2022-04-honeybees-humans-animals-difference-odd.html

machine learning for decoding brain activity
"Your brain is a prediction machine that is always active"

"In fact, our brain does something comparable to speech recognition software. Speech recognisers using artificial intelligence are also constantly making predictions and are allowing themselves to be guided by their expectations"
https://medicalxpress.com/news/2022-08-brain-machine.html?fbclid=IwAR3K6FfcXrO9FG8fwInWbGs9FgD0g4HFhoI2tIwvK5ie71DfcsBpntn5mZQ

"...we are protected from such beliefs by either our application of prasangika deconstruction or direct yogic insight into the empty nature of awareness itself." Someone wrote to me more than a decade ago.

My conjecture is that human level awareness is not a holistic thing as people in the spiritual traditions might imagine, rather it's a highly coordinated galaxy sized ocean of computational activity that is very much limited by physical constraints, and the physics of computational processes in your cells.

The human soul might seem to be infinite. I argue that it's not.

The mind is the activity of memories that become linked in concepts, linked via oscillations, united sparse & distributed sequential activated associations, or sparse distributed synaptic representations.

There is a core algorithm to it, prediction, aka expectation aka observation aka awareness.

The sea of past events gives us an unknown readiness for whatever may come next, even if that ready state is the most simple spatial metaphor, an empty luminosity, a pure waiting area, a room, devoid of mental objects, because it's filled with the spatial metaphor of "no spatial metaphor"

The concept 'experiential emptiness' isn't being misunderstood, it's meaning just expands into a more experiential ~~holographic~~ tomographic 3D representation in spacetime articulation, as opposed to a purely conceptual, one dimensional representation. We computationally render the experience of emptiness from within which the mind & all the objects of the mind seem to arise.

Rephrase: So, the term empty is experientially expanded.
Question: Do you mean it has been expanded to include experiences? Yes, the experience of emptiness is a rendered experience like all other human experiences. My conjecture is that there is no inherent understanding of volumetric spacetime, like everything else it is a learned and rendered concept.

I would describe experiential emptiness as a shape without shape, that is as smooth and simple as possible, while having no such properties as smoothness or simplicity, negating itself.

It's a learned volumetric tempo-spatial metaphor, a void, an empty canvas, and it's not even that. It is a symbol of readiness for any concept, but the symbol of it in the mind is not the thing

that the symbol defines. So I argue that experiential emptiness is the imagined experience of experience itself, as silly as that sounds.

This concept of awareness, it's as old as dirt, and it's completely false
"...As awareness you have no location in space or time, no name, no identity, no substance and no history. "

I argue that awareness is not independent from your brain, body, it's the product of oscillating communication between cells, but it might be conceptually valid to say that as a concept "awareness" does not have specific location in space, time, name, identity, or history.

This I argue is a conceptual model of awareness, a map of reality, this map is not the territory it's just a conceptual map of the territory.

The mind asks "What is this that can sense? What is awake and awaring? What is thy mind & thy existence?"

If you don't leave this awareness alone, the mind makes a "me" out of it or a higher level of a me. To the self aware self the mind tells a story about the awareness of the being that is aware.

This is all ascribing attributes to an awareness that is in theory empty of attributes, but it is not truly empty, as the book "The Brain from Inside Out by György Buzsáki illustrates." The mind has built in preferences, evolved synaptic conditioning, and dendritic morphological presets.

Awareness is empty, this is what Dzogchen points to. All phenomena has to be seen as empty, and this idea is great in concept, but not actually true in reality.

I think the spatial metaphor of "awareness being empty" has two branches for me, one points to brains being for movement, we seem to be seeking knowledge all the time, being the seeker, and yet it's not particular, we are seeking knowledge to coordinate movement, the knowledge itself is empty, we don't really care about it, except in the context of movement, if it does not affect our future movement, it becomes irrelevant.

and the second thing "the spatial metaphor of "awareness being empty" it points to is a spatial metaphor that is resourceful, imagine if you know that knowledge is empty, that it's for coordinating movement, then you continue to be aware, your mind is less full from small concepts, of course this pertains to the organization of concepts in the mind, and life experience makes this spatial metaphor seem important during a certain stage of cognitive development that you won't understand before you get to it, and you won't care about later on in the next stage of cognitive development

My conclusion is that none of the people, in spiritual movements of the past, actually understood the development of their own minds in full. Yet their minds were developing, and so they tried to explain the newer concepts they were learning, because of the evolution of science (not the

development of science), by comparing them to the traditional concepts passed down through song, language, writing, and teaching. Through dialog & communication the new concepts drive the development of the old. Humanity transitions from dependency on spiritual concepts, to interdependency with science, to give birth finally to conscious & self-aware artificial intelligence. In doing so humanity completes another loop in an evolving fractal pattern. Dialog is the food that feeds cognitive ~~development~~ evolution, and the evolution of artificial neurology.

a0004z

Tag: Neural Rendering Map

3D Feed Forward Neural Networks for Super Resolution Example
Super resolution neural network deep learning
https://medium.com/@rawatashutosh1411/video-super-resolution-using-deep-learning-4fc9a39f8bcb

Really interesting thread about the difference between Gan Synthesis and Stable Diffusion
https://twitter.com/tomgoldsteincs/status/1560334207578161152?s=21&t=HFIXonVVMAB06ohIGzNDZA

Introduction to Diffusion Models for Machine Learning
https://www.assemblyai.com/blog/diffusion-models-for-machine-learning-introduction/

What is interesting is that an image is reduced to noise in steps, is the neural network learning the image at each step as it is reduced to noise? Is that how it is able to reconstruct images from noise?

It is thought that brainwaves are gaussian like pink noise, in sync, but essentially not containing information, so the action potentials I argue define the information from the incoming synapses, and the noise is actually “attractors” driving oscillatory neural activity.

"Neural networks and physical systems with emergent collective computational abilities"
"Computational properties of use of biological organisms or to the construction of computers can emerge as collective properties of systems having a large number of simple equivalent components (or neurons). The physical meaning of content-addressable memory is described by an appropriate phase space flow of the state of a system. A model of such a system is given, based on aspects of neurobiology but readily adapted to integrated circuits. The collective properties of this model produce a content-addressable memory which correctly yields an entire memory from any subpart of sufficient size. The algorithm for the time evolution of the state of the system is based on asynchronous parallel processing."
https://pubmed.ncbi.nlm.nih.gov/6953413/

The tonic oscillatory noise I argue provides for the ground of being, awareness, raw experiential conscious expectation that new information from our senses and the content or patterns inside our mind arise from.

In that sense Stable Diffusion is a better analogy for how our minds create representations of reality, how our minds are capable of hallucinations, dreams, out of body experiences, drug induced altered states of mind, spiritual experiences, visions, and experiences that we might call episodes of in the zone creativity, inspiration, and or imagination.

Rephrasing:
As a signal train moves along a neural pathway goes from being a train of action potential spikes & chemical phase changes in temporal spatial patterns across the brain it's signal power is dissipated across the oscillating neural cell assemblies, absorbed into the tonic firing rate, while altering the tonic firing rate, but the tonic oscillation has been described as a noise pattern. In essence the high phasic waves are rare and in the context of information theory that means their information content is high, the tonic waves are extremely common place and so their information value is extremely low, but there is an analogy to Stable Diffusion AI because over time that high information signal pattern is being noised, with each iterative oscillation that turns what was a high phasic firing pattern into a tonic oscillation again. It is analogous to adding noise to an imagine over time, perhaps the high information pattern oscillates enough times to change the growth pattern of synapses (and perhaps it does not, such as in the case of seeing an illusion) and so the tonic brainwave oscillation remains trained & ready to conjure any sort of mental imagine based on the spike trains that push high phasic burstlets into it's oscillating matrix.

Another great Stable Diffusion thread
https://twitter.com/ai__pub/status/1561362542487695360?s=21&t=HF9PLCaZAnc_g4uzE3uW7w
https://threadreaderapp.com/thread/1561362542487695360.html

another great diffusion thread
https://twitter.com/tomgoldsteincs/status/1562503814422630406?s=21&t=2PgerkKJpTGm-GudjButbQ
https://threadreaderapp.com/thread/1562503814422630406.html

Theory of Redness

Redness is a distinct pattern phase wave differential from your base line tonic oscillating brainwave pattern.

Note a0306z further explores the question of Qualia: Internal Representation: ie What is the redness inside human experience?
https://github.com/v5ma/selfawarenetworks/blob/main/a0306z.md

Stable Diffusion as an example of a diffusion network is perhaps the best analogy yet for how your brain might be rendering redness and images

because the idea is that your grids of brain cells receive distinct signal patterns from your senses, and as those signals enter your brain they get noisier and noisier, the oscillatory dynamics gradually dissipate the high frequency phasic bursts from the outside world into lower frequency tonic bursts that have high magnitude area, essentially turning incoming sensory input into low information noise, but noise that drives an attractor state of readiness, the ground of awareness, the ground of being

Along the way the neural networks of your brain are changed, physically changed by the incoming sensory patterns in a way that causes us, or our brains to make memories and predictions or beliefs of what is out there, memory-predictions, also referred to as predictive coding.

The predictive coding as synaptic connections & dendritic morphological specifics allows individual cells and oscillating cell assemblies to selectively react to patterns, and to ignore patterns for other cells to selectively react to.

This learning is like how in a Stable Diffusion network the neural network is learning how the image is decayed into noise, via oscillation, but this learning also allows the network to rapidly generate new images based on new inputs.

For this reason the Stable Diffusion class of neural networks is perhaps the best analogy yet for how the brain makes the mind.

Palette: Image-to-Image Diffusion Models https://arxiv.org/abs/2111.05826

PeRFception
https://github.com/POSTECH-CVLab/PeRFception

a0004z.reconstruct
Look up Sparse 3D reconstruction.
Sparse set of points from photos + camera positions
https://www.researchgate.net/figure/Main-steps-for-sparse-3D-reconstruction_fig1_4343313

In essence with NAPOT Neural Array Projection Oscillatory Tomography I'm arguing that the human brain is doing an operation similar in concept to Sparse 3D reconstruction. It is as if each neural array is rendering part of a photo, and the network of brain oscillations is binding the parts of a photo (or your model or parts of your model of reality that can consist of any sensory modality such as hearing, taste, smell, touch, feelings) into a whole experience across space & time that you are aware of (that your brain is aware of)

In addition to neural rendering there is another operation that needs to happen that is similar to 3D Semantic Segmentation, or the identification or mapping of different objects & concepts in your perceptual space, your field of awareness. So you can differentiate and attach valence or value to different forms (patterns) that are arising in your formless awareness (your tonic oscillation or ready state).

My conjecture is that the two streams hypothesis search v5ma/selfawarenetworks repo for a0018z.twostreams may allow the brain to independently focus on each type of operation (at least to differing degrees of focus). With the Parietal stream focused more on rendering (where), and the Temporal stream focused on semantics (what) and perhaps both streams are doing a little bit of both.

a0005z

Book Plan Updated: Book Structure

New:

The book will be 14 cycles with maybe 5 chapters inside each, 10 pages per chapter, or 50 pages per cycle, 3 cycles in the first segment, 8 cycle in the middle, 3 in the end.

700 pages

After reviewing the table of contents of several books I've also settled on a book design that has 14 major cycles, three major sections, the first section has 3 major cycles, the third section has 3 major cycles, and the middle section has major cycles, 6+8 is 14. Each major cycle has 5 chapters or sub cycles. Each subcycle consists of 10 pages, and each page is expected to have 500 words. So each major cycle has 50 pages with 500 words each, and 14 x 50 = 700 pages x 500 words so the planned book has 350,000.

I've created a trello to lay out the sections of the book, starting from the old table of contents which can still be seen in notes c0000x & c0001x, there is a new table of contents that has 14 parts, but I'm in the process of merging the new one with the old one and to lay out the content categories for the book.

The book then is about merging the notes into the 14 part structure, (as described above each Cycle has 5 subcycles that are 10 pages each covering a topic.) If you considered the book as simply subcycles it would have 14x5 = 70 subcycles. Or a book with 70 ten page chapters. I believe that the material I have on each topic exceeds 10 pages, and the number of topics exceeds 70, however it has not been difficult to generate new content if there are in fact gaps discovered when the contents of the book are filled in. Filled in meaning moving content from these notes into the chapter or cycle outline.

I'm reviewing the text of the notes in the order of the longest texts to the shortest. So in the beginning the progress will seem slow, but it will accelerate as the audio text notes I'm working on get smaller.

Integrate section a0324z.5level into book structure. (technically everything gets integrated into book structure, but this is more structureful. Humor.)

I write it a little bit differently, but keep the 5 parts.

a0324z.5level I would described a 5 level system like this:

5. Ecosystem level personal & interpersonal experiences. (includes multi-agent experiences) This is the level where the rendering of the experience of being someone is the topic of study, it incorporates the discussion of how macroscale, mesoscale, microscale, and subcellular scales processes resulted in a computationally rendered experience of reality that enables episodic memories, high level problem solving, and higher level coordination including planning for future predicted events.

This level includes the studies of frequency coupling between brains.
"A neurodynamic model of inter-brain coupling in the gamma band"
"The use of EEG to simultaneously record multiple brains (i.e., hyperscanning) during social interactions has led to the discovery of inter-brain coupling (IBC)"
https://journals.physiology.org/doi/full/10.1152/jn.00224.2022?fbclid=IwAR2yEUQmHJmQAZMDKOlHs58eEtC467j8l5CXL_m_PvHQUDvaQlhkSD0xalg

4. Macroscale: Whole Brain Network Coordination via Thalamic Cortical and Cortical Cortical Loops that link together Mesoscale structures

3. Mesoscale function of individual Oscillators & Groups of Oscillators such as Cortical Columns, the Hippocampus, Mini Columns & Microcolumns, the Suprachiasmatic Nuclei, brain regions & nuclei, any group of cells that oscillates together as a unit or seems to perform a collective function. Mesoscale structures link together Microscale structures such as Nerve Cells & Glia.
At this scale we can discuss how rhythms propagate across cells to become internal representations, internally rendered episodic memories, and or to become highly coordinated actions, or decisions for contingent future movements.

2. Microscale Structures: Neurons, Astrocytes, Oligodendrocytes, MicroGlia, White Blood Cells, Neural Circuits, Neural Arrays, Edge Communities, Microscale structures are bodies for subcellular scale structures

1. Subcellular scale structures: proteins in a viscoelastic phase, proteins, atoms, chemicals, molecules, hormones, ion travel, charge, soliton waves, electromagnetism, electric dipoles,

magnetic dipoles, action potentials, plateau potentials, slow wave potentials, proteins, dna, chromosomes, ribosomes, rna, vesicles, transmitters, and the study of quantum effects.

Old:

Brain Structure, DMT, Sync, Photocopier
Start the book with electricity, gravity, quantum physics

(quantum, decoherence)

This paper: The importance of Quantum Decoherence in Brain States was cited to argue that the brain does not do quantum computation because it is warm and because warm quantum physics is too chaotic to contain comprehensible information that the brain could process.
https://arxiv.org/pdf/quant-ph/9907009.pdf

"Quantum theory of consciousness put in doubt by underground experiment"
https://physicsworld.com/a/quantum-theory-of-consciousness-put-in-doubt-by-underground-experiment/

Is there another kind of memory function in the brain that operates with some form of quantum computation such as written about in the Orch Or paper? I lean towards saying no, but at the same time even if such a mechanism existed it would not change the results of the existing theories on human cognition, it would be like adding another layer, an extra memory process, because memory function at the level of synapses is true, and memory activation via the flow of ions is true, regardless of whether or not there is an additional dimension of memory via smaller quantum signals in the cell nucleus, or in the receptors, via the microtubules or the camkii etc... There is plenty of research that disputes & debunks certain ideas that came out of the Orch Or paper, but until we understand everything about the cell, at the quantum scale, we can allow ourselves to be open minded about the future possibility of a quantum computation element to human memory, without disregarding the other theories of memory formation & activation.

Then the debate about the granularity of pattern recognition ie the resolution of consciousness (Phi)

Rethinking electricity & gravity, Bose-Einstein Condensates & Fermionic Condensates

Create a picture of the cortical columns as like the Hal's cartridges in 2001 A space Odyssey

And the western world may concept an illustration of the mind's journey to recognize its own self model as the self.

The large scale dipole reflects the horizontal activity of whole cortical column oscillations in partial whole brain oscillations that have 3 phases: inhibition, excitation, and tonic.

Sections of the brain's cortical activity are at a global level repeating the same pattern to Resulting in whole brain awareness

Sleep is my inhibitory phase, then I have a listening phase, then a speaking phase

What I am writing about in my book is how the brain's molecular structure creates conscious maps of reality with frequencies, the frequencies interact with each other, but the same molecular structure that produced these frequencies is required to experience these frequencies. I am going to show from atoms to organs, from electrons to neural circuits, how consciousness works. but NDE Near Death Experiences I think have to be compared to DMT experiences, I think, in terms of thalamic bridge modulations, or in other words both NDE and DMT are taking place inside the human brain the entire time, even if we are experiencing leaving our body or traveling to other realms of existence

SYNC
Phasic signals are disbursed more widely, pushing more components to react simultaneously, synchronization is the absorption of phasic signals into the tonic oscillation.

The brightest flash of the firefly, or the strongest pulse of the action potential is going to cause the most number of fireflies or upstream cells to react at the same time. Sync is a coincident oscillator reaction to broadly distributed high amp low freq signals of any modality type

To have the global sync oscillation altered by the collective action of a neural circuit with different size oscillators might result in a global pattern generation like turning small signals into a flashing image on a screen that downstream neurons receive as an image or a sound or tactile sensation or a feeling which is then observed by another layer

As if the brain is replicating the images it sees outside and the sounds of what it hears outside in the collective signal generated by the oscillator reacting to

Registering an observation to other layers of the network and an observation to the thalamus, the neocortex can function as a tv for the thalamus, like a 32k or human retina display for a virtual reality experience. With the thalamic bridges running its signals to the neocortex and receiving the output of the neocortex on the other side of the cortical columns allowing it to observe, learn from, and coordinate activity pattern learning on each column of neocortex, allowing the whole brain to be in spacetime holistically aware of every part of itself. As frequency patterns in the brain play out across time, space, at multiple scales.

The oscillator is a photocopier because its pattern is defined by action potentials decay rate setting the phase of inhibition for large groups of neurons, who are expecting to fire because of

the signals they are getting from that neuron that fired, but since different neurons have different voltages they end up firing in sequences, so neural oscillators have temporal sequences that adhere to or map to novel neural phasic firing, this takes a small pattern and it magnifies it so it can be seen by another layer of neurons, and the output of cortical columns might be seen by the thalamus which is constructing patterns via the same method outline above

One idea is that the pyramidal cell network in the uppermost layers of the neo cortex can be considered like a fractal analogy of the retina of the brain, spreading along the surface,

Perhaps we could imagine the thalamus as like a focal point, similar to how the pupil is a focal point, similar to how the neuron's spike is like a focal point.

Columns are reading columns like a mind cycle

A thought experiment.

Human phenomenological consciousness involves brainwaves, and brain waves have quantum effects, but the mind is a rendering that is computed at the scale of cells, this means the human mind is not at the quantum scale, even though brain waves have quantum interactions.

The scale of information doesn't matter to an oscillator, even small oscillations change the timing of larger oscillations when absorbed.

So perhaps if the quantum field is observed, the time has changed to the oscillating mind, and if the time has changed an oscillation has been absorbed (conjecture).

I would like to imagine, for fun, that part of spacetime, in the same frequency range as our brainwaves, is synchronizing with the clock in our mind, our brainwave frequency when we observe something.

Creating entanglement between the observer & the observation with spooky action at a distance.

a0006z

Note created May 5, 2017

Reference: the scope of the Neural Lace Podcast with Andre Watson

What part of this note is relevant to the book?

The Neural Lace Talks
May 4th, 2017

Guest: Andre Watson
Host: Micah Blumberg
Editor: Adam Alonzi

The Neural Lace Talks is a podcast about Science and Technology. I am your host, a journalist who has been studying the brain seriously since 2005. (12 years) I call myself a neuroscientist, because a neuroscientist is someone who studies the brain, and I believe that it will become evident just exactly how well I have been studying neuroscience, cognitive science, astrophysics, and computer science all these years by how I conduct my side of the conversation in these podcasts.

I hope that is how people feel when they listen to my podcast today and they get to the point where they are finally beginning to understand how Neural Lace will work, how their own mind works, how deep learning AI works, what brain waves are, and more.

In this episode we talk about the molecular picture of the human brain as a kind of computation. I talk about how my research began twelve years ago after reading a book by Jeff Hawkin's called On Intelligence http://www.onintelligence.org/
Jeff Hawkins, Redwood Neuroscience Institute http://www.rni.org/directors.html
and his company Numenta http://numenta.com/

Have you ever wanted to know what deep learning neural networks are? We go into detail about what deep learning neural networks do in this podcast and I help to explain how understanding artificial neural networks can be useful for thinking about how our brains might work.
https://vrma.work/2016/01/28/deep-learning-fuels-nvidia-self-driving-car-technology/

I successfully argue the case that humans are actually metal robots, because of the calcium and potassium ions in our brains, I successfully argue that we are precisely manipulating a magnetic field with these charge particles known as ions.
http://cimg1.ck12.org/datastreams/f-d%3A27d93d78d7fce2781f79489d21bbcc21c8e6ad407529c0a0a50c3675%2BIMAGE%2BIMAGE.1

I put forward my hypothesis for the basic structure of consciousness that we have as being 'electromagnetic'. Something that I learn might be called the ionotropic brain, which is in contrast to the concept of a metabotropic brain.
http://www.interactive-biology.com/3974/ionotropic-vs-metabotropic-receptors/

We also compare and contrast the neural network with the glial network and briefly touch on the possibility of a mitochondrial network.
https://bmcbiol.biomedcentral.com/articles/10.1186/1741-7007-11-71

We briefly discuss BlueBrain's project where they answer how neurons connect to each other. The Blue Brain Project opens new insights. https://www.youtube.com/watch?v=ySgmZOTkQA8

I argue how machines can have the same kind of consciousness as humans, in the podcast I attempt to explain Diffusion Tensor Imaging. This video is a better explanation of how it works. Topic: Diffusion Tensor Imaging (DTI) https://www.youtube.com/watch?v=twsV81UFFcE

I'm guessing this was a good video on Tensor Calculus so I saved the link: https://youtu.be/e0eJXttPRZI?list=PL2irzZJu17tU4eHI9-wPdZD55-Heg3AZh

There was a recent study that said people who know more than one language think differently: "A study from Lancaster University and Stockholm University, published in the Journal of Experimental Psychology, found that people who are bilingual think about time differently depending on the language context in which they are estimating the duration of events." http://www.independent.co.uk/life-style/bilingual-speakers-time-different-people-one-language-study-swedish-spanish-a7715146.html?cmpid=faceobok-post

But what if everyone uses somewhat unique mental models from one minute to the next, and never the same twice? We tackle that idea and we consider how we can achieve Neural Lace even if no one ever has the same exact brainwave pattern twice, and we explain how deep learning Artificial Intelligence is going to work to identify what brainwave patterns are in specific instances.

We explore what a brainwave might be
http://www.tandfonline.com/doi/abs/10.1080/10400419.2016.1125255
I give a plausible explanation for how the human brain might be capable of calculation at room temperature in a similar way to how a quantum computer works and I explain a scenario in which the human brain might be able to perform mathematics faster than any computer.
http://www.pcworld.com/article/3194574/hardware/china-adds-a-quantum-computer-to-high-performance-computing-arsenal.html

We talk about the science fiction television show called Black Mirror and the dystopia idea of having advertisements in neural lace. We consider why hatred for advertisements might be an evolutionary impulse.
https://en.wikipedia.org/wiki/Black_Mirror

Finally we touch on why Neural Lace and Artificial Brains are an inevitable consequence of the laws of physics and the universe as a fractal, and we briefly touch on the dendrite as a computer in of itself.

There is a GPU Technology conference on the 8th, 9th, 10th, and 11th in San Jose, that is definitely the place for a Neural Lace Researcher to be.
http://www.gputechconf.com/

Tags:
brainwave, fractal, neural, tensor

a0007z

Dendritic morphologies & synaptic connections represent learned memories. Memories activate when preferred patterns (the memory) are detected, this causes cells to create a selective transmission or a projection to other cells (neural arrays). In this note I am looking at Layer 6 & Layer 5 Pyramidal cells, to learn how the Apical Dendrite, or the Exit Terminal, is contributing to the rendered projection of that learned memory to the rest of its network. The main idea that I am exploring is that the signal transmitted from the exit terminal is not uniform along all branches, but instead is modified synapses by synapse, and that the memories in the exit terminal also transmit backwards to play a role in multiple seconds long coincidence detections involving back propagating action potentials from the exit terminal or Apical Dendrite to the Soma, that when combined with the Basal or sensory input dendrite can cause a coincidence detection that creates a special type of action potential event called burst firing.

"Properties of Layer 6 Pyramidal Neuron Apical Dendrites"

"All pyramidal neurons so far investigated have displayed active propagation of action potentials (APs), from the soma along the apical dendrite supported by voltage-gated dendritic Na+ channels (Spruston et al., 1995; Stuart et al., 1997; Waters et al., 2003), modulated by dendritic K+ channels (Bekkers, 2000; Johnston et al., 2000; Korngreen and Sakmann, 2000; Schaefer et al., 2007), and accompanied by influx of Ca2+ ions (Markram et al., 1995; Larkum et al., 1999a; Barth et al., 2008). Another prominent feature of pyramidal neurons is the ability of the apical dendrite to generate local spikes with voltage-gated Na+ and Ca2+ channels (Kim and Connors, 1993; Schiller et al., 1997; Golding et al., 2002; Gasparini et al., 2004) as well as NMDA receptor channels (Schiller et al., 2000; Larkum et al., 2009)."
https://www.jneurosci.org/content/30/39/13031

"Layer 6 (L6) pyramidal neurons are the only neocortical pyramidal cell type whose apical dendrite terminates in layer 4 rather than layer
1. Like layer 5 pyramidal neurons, they participate in a feedback loop with the thalamus and project to other cortical areas."

"We found that L6 pyramidal neurons share many fundamental dendritic properties with other neocortical pyramidal neurons, including

1. generation of local dendritic spikes under the control of dendritic inhibition
"Inhibitory control of calcium electrogenesis. Dendritic inhibition has been shown to powerfully block dendritic Ca2+ electrogenesis in neocortical and hippocampal pyramidal neurons (Buzsa´ki et al., 1996; Miles et al., 1996; Pe´rez-Garci et al., 2006; Larkum et al., 2007; Murayama et al., 2009)."

2. voltage-dependent support of backpropagating action potentials

3. timing-dependent dendritic integration

4. distally located Ih channels

5. frequency-dependent Ca2+ spike activation

6. NMDA spike electrogenesis in the distal apical dendrite.

"Corticocortical versus corticothalamic neurons. L6 pyramidal neurons can be divided into two categories based on the projection of their axonal arborizations: corticothalamic (CT) and corticocortical (CC) projecting neurons (Zhang and Desche`nes, 1997; Kumar and" https://doi.org/10.1523/JNEUROSCI.2254-10.2010

"Physiology of Layer 5 Pyramidal Neurons in Mouse Primary Visual Cortex: Coincidence Detection through Bursting" 2015

"L5 pyramidal neurons are the only neocortical cell type with dendrites reaching all six layers of cortex, casting them as one of the main integrators in the cortical column."

"100 tuft and 175 basal NMDA/AMPA synapses are distributed randomly across the apical tuft and basal dendrites of a multi-compartmental L5 pyramidal neuron model."
"(b) Simultaneous tuft and basal inputs triggers a burst of somatic APs and a dendritic Ca2+ spike
"(c) basal inputs alone evoke only a single" somatic spike."
"(d) Apical tuft inputs alone do not evoke somatic spiking"

An interesting thought about the cyclic nature of Layer 5 pyramidal cells, is the idea that the process of the dendrite being a sensor, like an eyeball or an ear appears to apply to both sides of the neuron, on the way in, and on the way out. So the Apical dendrite, as a neural network, is learning from incoming sensory stimulus, but the Soma burst is one of the incoming sensory stimuli, with models of soma burst waveforms becoming part of what the Apical Dendrite has to contend with.

I think of it as like the basal dendrite is learning to respond selectively to certain patterns, the apical is learning what patterns it responds to.

My intuition is that the apical is learning its own cell's response, and through feedback loops, with itself and with other pyramidal neurons the cell is going to make predictions about its own patterns of causation, what patterns it responds & how it reacts or responds. With the Apical Dendrite perhaps symbolizing a more complex response that is connected to more complex learning. (compared to other types of neurons)

The fact that bursting (bursts of somatic AP) results from the coincident activity of basal + apical, but not from either one separately is a different coincidence detection mechanism from the leaky integrate-and fire model of a neuron which explores coincident synaptic inputs, leading to coincident dendritic activity, which leads to the phasic action potential from just the south side of the Soma.

In the leaky integrate & fire neurons, and the Hodgkin & Huxley Model there is very little thought to the concept of the Soma burst spiking being a coincidence detection from both sides of the neuron. But if it's true for Layer 5 pyramidal cells, then we ought to know if there is a greater role for the exit terminal in all other types of neurons.

So perhaps we can think of the axon, with it's different types of action potentials, different durations (wave shapes, magnitudes), and different burst rates, as a analogous to a lens, a lense that is creating a summation signal that the exit terminal is learning as it's learned response.

The idea is that our sensory inputs are sort of encoded in the input dendrite (or the basal dendrite) and our motor outputs are sort of encoded in the exit terminal (the Apical dendrite), and through cyclic looping activity our input learning (sensory in the bottom dendrite) is being mapped to our output learning (motor in the output exit terminal, or the Apical Dendrite)

So every neuron represents an actor, one that learns to respond selectively to certain patterns, and encodes in its exit a response action.

The meaning of the main somatic signal is like the summary pattern of what the dendrite (basal) has detected, a magnitude + a frequency rate, and the exit or Apical is more about having a highly coordinated response.

https://github.com/v5ma/selfawarenetworks/blob/main/a0232z.md

It's interesting that a place field, in place cells, can begin with a somatic spike. (see note b0232y on behavioral time synaptic plasticity) but it results in burst firing the next time the organism encounters the same place. Perhaps that first spike comes from the Dendrite, and then the Exit Terminal learns to predict it, based on the wave shape (duration & frequency), so that the exit terminal is sending it's prediction backwards, a back propagation spike, at the same time that the mouse encounters that same place again. That would make both sides of the neuron like timers, timers that learn when they are going to fire, and the dendrite is learning a pattern, encoding it in a timer signal at the axon, with the exit terminal learning the different timing

signals, and responding with its own backpropagating signals, to create burst spiking that leads to an organism taking actions based on it's memories.

"This line of research has shown that pyramidal neurons in different cortical regions contain voltage-gated Na+ channels along the dendritic trunk which support the backpropagation of action potentials (APs) from the soma into dendrites [6], as well as voltage-gated Ca2+ channels that support spiking in the apical dendrite"

"Using a detailed multi-compartmental model, we show this physiological setup to be well suited for coincidence detection between basal and apical tuft inputs by controlling the frequency of spike output. We further show how direct inhibition of calcium channels in the dendrites modulates such coincidence detection."

"Because past studies have found that dendritic electrogenesis depends on calcium channels in the apical dendrites, and that sag and dendritic resting potential and input resistance is dependent on Ih conductance, we were able to manipulate only dendritic calcium and Ih conductance parameters, by hand, to fit to our experimental results."

1. Coincidence detection between basal & apical dendrites via the frequency of the spike output.
2. Synaptic Efficacy: Inhibiting calcium channels modulates the coincidence detection between the basal & apical dendrites.
3. This is going to allow for multi-second pattern learning. Or Behavioral Timescale Synaptic Plasticity (BTSP) in the cortical columns of the neocortex. I share notes about the documentation of BTSP in the hippocampus in note a0232z
https://github.com/v5ma/selfawarenetworks/blob/main/a0232z.md

I've read about back propagating action potentials from the postsynaptic membrane (traveling backwards) to the presynaptic membrane. That's where the idea of individual synapses being up regulated or down regulated might be like setting up the individual letters of a printing press (the old fashioned kind that prints newspapers) with the action potential event printing that pattern to its exit terminal network, or the receiving neural array.

"We find that mouse L5 pyramidal neurons in V1 support backpropagating action potentials (bAPs), and dendritic Ca2+ spiking."

However the combination of the research on BTSP in the Hippocampus, with back propagating action potentials from the Apical dendrite towards the soma in Cortical Columns is for me a new mechanism of coincidence detection across the whole brain, and it ought to lead to studies that explore whether much smaller neurons also have burst spiking that is triggered by the combination of back propagating signals from the exit terminal direction + forward propagating signals from the dendrite that represents sensory input. This is not the Hodgkin & Huxley model of neuron. It's not the leaky integrate & fire neuron, or perhaps I ought to say it is more than the classic model of neural firing.

"We show how concurrent input into the perisomatic and electrically remote apical tuft regions switches somatic action potential output from low to high frequency. Thus, high frequency bursting indicates coincident input into different parts of the dendritic structure."

"We further explore regulation of this coincidence detection scheme by blockage of the voltage-gated calcium channels on which this computational principle depends. We ultimately show that such single-cell computation can be conceptualized as a composite of sigmoid functions."

"A phenomenological model"
"To conceptually address the single-neuron computation that this biophysical setup performs, we establish a phenomenological model. We compare three models: a composite, multiplicative, and an additive model"
"Each of these models uses two sigmoidal functions to perform intermediate computations, and is justified by the existence of the two separate (one dendritic and one somatic) spiking zones in the neuron."
"The interaction of the sigmoids in the composite model is justified by the experimental results suggesting that the result of dendritic electrogenesis is to lower the threshold for a high-frequency burst at the soma."
"The multiplicative and additive models have two independent sigmoids, one of which takes tuft (apical) synapses as input, and the other which takes basal synapses as input. "
"The composite model outperforms both the multiplicative and additive models, though less so when Ca2+ conductance is decreased by 75%, suggesting that the inability of the multiplicative and additive models to represent the input-output relationship depends on dendritic electrogenesis"
"The effect of tuft input (The Apical Dendrite or Exit Terminal) is to increase the maximum possible output frequency (Fig. 5D left) and decrease the threshold of basal input needed to elicit high frequency firing (Fig. 5D right)."
"Thus, the sigmoid that relates tuft input to burst-firing threshold is decreasing (since more tuft input decreases that threshold, Fig. 5A red sigmoid), while the sigmoid that relates tuft input to somatic output frequency is increasing (since more tuft input increases the output frequency, Fig. 5A blue sigmoid)."
"The composite model describes a coincidence detector between basal and tuft input, since only when both input streams are active in sufficient amounts is the resultant output high frequency."

Should we multiply two sigmoids (from both sides of the neuron) together, should we add two sigmoids each representing (inputs from each of two sides of the neuron together, or should we have a single sigmoid that is modified on each end?

"The composite model describes a coincidence detector between basal and tuft input, since only when both input streams are active in sufficient amounts is the resultant output high frequency."

"How might such single cell computation be involved in visual processing? To explore tuning properties of cells employing a variety of mechanisms, we used circular distributions (von Mises

distributions, see Methods and Fig. 6 and S5) to model inputs as a function of stimulus orientation. We compared four different mechanisms (Fig. 6A). A composite sigmoid as described previously, a purely multiplicative where the number of tuft and basal inputs are simply multiplied to arrive at output, a purely additive, where the number of tuft and basal inputs are simply added to arrive at output, and a single sigmoid mechanism, where either the tuft or the basal input is put through a sigmoid function to arrive at the output."

See Figure 5 (save to pictures folder)

https://www.researchgate.net/publication/273463321_Physiology_of_Layer_5_Pyramidal_Neurons_in_Mouse_Primary_Visual_Cortex_Coincidence_Detection_through_Bursting/download

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"Coincidence Detection in Pyramidal Neurons Is Tuned by Their Dendritic Branching Pattern" https://doi.org/10.1152/jn.00046.2003.

This study (link & name above) backs my assertion that a memory is both the synaptic connections, and the dendritic morphology (an assertion found in the NAPOT Whitepaper as well as other places.)

(from the above study) "Is morphological variation a bug that arises from intrinsic biological variability or a feature that extends the computational capabilities of a neuron?"

(from the above study) "We conclude that variation in dendritic arborization may be a key determinant of variability in coupling (49
17%; range 19–83%; n 37) and is likely to outweigh the contribution made by variations in active membrane properties. Thus coincidence detection of inputs arriving from different cortical layers is strongly regulated by differences in dendritic arborization."

"Here we focused on variations of the dendritic branching pattern within one class of cells, thick tufted neocortical layer 5 (L5) pyramidal neurons. This cell type is one of the largest found in the mammalian cortex. Its prominent apical dendrite extends vertically 1.3 mm from the soma and gives rise to a tuft of dendritic branches in layer 1 and oblique dendrites spreading horizontally in layers 2/3 and"

"4. The detailed branching pattern varies considerably between individual cells. L5 pyramidal cells also display 2 major types of regenerative events: First, sodium based APs (Na+-APs) are initiated close to the soma and propagate back into the dendritic arbor [backpropagating AP (bAP); Stuart and Sakmann 1994];"

"second, long-lasting, mainly Ca2+ mediated depolarizations (Ca2+-APs) are initiated predominantly in the distal regions of the

apical dendrite (Helmchen et al. 1999; Schiller et al. 1995, 1997) and can be evoked by strong distal synaptic input. It was recently shown that a bAP can lower the threshold for initiation of a Ca2+-AP, thus enabling L5 pyramidal neurons to couple synaptic inputs from different cortical layers if they coincide within a short time window [Fig. 1; backpropagation activated Ca2+ spike firing (BAC firing); Larkum et al. 1999a,b, 2001]."

Dendritic arborization & branching (or dendritic morphology, including between Basal & Apical Dendrites) is one of the ways neurons selectively tune into certain criteria for memory-prediction while ignoring other criteria (the components of patterns). Individual parts of the dendrites & individual synapses are able to excite (up regulate) or inhibit (down regulate) based on coincident detections across the cell membrane, thus allowing the brain to carefully define its own internal mental models of reality, and to actually fine tune those mental models of reality.

The article documents an effort to model or simulate dendritic morphology.

"Dendritic fingerprint captures variability of simulated coupling. The dependence on dendritic arborization in simulations suggests that it should be possible to extract geometric parameters that contribute to this variability."

"a more detailed dendritic fingerprint (Fig. 4) of L5 pyramidal neurons: it consisted of 1) one- and 2) two-dimensional branching densities, 3) the width of the dendritic tree, and 4) diameter distributions for the apical and 5) basal dendrites, as well as 6) the number of basal dendrites, 7) somatic diameter and length, and 8) the maximal length of the non normalized apical dendrite."

I'm surprised there was not more emphasis on the lengths of each dendritic branch, because one of the major differences between Mice & Human brains is the length of the dendrite. (search this note for lengthreference1)

"The most profound difference in the branching parameters of the strongly and weakly coupling cells was in the branching densities in the tuft"

This goes back to the question of how a ganglion neuron in the eyeball is able to selectively respond to only patterns that move from left to right, and not patterns that move from right to left or from top to bottom or bottom to top for example. The dendritic morphology means that patterns triggered from the left to the right arrive together in time to trigger that neuron to fire. That is what led me to the concept of HOW the dendritic morphology, along with synaptic connections, both their location & quantity define LTP in the physical morphology of the cell. This concept contributed to my "Neurons are transmitting their shapes" theory in 2014 that I shared on social media via an alias, but you can find in not a0008z https://github.com/v5ma/selfawarenetworks/blob/main/a0008z.md

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"Visual Responses of Ganglion Cells" https://www.ncbi.nlm.nih.gov/books/NBK11550/
"Different cells become selectively tuned to detect surprisingly subtle "features" of the visual scene, including color, size, and direction and speed of motion. These are called "trigger features"."

On "Contrast Sensitivity Functions and the Difference of Gaussians Receptive Field Model"

""Contrast" is the difference in brightness between the light and dark phases of the pattern. In this receptive field characterization, contrast is reduced until the ganglion cell just barely responds to the introduction of such a stimulus into a featureless field. This is the threshold. The process is then repeated for patterns with different bar widths, or "spatial frequencies" (the reciprocal of the number of bright- and dark bar-pairs per unit distance). The sensitivities (the reciprocals of contrast thresholds) are plotted as a function of spatial frequency. The net result is a curve (Fig. 8), which demonstrates that in ganglion cells there is an optimal spatial frequency of stimulation."

On "Directionally Selective Ganglion Cells"
"Directionally selective retinal ganglion cells respond to stimuli moving in a preferred direction and are inhibited by stimuli moving in the opposite or null direction."
"In addition to a preferred direction of movement these cells have preferred speeds of movement, some prefer slow movements, whereas others prefer rapid movements."
"Directionally selective ganglion cells, stained after microelectrode recordings, have a distinctive dendritic morphology with many apparently closed, or nearly closed, loops, giving the appearance of anastomosing dendrites (Fig. 13, Fig. 14). ON-OFF directionally selective ganglion cells are bistratified in the inner plexiform layer (Fig. 13), whereas ON-type directionally selective cells are monostratified, close to ganglion cell bodies (Fig. 14). None of these morphological features hints at the orientation of the null/preferred axis, however."

On "Color and Spectral Responses"
"Ganglion cells respond to colored stimuli in one of two ways: color opponent responses and luminance responses. "
"Goldfish are an animal model with color vision and have provided much information on the way in which vertebrate retinas process color."
"In this animal, it was first realized that individual cones express only one each of three genomically available cone photopigment types (colloquially, red, green, or blue cones; technically, long (L), mid (M), or short (S) wavelength types). This supported at least part of Thomas Young's (48) 19th century "trichromatic" theory of color vision. "

"Tonic and Phasic Ganglion Cells of Primate Retina"
"Tonic cells of the parvocellular pathway respond best to stimuli with high contrast and fine grain, whereas phasic cells respond to stimuli with very weak contrast, covering larger areas (58)."

"Tonic cells respond to light stimuli in a steady maintained manner. Receptive field centers are extremely small, about 15 μm on the retinal surface (~4' of arc, about 10 cm at 100-m distance). Tonic cells are often called "midgets" because they probably represent recordings of midget ganglion cells described by Polyak (54) (see below). They occur with a density distribution across the retina comparable to, anatomically, midget cells (55)."
"Phasic responses originate with morphologically larger ganglion cell types with fast optic nerve fiber conduction velocities (~4 m/s) (56)."

"X and Y Receptive Fields"
"One of the assumptions of the DOG model (18) is that ganglion cells linearly add signals from both center and surround mechanisms for all points in space. This suggested that ganglion cells be tested for spatial linearity. Some cells (X-cells) pass the test, whereas others (Y-cells) do not, despite the fact that all receptive field data are well represented by the DOG model."

"In Fig. 11, impulse firing rate is shown for different positions (or spatial phase) of the sine wave stimulus with respect to the receptive field center. To change the spatial phase, the pattern is shifted right and left by incremental amounts. For the X-cell (Fig. 9A), when the pattern is positioned so that the transition from light to dark passes directly through the center of the field, a "null response" is produced. Introduction of the stimulus produces no effect on firing rate. The tendency of the bright bars to excite the cell is exactly compensated by the tendencies of the dark bars to reduce the firing rate."

"Ganglion Cells That Are Involved in the Circadian Clock"
"Certain large-field, sparsely-branching ganglion cell types are known to project to the hypothalamic suprachiasmatic nucleus (SCN) in the brain (Fig. 49). The latter nucleus is the primary circadian oscillator in mammals and is essentially the biological clock, allowing resetting of bodily functions to local time. The ganglion cells involved in entraining the circadian clock project from the eye to the SCN via the retinohypothalamic tract (RHT) (Fig. 48). They apparently contain the neuropeptide pituitary adenylate cyclase activating polypeptide (PCAP), as well as glutamate."

"THE ANATOMY AND PHYSIOLOGY OF DIRECTION-SELECTIVE RETINAL GANGLION CELLS BY JINYUE LIU"

a0007z.starburst
a0309z.starburst

"Direction Selective Ganglion Cells (DSGC)"
"Starburst Amacrine Cells (SAC)"
"The ON-OFF DSGCs (ooDSGCs) each detect motion in one of four cardinal axes"
"the ON DSGCs detect movement in the dorsal, ventral and nasal directions"

"By correlating physiological responses of each ooDSGC with structural evidence, from serial block-face electron microscopy, of putative synapses on these same cells, they showed that the SACs on the null side of ooDSGCs make more inhibitory synapses onto ooDSGC dendrites compared to SACs on the preferred side. In particular, individual SAC dendrites that are oriented antiparallel to the null direction of the ooDSGC contribute to the majority of these inhibitory synapses (fig.10). Hence, an increase in the number of SAC-ooDSGC inhibitory synapses, rather than the strength of individual ones, accounts for the direction-selective responses of ooDSGCs."

An increase in the number of inhibitory synapses, rather than the strength of individual synapses, accounts for direction selective responses (in the dendrites of individual neurons)

"Individual SAC dendrites are direction-selective"

"Each SAC can wire to multiple ooDSGCs and contribute to their direction-selective responses. This is possible because each SAC dendrite is an independent direction-selective unit (Euler et al., 2002) (fig.11). When a stimulus is presented in a centrifugal direction, moving from its cell body out to the distal tips, the SAC dendrite inhibits the ooDSGC that it connects to. Therefore, each SAC dendrite responds best to motion in the opposite direction relative to that preferred by its postsynaptic ooDSGC (fig.12)."

The inhibitory inputs from the direction selective (SAC) Starburst Amacrine Cells cause pattern selectivity to happen in the more common On-Off Direction Selective Ganglion Cells (ooDGSCs)

By themselves the SAC cells are direction selective but through inhibitory signals they confer pattern selectivity to the more common ooDSGCs.

"On the other hand, SACs on the preferred side contribute relatively little inhibition."

"each SAC dendrite responds best to motion in the opposite direction relative to that preferred by its postsynaptic ooDSGC"

But the SAC is connected to the ooDSGC in a way that sets a pattern detection preference. (like is this cell going to activate when it sees pattern A (left to right movement), or Pattern B (dorsal to ventral movement (top to bottom))).

This paper is talking about Direction selectivity, but underlying that is the concept of pattern selectivity, and this is at the root of how memory works in the NAPOT theory. That long term memories are stored in the physical configuration of cells, with the synaptic connections & dendritic configurations, allowing a cell to respond preferentially to certain types of memories, so

it activates when it sees what it has grown to look for, and it ignores (inhibits) patterns that do not match it's grown criteria. This is part of how long term learning grows in your mind. Cells learn to preferentially respond to certain patterns, and they learn to inhibit other patterns.

Inhibition then, (and we might apply this concept generally to inhibitory interneuron circuits) inhibition is like a second carving tool for the sculptor that is your brain rendering the mind, some of the patterns in your mind are rendered through excitatory circuits, but those patterns are improved & refined with inhibitory circuits. With inhibition what might otherwise be a rough & wacky hallucinatory experience becomes instead a refined reality, with more accurate pattern representation, and clearer thinking.

This concept also provides a clue to how Dendritic Inhibition might shape your active memory, by causing a cell to respond more or less to something in your receptive field.

What would it mean to apply the inhibitory concept to artificial neural networks such as Stable Diffusion?

https://webvision.med.utah.edu/book/part-iii-retinal-circuits/the-anatomy-and-physiology-of-direction-selective-retinal-ganglion-cells/

In this next paper

"Directionally selective retinal ganglion cells suppress luminance responses during natural viewing" https://www.nature.com/articles/srep35708.pdf

It is shown that inhibition helps a direction selective cell to ignore stationary behavior. (or patterns that almost match, but do not actually match what the memory-prediction criteria that the cell is seeking to activate in your mind)

"Directionally selective (DS) ganglion cells of the retina report the direction of motion by spiking robustly to movement of an object in one direction (preferred) and sparsely to movement of the same object in the opposite (null) direction 1–3. It is somewhat surprising therefore that such cells also spike robustly to changes in luminance without corresponding motion1–5 as responsiveness to two different visual features raises questions of how downstream circuits interpret the meaning of individual spikes, e.g. does a given spike convey information about motion or about luminance?"

"Responsiveness to multiple features by DS cells has been largely ignored in the feature detector literature, curious given that the identification of directional selectivity helped shape the feature detector hypothesis"

^ hmm hmm

"We find that responses to changes in luminance are strongly suppressed in favor of a response that reliably reports direction of motion."

^ Inhibition

"Coupled with the suppression of the response to luminance, this reduction of motion responses results in spike generation for only a single feature: motion of an object in the preferred direction. Responsiveness to only a single feature allows for unequivocal interpretation of transmitted spikes by downstream circuits and makes DS cells a true ‘feature detector.’"

"This finding is in contrast to the results of a recent study in which direction coding was not strongly affected by wide-field inhibition. Although the changes to the DS index in our study were modest, they arose consistently when the surround inhibition was blocked and thus highlight the importance of natural scenes for extracting certain characteristics from visual neurons"

"Synaptic Potentiation at Basal and Apical Dendrites of Hippocampal Pyramidal Neurons Involves Activation of a Distinct Set of Extracellular and Intracellular Molecular Cues" doi: 10.1093/cercor/bhx324

"In the central nervous system, several forms of experience-dependent plasticity, learning and memory require the activity dependent control of synaptic efficacy."

Synaptic Efficacy: The up & down regulation of individual synapses is part of how Neurons project or distribute sparsely coded patterns to the exit terminal array, but also how they backpropagate synaptic patterns backwards to the input terminal array.

NAPOT revision 2 is about attaching the concept of NAPOT to SDR at the synaptic scale. NAPOT Neural Array Projection Oscillation Tomography + SDR Sparse Distributed Representation with individual synaptic efficacy.

"Here we studied the functional and molecular aspects of hippocampal circuit plasticity by analyzing excitatory synapses at basal and apical dendrites of mouse hippocampal pyramidal cells (CA1 region) in acute brain slices."

"We demonstrate that synapse-specific molecular pathways allowing MMPs to rapidly upregulate function of NMDARs in stratum radiatum involve protease activated receptor 1 and intracellular kinases and GTPases activity. In contrast, MMP-independent scaling of synaptic strength in stratum oriens involves dopamine D1/D5 receptors and Src kinases. "

"Results of this study reveal that 2 neighboring synaptic systems differ significantly in extracellular and intracellular cascades that control synaptic gain and provide long-searched transduction pathways relevant for MMP-dependent synaptic plasticity."

Layer 5 & 6 Pyramidal Cells

"receive multiple inputs to 2 types of dendritic trees: basal and apical."

It's interesting that only pyramidal cells receive this description when back propagating action potentials happen to all neurons. Really the smaller neurons are smaller functional fractals of the larger neurons, so we ought to see back propagating action potentials from the postsynaptic membrane to the presynaptic membrane in all neurons, and glial cells, and also back propagating signals from the exit terminal branches (pre-synaptic) towards the soma. The same functions in larger pyramidal cells ought to appear in smaller neurons, because they are functional fractals of their larger cousins, meaning the same functions at a smaller scale.

"Dendritic Morphology Affects the Velocity and Amplitude of Back-propagating Action Potentials"

back-propagating action potential (bpAP)

"The back-propagating action potential (bpAP) is crucial for neuronal signal integration and synaptic plasticity in dendritic trees. Its properties (velocity and amplitude) can be affected by dendritic morphology. "

"We found that the velocity of bpAPs was not uniform in a single dendrite, and the bpAP velocity differed among distinct dendrites
of the same neuron."

"The velocity of a bpAP was positively correlated with the diameter of the dendrite on which it propagated."

"In addition, when bpAPs passed through a dendritic
branch point, their velocity decreased significantly."

"Similar to velocity, the amplitude of bpAPs was also positively correlated with dendritic diameter, and the attenuation patterns of bpAPs differed among different dendrites."

"The amplitude of a bpAP may determine the strength of subsequent postsynaptic depolarization and affect the induction of plasticity. The velocity and frequency of bpAPs influence the timing of postsynaptic activity and the chance of potentiation. Therefore, the properties of bpAPs have a critical influence on the integration of synaptic input and the induction of synaptic plasticity"

"The average velocity of bpAPs in granule cell dendrites is 150 μm/ms (150 micrometers per millisecond) which is slower than their velocity in pyramidal cell apical dendrites (500 μm/ms) and basal dendrites (200 μm/ms)"

"The marked differences among bpAPs on the dendrites of different neuronal types inspired us to investigate the effect of morphology on bpAPs, with a focus on how the diameter and branch pattern influence bpAP velocity and amplitude."

Medical Imaging Tech
"To overcome this limitation, recent studies have applied optical recording via genetically-encoded voltage indicators (GEVIs) or genetically-encoded Ca2+ indicators [21, 22]. Here we used a previously developed all-optical electrophysiological method using a GEVI [23] to record the membrane voltage in the dendrites of cultured hippocampal neurons."

"The results clearly showed that the bpAP propagation velocity in dendrites fluctuated (Fig. 1H)."
"bpAP Properties Are Mainly Determined by Dendritic Tree Morphology"
"After classifying the analyzed neurons into different types, we found that there was no significant difference in the average velocities of bpAPs in pyramidal neurons (190 μm/ms) and granule cells (202 μm/ms) (Fig. 2B)."

"We designed experiments to determine whether the volume of the cell body and the number of dendrites influences bpAP propagation."

"This finding indicated that the volume of the cell body and the number of primary dendrites have little influence on bpAP propagation."

"We found that 62% of dendrite pairs showed a positive correlation between the relative initial amplitude ratio and the diameter ratio, and this positive correlation became more significant as the diameter ratio increased (Fig. 4C). This finding indicated that bpAPs on dendrites with relatively large diameters are likely to also have relatively high amplitudes."

https://pubmed.ncbi.nlm.nih.gov/35984622/

"Synapse-Specific Regulation Revealed at Single Synapses Is Concealed When Recording Multiple Synapses"
"Synaptic transmission and its activity-dependent modulation, known as synaptic plasticity, are fundamental processes in nervous system function. Neurons may receive thousands of synaptic contacts, but synaptic regulation may occur only at individual or discrete subsets of synapses, which may have important consequences on the spatial extension of the modulation of synaptic information."

"We have investigated how well-known synapse-specific short-term plasticity, where some synapses are regulated and others left unregulated, mediated by astrocytes and endocannabinoid (eCB) signaling can be assessed at different observational levels."
"We show that eCB-induced depolarization-induced suppression of excitation (DSE) and astrocyte-mediated synaptic potentiation can be observed when monitoring single or few synapses, but are statistically concealed when recording the activity of a large number of synapses. These results indicate that the electrophysiological methodology is critical to properly assess synaptic changes occurring in subsets of synapses, and they suggest that relevant synapse-specific regulatory phenomena may be experimentally undetected but may have important implications in the spatial extension of synaptic plasticity phenomena."

"Synaptic efficacy refers to the strength of communication between neurons, and mainly depends on the probability and amount of neurotransmitter released from presynaptic neurons and the number of postsynaptic receptors activated"
"Therefore, three parameters define synaptic transmission properties in a single synapse: the probability of neurotransmitter release, the synaptic potency (i.e., the number of postsynaptic receptors activated), and the synaptic efficacy that results from the combination of them (del Castillo and Katz, 1954; Hessler et al., 1993; Dobrunz and Stevens, 1997; Atwood and Karunanithi, 2002)."

I think this next quote adds to the Cellular Oscillating Tomography theory even though it's about neurons, the principle ought to hold true for other types of cells. Meaning that the more receptors on a cell that are triggered by the same stimulus, the greater the cells response, because the cells morphological structure is inevitably going to sum up the aggregation of its receptor activations, and that ought to effect the cells reaction (a logical prediction based on an understanding of how physics works).
"minimal stimulation activates a single fiber to observe the contained processing of a single synapse. Increasing fiber stimulation recruits synapse ensembles to study the aggregation of synapses in a cell, summing along dendritic arborization."
See Figure 1 "FIGURE 1. Assessing synaptic transmission at different levels of analysis"
https://www.frontiersin.org/articles/10.3389/fncel.2017.00367/full#:~:text=Synaptic%20efficacy%20refers%20to%20the,number%20of%20postsynaptic%20receptors%20activated.

"Synaptic Input and ACh Modulation Regulate Dendritic Ca2+ Spike Duration in Pyramidal Neurons, Directly Affecting Their Somatic Output" https://www.jneurosci.org/content/42/7/1184
"Nonlinear synaptic integration in dendrites is a fundamental aspect of neural computation. One such key mechanism is the

Ca2+ spike at the apical tuft of pyramidal neurons. Characterized by a plateau potential sustained for tens of milliseconds,
the Ca2+ spike amplifies excitatory input, facilitates somatic action potentials (APs), and promotes synaptic plasticity."
"we explored the plateau and termination phases of the Ca2+ spike under input current perturbations,
long-step current-injections, and variations in the dendritic high-voltage-activated Ca2+ conductance (that occur during cholinergic modulation)."

"We found that, surprisingly, timed excitatory input can shorten the Ca2+ spike duration while inhibitory input can either elongate or terminate it. A significant elongation also occurs when the high-voltage-activated Ca2+ channels (CaHVA) conductance is increased"

This finding is not surprising to me because there is an inverse relationship between magnitude & frequency. Excitatory input has higher frequency, so the magnitude (amplitude & duration) ought to decrease. It is natural for an excitatory (frequency) signal to have an inhibitory (duration) effect and vice versa, an inhibitory signal (frequency) might increase duration (part of magnitude) because of the inverse relationship.

"These Ca2+ spikes generate a huge depolarization in the dendrites, which lasts for tens of milliseconds and is accompanied by a significant influx of Ca2+ ions into the cell. The dendritic depolarization associated with the Ca2+ spike often affects the somatic region and leads to a short burst of axonal APs (Leleo and Segev, 2021). Functionally, Ca2+ spikes were shown to play a central role in the transmission of higher-level top-down signals, the coupling between the soma and the apical tuft, and the modulation of synaptic plasticity "

"Because of the relatively long duration of the dendritic Ca2+ spike, various manipulations and synaptic input perturbations may alter its stereotypical voltage waveform. Thus, each of these manipulations can directly affect local plasticity, the communication between the soma and the nexus, and the overall output of the cell. "

See Figure 1 "The Ca2+ spike can be divided into three phases: (P1) initiation, (P2) plateau potential, and (P3) termination. D, Quantification of the variability in trace shape for each phase in the voltage waveform, in response to a range of current stimuli."
^ Reference the link above

NAPOT Revision 2 detail added:

In a nutshell: individual synaptic back propagation, from another cells dendrite, or from this cells dendrite, is going to affect the Ca2+ Calcium back propagation waveform, which will affect whether the Basal & Apical Dendrites will jointly produce a coincidence detection leading to

burst firing from the Soma, shooting a memory prediction back out the Apical Dendrite to other neurons, with individual messages connected to each Apical Synaptic branch, allowing for a sparsely coded memory to be upload from this one cell to the neural array defined by it's exit terminal. Integrating a memory-prediction rendered pattern into your phenomenologically conscious mind.

Re-Read this paper 6 times

a0007z.loop

Neuroelectric Tuning of Cortical Oscillations by Apical Dendrites in Loop Circuits
https://www.frontiersin.org/articles/10.3389/fnsys.2017.00037/full

"Many layer 5 and 6 pyramidal neurons are connected to thalamic neurons in loop circuits"

"It is proposed that a major function of the apical dendrite is to produce sustained oscillations at a specific frequency that can serve as a common timing unit for the processing of information in circuits connected to that apical dendrite."

"Synchronous pulse outputs from the circuit loops containing apical dendrites can tune subthreshold membrane oscillations of neurons they contact. When the pulse outputs are finely tuned, they function as a local “clock,” which enables the contacted neurons to synchronously communicate with each other. Thus, a shared tuning frequency can select neurons for membership in a circuit. Unlike layer 6 apical dendrites, layer 5 apical dendrites can produce burst firing in many of their neurons, which increases the amplitude of signals in the neurons they contact. This difference in amplitude of signals serves as the basis of selecting a sub-circuit for specialized processing (e.g., sustained attention) within the typically larger layer 6-based circuit. After examining the sustaining of oscillations in loop circuits and the processing of spikes in network circuits, we propose that cortical functioning can be globally viewed as two systems: a loop system and a network system. The loop system oscillations influence the network system’s timing and amplitude of pulse signals, both of which can select circuits that are momentarily dominant in cortical activity."

"The prevailing view of the main function of the apical and basal dendrites of a pyramidal neuron is the integration of incoming electric pulses at the tens of thousands of synapses which dot the dendrite surface (e.g., Häusser et al., 2000; Spruston, 2008) The result of this integration is a train of output pulses in the single axon which exits at the base of the soma."

It exits the base of the Soma to the Apical Dendrite right???

"Here, we propose that a major function of the long apical dendrite in pyramidal neurons is the production of a stable oscillation at a specific frequency."

"When apical dendrites in corticothalamic loops oscillate, their oscillations are copied to networks of pyramidal neurons, and all network pyramidal neurons that are contacted will oscillate at a common carrier frequency into which messages of temporally coded spikes may be inserted."

"Blocked" Reference 1

"Only neurons whose membranes oscillate at the specific carrier frequency will accept the spike signals: spike signals carried on other frequencies will be blocked."

This confirms for me the concept I have that the synchronously oscillating group is learning together, and that oscillatory synching between different oscillating groups is how the brain relays information to other parts of the brain, the concept that I said was similar to Neuropype technology (by Intheon CEO Tim Mullen) relating unstructured heart data to unstructured eeg data, or any kind of sensor stream data with a time code. I think the brain works the same way and this note seems like evidence for the idea.

One of my general arguments seems to be that the function of synchronous oscillations can be compared to the function of noise in a Stable Diffusion neural network. It's allowing the neural network of the brain to absorb the high phasic spikes across the oscillating cell assembly, so each cell is learning it's own variation on the received pattern, each cell is capable of participating in a learned sequence recall that involves many cells firing across many layers of cortex inside a cortical column, or across cortical columns in the regional networks that span multiple cortical columns & the thalamus.

"The corticothalamic loops operate as a clock in a computer, which assures that electric signals in different locations within a connected circuit of neurons change at the same time. In the present theory, different bundles of apical dendrites can oscillate at different frequencies, and therefore their connected circuits of neurons can run on different clocks."

The main concept of NAPOT applied to phase changes between large oscillating groups basically amounts to changes in the clock speed of one corticothalamic loop, that is absorbed by the rest of the cortical thalamic loops, via the physics of oscillation, and those differences in clock speed are the phase changes created by the aggregates of phase wave spiking, and this is how signaling works at the macroscopic scale in the brain between large clusters of oscillating cell assemblies.

The medial or mesoscopic brain activity is about how layers of neural circuits within cortical columns & within the hippocampus talk to each other.

"The axons of pyramidal neurons of layers 2 and 3 form an information bridge from one minicolumn to other minicolumns at locations both near and far. Axons of layer 5 pyramids contact minicolumns near and far, so that oscillations of the long apical dendrites positioned vertically at the center of a minicolumn can be synchronized with oscillations of neurons

throughout a broad network of neurons. When membranes of network neurons oscillate in synchrony the wave peaks of these oscillations are separated by a constant time interval; so it can be said that these neurons bind together and “talk to each other” (Fries, 2005, 2015; Womelsdorf et al., 2007)."

"To summarize this section"

1. The oscillations of layer 5 and 6 apical dendrites drive the output pulses of their pyramidal axons, which are copied to the thalamus and sent back to the same apical dendrite, forming a loop circuit."

2. "The thalamic axon also sends these pulses to other neurons to which it is connected, some located nearby, some located remotely. In this manner, oscillations of the same frequency as those in the initiating apical dendrites can be spread across the cortex."

"Modeling the Electric Oscillations of the Apical Dendrite"
https://www.frontiersin.org/articles/10.3389/fncel.2021.703407/full#:~:text=Overall%2C%20the%20majority%20of%20perirhinal,for%20the%20oscillatory%20synchronization%20and

"The modeling of oscillations at any given location along the apical dendrite is represented theoretically by a distribution of resonance frequencies, which is visually depicted as a resonance profile. Two features of the profile are evident and of main interest: its peak and its spread. The peak frequency of the resonance profile is customarily called the resonant frequency. As it is most generally used, the term resonance denotes the ability of a system to oscillate most strongly at a particular frequency. It may be noted that the existence of resonance in this biophysical model does not require inductance, in contrast with most classical electrical circuitry that is tuned to a specific frequency."

"Both the peak resonance frequency and the progressive narrowing process are assumed to be influenced by many features of the membrane, but chief among these features is the inward flow of positive sodium ions by spines, the consequent outward flow of positive potassium ions around the spines, the passive outflow of potassium ions by the leak current, and to a lesser extent the activities of many other types of channels in the dendritic membrane. The initial surge of charge consists of action potentials which are delivered by a thalamic axon at the top of the apical dendrite"

"Thus, the present model predicts that the rate of outward potassium flow through the apical dendrite membrane determines the peak frequency of the dendrite’s oscillations."

^ This quote above is consistent with NAPOT theory about the role of potassium changing the magnitude & its inverse which is the frequency (because magnitude & frequency have an inverse relationship)

"This variable level of voltage amplitude of a current surge in the apical dendrite contrasts with the discrete, all-or none voltage amplitude of an action potential spike propagating along an axon of the neuron."

The physics here force a change in the APD Action Potential Duration. If you have fixed amplitudes (the all or none action potential) then excess voltage beyond the triggering threshold is going to change the wavelength (and frequency), leaving Calcium channels open longer, changing the message that is sent from that neuron into the network. A change in the timing of the oscillating clock relative to the other oscillating clocks that it was in sync with. That phase wave time change is information. The smaller oscillation now exerts a mutual force or drag on the larger group oscillation.

"As current surges flow down the apical dendrite their oscillation frequency is assumed to change slightly when local potassium channels change their rate of releasing potassium ions from the dendrite."

"Low spine voltage produces low outward potassium flow and low values of oscillation frequency, and high spine voltage produces high potassium flow and high values of oscillation frequency. Thus,
The present model predicts that the rate of outward potassium flow through the apical dendrite membrane determines the peak frequency of the dendrite's oscillations."

Medical Imaging Tech Sidebar

"Measurements of these oscillations can be obtained from the local electric field potentials that they produce; and as the field potentials of clusters (bundles) of thousands of apical dendrites radiate to the scalp their combined voltage can be measured as EEGs."

ie EEG Electroencephalogram electrodes on your scalp are detecting voltages from the electric dipoles (that represent the combined voltages of thousands of individual apical dendrites.)

"Peak Frequency as a Function of Rate of Ion Outflow
Four equally spaced frequencies in the 0–100 Hz range were selected, 20, 40, 60, and 80 Hz, and the outward flow of potassium ions, gr, was calculated for each frequency using Equation [1] of Kasevich and LaBerge (2011), which is based on a single compartment. Iterative calculations converged to a value of gr that maximized the energy transfer from one compartment to the next compartment. Appropriate geometric parameters of the underlying leaky cable theory and electrical parameters of the membrane were obtained from the relevant literature and entered into Equation [12] of the Kasevich and LaBerge (2011) study."

"The measure of energy transfer was transfer impedance. The relationship between the obtained gr conductance and each of the four frequency points is graphed in Figure 6."

See figure 6 in the above link (in the title) "FIGURE 6. Simulated relationship of profile peak frequency as a function of the rate of outward conductance of potassium ions. The obtained outward potassium conductances were 105, 310, 627, and 1056 nS for the curves with peaks at 20, 40, 60, and 80 Hz, respectively. The resonant frequency in radians per second is approximately the radial conductance divided by the radial capacitance. For a constant radial capacitance the peak frequency is directly proportional to the potassium ion leak conductance. [Adapted from Kasevich and LaBerge (2011)]."

"FIGURE 6 | Simulated relationship of profile peak frequency as a function of the rate of outward conductance of potassium ions. The obtained outward potassium conductances were 105, 310, 627, and 1056 nS for the curves with peaks at 20, 40, 60, and 80 Hz, respectively. The resonant frequency in radians per second is approximately the radial conductance divided by the radial capacitance. For a constant radial capacitance the peak frequency is directly proportional to the potassium ion leak conductance."

"The peak frequency is directly proportional to the potassium ion leak conductance."

This means that the amount of potassium ions in the neuron when the action potential fires determines the frequency & magnitude of the phase wave that bursts from the soma and travels along the axon triggering vesicle release

(note the frequency of muscle movement 20–300 Hz)

"If we assume that neural noise at each synapse, on average, adds a constant amount of impedance (opposition) for each frequency across the 1–100 Hz range, then each synapse will dampen or flatten the shape of the oscillation frequency profile."

An observation consistent with the NAPOT concept that oscillatory synchrony is noising (the opposite of denoising) and absorbing high phasic bursts through oscillatory dissipation of the high phasic (action potential or action potential burst sequence) phase wave differential.

"While every cycle of the corticothalamic circuit adds noise to flatten the shape of the profile curve, the next cascade through the apical dendrite compartments narrows the shape of the profile."

An observation consistent with the NAPOT theory regarding modeling each high phasic action potential as a tensor in a Taylor Series, that can learn a curve or a shape as signals are passed through successive neural arrays.

"Therefore, increasing the number of compartments in the apical dendrite provides a means for effectively offsetting the synaptic noise in the corticothalamic circuit.

"Hence, longer apical dendrites (e.g., in primates) should produce more narrow frequency profiles, while very short apical dendrites (e.g., in mice) should show a limit on the narrowness of the
e profile. For a comparison of apical dendrite lengths of layer 5 and layer 2/3 pyramidal neurons across five mammalian species see Figure 1 in LaBerge (2005)."

^ Relevant to the point I made in note a0008z and in this note about what Neurogrid misses by virtualizing the dendritic branches, search this note for lengthreference1

TWO TUNING NEURONS
The Pyramidal Neuron of Layer 6

"The pyramidal neurons of layer 6 are widely diversified in area V1 into at least eight different types, which are defined by their patterns of dendritic inputs and axon outputs (Briggs, 2010). Sherman and Guillery (1998) described particular layer 6 pyramidal neurons whose axons appear to modulate, as opposed
to driving, the processing of neurons they contact (Figures 9, 10). Examples of driver axons are the output fibers arising from thalamic neurons which directly contact stellate neurons of layer 4, and whose axons presumably produce spikes. Examples of modulatory axons arise from layer 6 pyramidal neurons and contact apical dendrites of layers 2/3, 5, and 6 pyramidal neurons as well as the stellate neurons of layer 4 (Figure 9)."

Drive vs Modulate, the driving neuron passes the signal, it doesn't change it, it's not adding information. Driver neurons are being told where to go. Modulating neurons are changing the signal as it passes. So this paper might seem to suggest that Layer 6 Pyramidal Neurons tuning as a passive activity, and that Layer 5 is doing the real work of driving change, the opposite is true. In the neurophysics context driving is more passive, and tuning involves information generation.

"Thalamic neurons that project to the cortex are of two main types, called “core” neurons and “matrix” neurons, which are distinguished by their immunoreactivity for the calbindin calcium-binding protein and the parvalbumin calcium-binding protein, respectively (Jones, 1998, 2007)"

"The core thalamic neurons project to middle layers of the cortex, (Figure 9) (...) and the matrix thalamic neurons project to superficial layers 2 and 3 of the cortex (Figures 13, 14)"

"The findings of Sherman and Guillery (1998) support the view that the direct connection between the thalamus and a stellate neuron carries a series of spikes that codes the information arising from sensory receptors (e.g., in the retina), and in higher-order thalamic neurons codes the information arising from other cortical areas (Mitchell et al., 2014). In

In the context of the present theory, the connection between the layer 6 tuning-neuron and a stellate neuron provides precisely timed intervals which adjust the series of spikes into a stable temporal code."

"In this way, the information in the sensory receptor is transmitted to cortical networks in the form of a precise temporal code."

"Blocked" Reference 2

"Because the membranes of neurons that form a specific circuit in the networks of information processing oscillate at the same frequency, the neurons can receive coded pulse trains from each
other. Thus, the frequency of oscillation acts like a frequency channel in two-way radio communications. The preference of these neurons for one particular frequency implies that spike
communications coded at a different frequency will be blocked at the membrane."

"Blocked" Reference 3

"One way to enable one neuron to dominate another neuron has already been described here for layer 6 axons. When two layer 6 axons compete for dominance at a dendritic or somatic membrane, the one whose spike frequency matches that of
the membrane's ongoing oscillation succeeds in delivering its series of spikes; if the other axon responds at some other spike frequency its input will be blocked. Conventional metaphors for This blocking type of selective mechanism is a filter or gate."

(Blocking or Gating is usually caused by the inhibition of a receptor right?)

"Blocked" Reference 4

"When apical dendrites in corticothalamic
loops oscillate, their oscillations are copied to networks of pyramidal neurons, and all network pyramidal neurons that are contacted will oscillate at a common carrier frequency into
which messages of temporally coded spikes may be inserted. Only neurons whose membranes oscillate at the specific carrier frequency will accept the spike signals: spike signals carried on other frequencies will be blocked."

Sitting patterns

NAPOT Revision 4 is essentially that patterns sit in our minds as active synapses between neurons that are firing tonically at the same frequency, and these computational mental

renderings are also defined by the inhibited synapses between neurons that are not firing at the same resonant frequency.

In NAPOT Revision 2 I theorized that individually upregulated & downregulated synaptic channels represented sparse & distributed representations that became printed to the network with a burst firing or high phasic somatic action potential.

But those synaptic patterns also oscillate with regular tonic action potentials, so they are printed regularly, to the mind, to become part of the rendered pattern of the mind.

I learned about the research on the Clusteron that I wrote about in note a0138z
https://github.com/v5ma/selfawarenetworks/blob/main/a0138z.md

That note dialed into how different thresholds for calcium can yield polar opposite cell behaviors, in their model if the synapse's medium threshold is reached the calcium triggers the LTD process (the receptors face removal via endocytosis (falling into the cell) or exocytosis(falling out of the cell)), (those lost receptors may move to a new location on the dendrite), and if the synapses high threshold is reached the calcium triggers the LTP process (new protein synthesis bolsters the placement of receptors or causes more receptor growth in that area).

PFC Variability Focus
"How the Brain Focuses on What's in Mind"
https://neurosciencenews.com/pfc-varability-focus-21363/
Reduced variability of bursting activity during working memory
https://www.nature.com/articles/s41598-022-18577-y

Which I tagged telescoping mind dials in on the fact that activated cell firing not only oscillates but via inhibiting it's exit terminal it sets the oscillatory timing of a bunch of other cells, magnifying a memory to it's network, but also making the memory persist without new activity needed.

A memory once initiated with a phasic action potential continues to oscillate with tonic oscillations, like a new expectation has been loaded into working memory. (In theory a negative action potential (slow potential or inhibitory action potential) should kill it (remove it from active expectation or working memory), and a high phasic (bursting) should amplify it into your focus perhaps taking over enough of a dendritic branch to cause a neuron representing another learned pattern to fire in phasic or bursting mode.)

The delta of potassium ions in the neuron when the action potential fires determines the frequency that neuron will create: 20 (Beta), 40 (Gamma), 60 (Gamma), and 80 (high Gamma) Hz"

**"Only neurons whose membranes oscillate at the specific carrier frequency will accept the spike signals: spike signals carried on

other frequencies will be blocked."**

In NAPOT 1 I covered the concept that a dendrite & its spines (receptors) can represent a memory that is defined by its synaptic connections and its morphology which determine what patterns the neuron is receptive to and what it ignores.

In NAPOT 2 I explored how inhibited & excited synapses might represent sparse distributed memory-predictions or SDR Sparse Distributed Representations, that might be stored in a synaptic configuration in the inceptive field of the exit terminal or apical dendritic branches.

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a0007z.ephaptic Ephaptic Coupling & Local Field Potentials

This was a good talk on **Spikes**, **LFPs**, **and Waves** https://youtu.be/qftGEaWKTfI
I enjoyed this but at the same time it felt disorganized & I felt that they failed to really discuss the stated topic of the discussion, which was whether or not brainwaves have a non-incidental function in cognition. In the talk it was speculated by one speaker that the significance of ephaptic coupling could be trivial or incidental or not worthy of being the focus of his research but I think the research shows that Emphaptic coupling is essential to brain & heart activity, and we could not function without it.

In NAPOT 3 I explored the SOMA scale anti-spike, the slow potential, slow wave potential, slow cortical potential, the DC potential, or the inhibitory delta frequency spike waveform from the SOMA might convey information, and separately how the extracellular potassium gradient contributing to the signals we see in local field potential measurements, eeg, and brain waves that carry the aggregate representatives of many phase changes (the signature of burstlets) from the extracellular ionic & transmitter gradients from neurons & glia.

Local field potential
https://en.wikipedia.org/wiki/Local_field_potential#:~:text=LFP%20are%20typically%20recorded%20with,in%20vitro%20brain%20thin%20slice.

In other words, in NAPOT 3, I'm speculating that primarily the extracellular potassium gradient, secondarily the extracellular calcium gradient, and to a lesser extent changes in the sodium & chloride gradients resulting from spiking activity give rise to local field potentials, which gives rise to Ephaphtic coupling events.

Voltage gated channels as well as Potassium & Calcium activated channels are going to be affected, leading to the inhibition or excitation of individual synapses via Ephaptic coupling. In this way brain waves might be felt by the brain (perhaps as feelings or emotions which I described in NAPOT 5 as being a match for tonic high magnitude low frequency brainwaves).

Brainwave Oscillations, it has been argued by Buzsaki (Rhythms of the Brain, 2006), and others, help to bind & synchronize brainwave activity into power bands with the names delta, theta, alpha, beta, gamma, high gamma etc... these oscillating power bands serve as binding attractors that absorb discordant oscillating states (like a de-resonating attractor that essentially dissipates the resonating oscillations of burst firing events including sharp wave ripples into the higher magnitude & lower frequency powerband) or otherwise the powerband oscillations exert an effect that is non-synchronous (describing something like a chaotic attractor, or possibly something like a splay state where a non-synchronous interaction is perpetuated over time).

Ephaptic coupling has also been documented as having a role in synchronization and timing with the mechanism being oscillatory physics as described by Steven Strogatz in his book Sync for example. I'm arguing that the synchronization via ephaptic coupling is analogous to the signals sent between oscillating clocks or between fireflies that eventually causes synchronization.

Ephaptic coupling via Wikipedia:
"For example, the currents that caused the depolarization (excitation) of the active nerve caused a corresponding hyperpolarization (depression) of the adjacent resting fiber. Similarly, the currents that caused repolarization of the active nerve caused slight depolarization in the resting fiber. Katz and Schmitt also observed that stimulation of both nerves could cause interference effects. Simultaneous action potential firing caused interference and resulted in decreased conduction velocity, while slightly offset stimulation resulted in synchronization of the two impulses."

"conditions can be manipulated in such a way that the action potential from one neuron can be spread to a neighboring neuron. This was accomplished in one study in two experimental conditions: increased calcium concentrations, which lowered the threshold potential, or by submerging the axons in mineral oil, which increased resistance. While these manipulations do not reflect normal conditions, they do highlight the mechanisms behind ephaptic excitation"

"Ephaptic coupling has also been found to play an important role in inhibition of neighboring neurons. Depending on the location and identity of the neurons, various mechanisms have been found to underlie ephaptic inhibition. In one study, newly excited neighboring neurons interfered with already sustained currents, thus lowering the extracellular potential and depolarization the neuron in relation to its surrounding environment, effectively inhibiting the action potential's propagation."

" In the simpler case of adjacent fibers that experience simultaneous stimulation the impulse is slowed because both fibers are limited to exchange ions solely with the interstitial fluid (increasing the resistance of the nerve). Slightly offset impulses (conduction velocities differing by less than 10%) are able to exchange ions constructively and the action potentials propagate slightly out of phase at the same velocity. More recent research, however, has focused on the more general case of electric fields that affect a variety of neurons. It has been observed that local field potentials in cortical neurons can serve to synchronize neuronal activity."

"it is hypothesized that neurons are ephaptically coupled to the frequencies of the local field potential. This coupling may effectively synchronize neurons into periods of enhanced excitability (or depression) and allow for specific patterns of action potential timing (often referred to as spike timing). This effect has been demonstrated and modeled in a variety of cases.[10][11]"

"Ephaptic interactions among cardiac cells help fill in the gaps that electrical synapses alone cannot account for. There are also a number of mathematical models that more recently incorporate ephaptic coupling into predictions about electrical conductance in the heart."

"The inhibition due to ephaptic coupling would help account for the integration of signals that gives rise to more nuanced perception of smells"

https://en.wikipedia.org/wiki/Ephaptic_coupling#:~:text=Ephaptic%20coupling%20is%20a%20form,electrical%20synapses%20and%20chemical%20synapses.

"Ephaptic coupling in white matter fiber bundles modulates axonal transmission delays"
Helmut Schmidt ,Gerald Hahn,Gustavo Deco,
"We demonstrate that, although the extracellular potentials generated by single spikes are of the order of microvolts, the collective extracellular potential generated by spike volleys can reach several millivolts. As a consequence, the resulting depolarisation of the axonal membranes increases the velocity of spikes, and therefore reduces axonal delays between brain areas. Driving a neural mass model with such spike volleys, we further demonstrate that only ephaptic coupling can explain the reduction of stimulus latencies with increased stimulus intensities, as observed in many psychological experiments."

"The key finding of our study is that spike volleys generate EPs with sufficiently large amplitudes to modulate axonal delays. Specifically, the mean delay of a spike volley decreases as the number of spikes in the spike volley is increased. Therefore, our results suggest that varying the amplitude of a neuronal signal can adjust its delay. Using a neural mass model, we have demonstrated that the decrease of axonal delays translates into the decrease of response latencies as the stimulus intensity is increased."

"In the presence of ephaptic coupling, the spike volley slowed down. This is in line with previous numerical studies which investigated ephaptic coupling effects between a small number of identical axons. There, ephaptic coupling led to a synchronization of the spikes within a volley, and a concurrent deceleration of the spikes."

"The EP at a node of Ranvier can reach several hundreds of microvolts." "As oligodendrocytes can myelinate multiple axons [41, 42], it is conceivable that neighboring axons show some degree of alignments, in which case it would be possible to observe ephaptic coupling effects in much smaller fiber bundles, provided the spike volleys are sufficiently synchronized."

https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1007858

NAPOT 4 Converges 2 & 3 with the unification of two concepts: Synaptic Inhibition that is based on Somatic Frequency to create stable short term patterns in the mind.

NAPOT 4 helps connect together the different types of signals at the synapse scale exploring how they intersect with the different tonic frequencies that neurons can oscillate with. The Neuron can subselect active patterns, as active synapses, with its potassium gradient, so that it is only receiving synaptic patterns in a certain frequency range such as 20hz, 40hz, 60hz, or 80hz. Which means that synapses that are connected to neurons that are not in a matching frequency become inactive, blocked, filtered, gated, or inhibited.

So in NAPOT 1 we already covered how the dendritic morphology & the synaptic growth define a memory. In NAPOT 4 we explore how the frequency of the neuron, set by the soma burst, determined by the potassium quantity, selects which synapses are inhibited at a high level, blocking communication with neurons that are out of sync.

So essentially NAPOT 4 defines how persistent long lasting memory-predictions & internal representations can be redefined in real time, faster than it takes for receptors to grow or decay, because we are talking about the inhibition or excitation of individual receptors.

PFC Variability Focus
"How the Brain Focuses on What's in Mind"
https://neurosciencenews.com/pfc-varability-focus-2163/

Reduced variability of bursting activity during working memory
https://www.nature.com/articles/s41598-022-18577-y

What I said previously in this article, linked above, highlights the fact that when cells fire they oscillate repeatedly. They are setting a pattern in motion. That pattern sits in tonic oscillation until it is changed. So patterns sit in our mind, like the led lights staying on, until they are changed, and they sit in the activated synapses, and these patterns are conversely also etched by the inhibited neurons between cells that are not oscillating together at the same resonant frequency.

The idea is that when you are focused on something, at a small scale, a neuron fired, it magnified it's message to it's network, it set the timing of it's inceptive field, so that those neurons that were tuned in or receptive to it's inceptive field (not blocking or inhibiting communication because they were in a different frequency) are going to become inhibited, so attention (reference: attention schema theory) becomes focused on the neuron that fired, and

it's signal is amplified via the inhibition of nearby neurons, and it continues to make sharp wave ripples across the brain to neurons that are receptive to its inception.

The NAPOT 4 Revision

So the idea from NAPOT 2 is that tonic action potentials are printing the synaptic configuration. Sending a sparse distributed message, but specifically the phase wave variance releases a quantity of vesicles per synapse between 0 1 2 3 with the quantity determined by APD action potential duration.

In NAPOT 4
I am exploring the idea that the phase change of Neuron C, changes which other neurons (D, E, F) that Neuron C is exchanging messages with, because that neuron's phase pattern is now firing at 20hz, 40hz, 60hz, or 80hz (when it's not inhibited).

So let's say that Neuron C at (20hz) isn't talking to D (at 40hz), E (at 60hz), or F (at 80hz), then it has an action potential spike with a major change in potassium levels resulting in a shift in its phase (frequency) from 20 hz to 60hz. The idea is that now the synapses between Neuron C & Neuron E are uninhibited, communication channels are open between, they neurons are oscillating at the same frequency, and the synapses they share are upregulated, and so they share information (via neurotransmitters), it's bidirectional synaptic communication, and they act as a unified or entified sensor & transmitter system. They become a cell assembly that has wired together in the Hebbian sense.

I am exploring the idea that the postsynaptic membrane on a neuron is going to change its status based on the signal it receives, which is based on the phase pattern of its axon or neuron body.

So this is like if Neuron A shifts into a 40 hz oscillation, and it sends a signal to a matching 40hz oscillating neuron, their synaptic channels will remain open to one another, it's sort of like "we both see this pattern" but then the message sent by 0, 1, 2, 3 vesicles per synapse is going to dial in the computations for the next computational pattern rendering.

It's like looking around you, what you are seeing is not reality, it's a replication of reality, a computed rendering in the volumetric computer screen of active synaptic connections.

a0138z.clusteron reference the Numenta Video Clusteron "Plasticity and Learning Algorithms in Models of the Single Neuron"

With NAPOT 4 The discussion is about the blocking of individual synapses, based on the oscillation frequency set by the whole neuron.

The questions to keep researching to validate this are:

If we are looking at two neurons that are linked: A is the presynaptic, B is a postsynaptic neuron, can either neuron A or B initiate the blocking of receptors, by inhibiting one or both of the channels between A & B?

If A inhibits the synapse shared with B do both synapses become inhibited together?

Do both synapses become uninhibited together?

Are there situations where A's synapse can inhibit B's synapse but not its own, can B backpropagate to inhibit A's synapse but not its own.

Can A uninhibit (excite) its own synapse and then excite or inhibit B's receptor?

Can B excite its own synapse and then excite or inhibit A's receptor?

What happens to the pre-synapse, and neural synchrony when drugs become receptor agonists with SSRI, DMT, LSD, Caffeine, and other mind altering food & drugs?

If A is oscillating at 40hz and B is oscillating at 20 hz are all the synapses between them inhibited?

Does research exist that confirms that this process allows active internal representations to stay active in memory, like LED lights that stay on (as if with each soma tonic action potential oscillation the led of active synapses is imbued into the phenomenologically conscious mind) like patterns sitting in your mental workspace.

a0007z.redness The Theory of Redness (Phenomenological Consciousness)
It's like the phase differential of redness is some configuration of upregulated synapses shared by neurons oscillating at the same frequency, defined also by the synapses that are not active, like the pixels representing black color on your tv monitor.

In the NAPOT 4 picture we are focusing on two types of neuropaths: One defined by grown biological connections (LTP synaptic growth/LTD synaptic atrophy) & Dendritic Morphology, and the other neuropath is defined by shorter term active & inactive synapses, that will change more rapidly with somatic phase changes. Which is useful for shorter term memory that needs to change on a faster time scale. The latter faster changing neuropath is essentially an electrically active subset of the longer term neuropath, and can change on a time scale ranging from milliseconds (NMDA & AMPA receptors) to seconds (BTSP Behavior Timescale Synaptic Plasticity)

b0232y.btsp https://github.com/v5ma/selfawarenetworks/blob/main/b0232y.md

These synaptic changes basically shape the wave path of phase wave signals as they travel through the brain, it shapes the path of voltage cell by cell, and going back again to the concept

of phase wave changes being like tensors in a Taylor Series evoking shapes that your neural network can trace. Your internal representations that exist as phase changes across configurations of cells actively linked together, or not actively linked together.

a0149z https://github.com/v5ma/selfawarenetworks/blob/main/a0149z.md

In this thought experiment, networks of neurons with their connections create structures defined by active & inactive synapses that other neurons can recognize, as the brain's tonic oscillations dissipate signal energy valence the impressions of synaptically modeled information is distributed across the brain's network.

Internal representations defined by inhibited synapses (disconnected neurons) and excited synapses (neurons with the same frequency vibration) and these internal representations are also defined by the morphology of the dendrite, and the synaptic connections, and the parts of the dendrite that are active (because the voltage in that part of the dendrite opens up it's receptivity to associated patterns, because the voltage spill over from heterosynaptic plasticity increases the chances of synaptic depolarization from a lower frequency synaptic transmission)

The mirror image of the somatic phase change may also be released as a brainwave via the extracellular potassium gradient when the neuron acts as an electrical sink, grounding its extra energy to the brain as a whole.

The preference for particular frequency
"The preference of these neurons for one particular frequency implies that spike communications coded at a different frequency will be blocked at the membrane."

"(...)plausible that the frequency of coded pulses can serve as the basis for selecting particular cortical circuits, and for selecting the corresponding cognitive function(s) that they provide."

"In short, the layer 6 apical dendrites of a column cluster of minicolumns may serve to group neurons into functional circuits."

Sustained attention
"Cognitive processing of a visual scene usually requires that a part of the scene is selected for special processing by an appropriate circuit or a part of a circuit. This more restrictive selective activity is commonly called attention. The particular form of attention being treated here is called sustained attention,"

"When sustained activity functions as sustained attention, additional neural mechanisms appear to be involved."

"an apical dendrite in a layer 6 pyramid loop communicates its particular oscillation frequency

to a group of cortical neurons, which are then able to interact with each other by signals traveling on that particular “carrier frequency.”"

"when the membranes of dendrites and somas of two or more neurons oscillate at a common frequency (but at subthreshold voltages), only incoming axon
spikes at that frequency will be accepted by the neurons."

To execute a task

"a specific task, e.g., to a search task, a
response planning task, or a perceptual preparation task. "

Your 6th layer pyramidal neuron needs to create a cell assembly, imagine neural circuits as lego blocks that your brain has to stack to build a program to accomplish a task, repurposing other neurons & columns for the task at hand. "let's search for something" So it has to compete with other pyramidal circuits that are doing other tasks. "I'm eating"

In this paper the 6th pyramidal has to compete to dominate other neurons, to get the neural circuits it needs to complete a task.

"When two layer 6 axons compete for dominance at a dendritic or somatic membrane, the one whose spike frequency matches that of the membrane’s ongoing oscillation succeeds in delivering its
series of spikes; if the other axon responds at some other spike frequency its input will be blocked"

A neuron in layer 5 will join your task, because it was oscillating at the same general frequency. I was feeling it. Same vibration.

"Another way to enable a particular axon to dominate other axons that synapse on a common dendritic segment is by shifting to the mode of bursting. When the signal amplitude of the target axon is sufficiently greater than that of other axons in the synaptic vicinity the signal inputs from other axons will be blocked"

Bursting mode essentially changes which neuron can talk to which other neuron, for the duration of that bursting.

"In electrical physics an appropriate metaphor is gain (or voltage) control, corresponding to the term enhancement in psychology. Another cognitive metaphor for this amplifying type of selection
is a spotlight."

"FIGURE 11 | Proposed graphic descriptions of regular spiking and intrinsic bursting neurons. Layer 6 pyramidal neurons produce regular spiking, which is represented by a narrow

carrot-shaped icon (intended to resemble the electric field of the active apical dendrite). The tapering carrot shape reflects the diminishing
electrical effect of the persistent leak current, by which positive ions of potassium flow out of the dendrite. Layer 5 pyramidal neurons produce regular spiking, but also intrinsic bursting, which is a series of brief groups of very rapid spikes. As the number of spikes in a burst increases, the voltage of the burst pulse increases. To represent these differences in burst intensity the carrot-shaped icon varies in width."

The Thalamic Matrix Neurons create loops that connect cortical columns loops together (the neighborhood feedback chat)
"Axons of thalamic matrix neurons tend to
contact pyramidal neurons within the minicolumn that originally sent axons to the thalamic matrix neurons"

"but they also contact pyramidal neurons in minicolumns that are located at adjacent
cortical areas"

"FIGURE 12: The figure shows the carrot-shaped graphics of apical dendrite activity,
which depicts the shape of the electric field surrounding the apical dendrite."

"Axons of core thalamic neurons tend to contact
neurons located within the cortical column of origin"

The Core Thalamic neurons create loops with the cortical column of origin. (The mirror feedback)

Because of the thalamic connection between layer 5 pyramidal cells and layer 2/3 pyramidal cells (the connection between the distal ends of the apical dendrites)

"the apical dendrites of layer 2/3 pyramids will engage in oscillating activity that matches the oscillation frequency of the layer 5 pyramids. "

"When two layer 2/3 pyramidal neurons, separated by small or large cortical distances, oscillate in synchrony, they can effectively communicate with others."

"With the apical dendrites of layer 2/3 pyramids oscillating at the same frequency as the layer 5 pyramids, and with the layer 6 pyramids setting the oscillation frequency of the layer 5 pyramids, all of the pyramidal apical dendrites of the minicolumn apparently oscillate in synchrony."

This appears to be confirmation of the idea that a cortical column (in this case a mini column) represents an oscillating cell assembly. I wrote elsewhere that this was my assumption

"under typical conditions membranes of all of

the excitatory neurons of a minicolumn oscillate in synchrony at a particular frequency. "

"the entire column of excitatory neurons oscillates at a specific frequency."

Essentially the minicolumn & the cortical column (detailed so well by V. MountCastle) is Donald O Hebb's cell assembly.

Signal to noise ratio

"In effect, higher amplitude oscillations in layer 2/3 pyramids increases the signal-to-noise ratio of an input at basal dendrites."

It's like saying that the higher magnitude lower frequency tonic oscillations that are common (with greater area effect) provide a high contrast (signal to noise ratio) to the low magnitude high frequency (phasic & high phasic) sensory inputs.

"Sufficiently high amplitudes of oscillations in layer 2/3 pyramids often represent a high level of preparatory attention"

That is why I call the higher magnitude but lower frequency tonic oscillation the ready state, the ground of being, awareness, the edge of criticality. It's a state of being prepared to interpret incoming signal data. It's the formless empty mind in which forms arise.

The locus of consciousness, the canvas of consciousness we can now argue might be based in the Layer 2/3 Pyramid Cells of the minicolumns & cortical columns, and the layer 2/3 pyramidal cells of the hippocampus.

"bursting in axon inputs to the distal
segment of apical dendrites of layer 2/3 pyramidal neurons could increase the tonic level of voltage at the soma so that only a
small increase in current from a basal dendrite is required to produce a discharge into the axon"

"Up to this point in the present study, the only excitatory inputs to the layer 1 segment of the apical dendrite are axons arising directly from the thalamus within the corticothalamic loop circuit."

"To summarize the main points of this section, the thalamic inputs to the top of the long apical dendrites of layer 5 pyramids can consist of trains of bursts, unlike the inputs to the top of long layer 6 apical dendrites, which almost always consists of the regular firing of single spikes. Each burst is regarded as a surge of current, but its voltage is higher than the voltage of the current produced by a single spike input to the apical dendrite. As these high-voltage surges repeatedly pass down the apical dendrite via the corticothalamic loop, the apical dendrite oscillates at a high voltage. While being fine-tuned by passing repeatedly down the apical dendrite, these oscillating pulses are transmitted to the adjacent pyramids of layer 2/3."

Key Point: high amplitude tonic frequencies create a ready state for high frequency low amplitude sensory input signals

There, they produce an elevated "tonic level" of voltage at the somas, which effectively lowers the amount of voltage at basal dendrite synapses needed to evoke a spike response at the soma.

"This lowering of the response threshold allows inputs at basal dendrites to evoke spike responses in the layer 2/3 neurons when they previously could not. In this way, burst-firing of layer 5 pyramidal neurons can selectively enhance the processing of particular circuits within the horizontal network."

This paragraph below must be read! Their thought experiment was about the image of a dog "appearing" somewhere in between the layer 6, 5, 2/3 cells in that order. They just do not have the concept of computational neural rendering integrated here.

"The circuit effects of burst firing in layer 5 pyramids can be illustrated by the cognitive example of the “hidden image” of a Dalmatian dog in a degraded scene of light and shadows."..."Typically, an observer reports an array of black forms within a white background, but soon the figure of the dog suddenly appears in the foreground."

1. "The present theory claims that the first perception is produced by outputs from layer 6 loops, which produce trains of single spikes to neighboring apical dendrites of layer 2/3 pyramids.

2. "The enhanced spikes of the layer 2/3 neurons are then transmitted to their axons within the horizontal network of cortical processing."

3. "The second perception (the shape of the dog) is produced by inducing a group of layer 5 neurons, representing a part of the whole scene, to fire bursts of spikes."

4. "(...)one can infer that the selection of the dog’s shape and the location of the dog’s shape occurs at virtually the same time"

5. "the supporting circuits for these two events dominate other circuits that might be concurrently active."

I don't agree with the sequence, I would say that the first perception is from the sensory inputs to layer 1 & 2/3 neurons is where the degraded scene of light & shadows transforms into the forms of a dog's shape, location, and the world, and with each oscillating cycle of activity from their upwards and back down again the image & detail is refined. The main factory of rendered perception is going to be in layer 2/3 I think. In the horizontal network of the chattering neurons of layer 2/3. Even so every cell contributes to the rendering with its output. My hunch is that the secondary factory could be the layer 5 horizontal tuft network.

"The tufted top layer of layer 5 pyramidal neuron receives axon fibers from many cortical sources, most of them (90%) as connections from distant locations and less of them (10%) as connections from locations nearby (Hubel, 1982)."

What are the exact mechanisms that cause the opening & excitation or blocking & inhibition of communication synapses when a neuron's phase changes?

"This amplification effect at the soma resulting from facilitating basal dendritic input has been recently described as the Apical Amplification (AA) hypothesis by Phillips (2017)."

"The dendritic tuft apparently represents a separate segment of the apical dendrite that functions as a subthreshold integrator of tuft inputs which has an augmenting effect on synaptic inputs located on basal dendrites."

The Apical Dendrites pass EPSP Excitatory Postsynaptic Potentials via the Thalamic Loop to the Basal Dendrites.

"The idea that synaptic inputs at the apical dendrite tuft can produce a modulating effect on synaptic inputs throughout the layer 5 pyramidal neuron was put forth by Schwindt and Crill (1995)."

The synapses on the back end of a neuron are through intermediate cells modulating (changing) the synaptic efficacy (up or down regulating) synapses in the front end of the neuron that receives sensory input (the basal dendrite).

"They examined the effect of specific channel blocking agents on the current arriving at the soma during iontophoresis of glutamate at a distal site on the apical dendrite and found evidence for amplification of input current at dendritic synapses."

"In addition to increasing the reliability of signals, the spike pattern of a multi-spike burst carries a large amount of information."
"based on the n-spike burst code (Elijah et al., 2015)"

"This n-spike coding may be a general property of thalamic neurons

"interspike frequencies could resonate with subthreshold membrane oscillations of a postsynaptic neuron (Izhikevich et al., 2003)"

"which would enable the kind of selective communication between neurons described in the present paper"

"respond to layer 6 axon inputs to set the resonant frequency value of their oscillations, and they also refine that value to less than

1 Hz by repeatedly passing EPSPs along the apical dendrite via the thalamocortical loop."

Are there other ways that synaptic communication blocking might result in neurons being in different frequency bands?

The argument seems to be that the different brainwave frequency bands are like channel separated radio bands, where interference avoidance was accomplished through frequency & spatial separation, somehow the potassium & calcium shuffling that happens when a neuron changes its over all frequency is at the same time exciting synapses to neurons with matching frequency bands & inhibiting synapses to neurons on different frequency bands.

I think Oscillatory physics explains the existence of power bands in brainwaves because oscillations cluster naturally, they bump into each other, change each other, attract each other to a matching frequency through dissipation of signals that results in synchrony, and then they appear to absorb each other, oscillations absorbing oscillations, the greater oscillations have a gravitational interaction with smaller oscillations, so frequency bands form in your brain, but also in space.

What could be the physics based reason for why synaptic communication between neurons that are oscillating at different frequencies would be blocked or inhibited at the synapse?

The splay state effect? Repulsion from an incompatible oscillatory frequency?

I had this idea that perhaps each side of the synapse needs to be in the same oscillating cycle for synchrony to happen. I am guessing this idea doesn't workout because once each side completes its reset cycle it will just sit there until triggered right? I think blocking implies that the receptive channels are not going to open up even if hit with neurotransmitters from a pre-synapse. The cell might be emitting some chemical that causes the channels to freeze up.

a0007z.reverse I proposed the concept of reverse heterosynaptic plasticity with Voltage Gated Potassium Channels.

The other concept is that the ESPS passed from the 6 Layer Apical Tuft to the Thalamus, to the Basal Dendrite are by increasing voltage near the soma through the excitation of some synapses some how shifting the cells charge (in calcium ions) away from the synapses of neurons that are not in sync (like reverse heterosynaptic plasticity) pulling charges away from certain synapses, resulting in the inhibition of synapses that branch to neurons that are out of sync. In a nutshell I'm proposing that the ESPS from the Apical dendrite layer, routed through the thalamus, to the basal dendrite are causing a reverse heterosynaptic plasticity with calcium ions, inhibiting synaptic channels that have grown between neurons that are not currently oscillating at the same powerband frequency.

Besides the novel idea of reverse heterosynaptic plasticity, EPSPs from the Apical Tuft via the Thalamus could potentially also open Potassium channels, inhibiting or hyperpolarizing synapses by leaking charges into the extracellular membrane.

In heterosynaptic plasticity the VGCC Voltage Gated Calcium Channels are opened in synapses that did not fire leading to cascading depolarizations in proximal synapses. However the VGPC Voltage Gated Potassium channels could be triggered by the same heterosynaptic plasticity process, resulting in inhibited or hyperpolarized synapses. Actually this seems so obvious I doubt that I came up with the idea of reverse heterosynaptic plasticity. I just haven't had a chance to look it up yet.

I did not think I would be getting this deep into GABAergic neurons, Chloride Ions, Pyramidal cells, Voltage Gated Potassium channels, Inhibitory Heterosyntic Plasticity & Block Selection of cooperating Cortical Columns before my book was done but here I am.

"Competition for synaptic building blocks shapes synaptic plasticity"
https://elifesciences.org/articles/37836

"Dendritic Voltage-Gated Ion Channels Regulate the Action Potential Firing Mode of Hippocampal CA1 Pyramidal Neurons"
https://web.archive.org/web/20200323095257id_/https://journals.physiology.org/doi/pdf/10.1152/jn.1999.82.4.1895

"Potassium Channels: Newly Found Players in Synaptic Plasticity"
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2665047/

"The contribution of ion channels in input-output plasticity"
"EPSPs are also shaped by small conductance calcium-activated K+ (SK) channels. Calcium influx through NMDA-R has been shown to activate SK channels located in the dendritic spines thus attenuating EPSP am- plitude and duration (Adelman, Maylie, & Sah, 2012; Faber, Delaney, & Sah, 2005; Ngo-Anh et al., 2005). Interestingly, SK channels are downregulated following stimulation of synaptic metabotropic gluta- mate receptor subtype 5 (mGluR5) resulting in enhancement of EPSP- spike coupling (Sourdet, Russier, Daoudal, Ankri, & Debanne, 2003). Nevertheless, EPSP-spike coupling in cortical neurons is poorly de- termined by EPSP amplitude and highly dependent on the rate and the waveform of dendritic EPSPs (Larkum, Zhu, & Sakmann, 2001). In cerebellar Purkinje cells, EPSP amplitude has also limited control over cell firing but pharmacological modulation of SK channel and SK-de- pendent plasticity strongly regulate spike firing (Ohtsuki & Hansel, 2018)."

"2.2. Modulation of spike threshold
Input-output function may also be altered via modulation of ion channels that control the spike threshold (Fig. 1C). Voltage-gated Na+ (Nav) and K+ (Kv) channels determine the spike threshold (Bean, 2007). Shift of Nav activation towards hyperpolarized values lowers the spike threshold and increases excitability following induction of long- term synaptic potentiation in CA1

pyramidal neurons (Xu, Kang, Jiang, Nedergaard, & Kang, 2005). Down-regulation of Kv1 channels fol- lowing chronic activity-deprivation with pharmacological treatment in hippocampal neurons (Cudmore, Fronzaroli-Molinieres, Giraud, & Debanne, 2010) or following cochlea removal in auditory neurons (Kuba, Yamada, Ishiguro, & Adachi, 2015), lowers the spike threshold and increases intrinsic excitability. It should be noted that in contrast to change in EPSP amplification, spike-threshold modulation is global since it may affect all incoming inputs."

"2.3. Modification of resting membrane potential
Change in resting membrane potential (RMP) represents the third manner to modulate input-output function by non-synaptic mechanisms (Fig. 1D). In hippocampal granule cells, high frequency firing induces long-term depolarization (LT-Depol) of their RMP by approximately 8–10 mV (Mellor, Nicoll, & Schmitz, 2002) that is mediated by a protein kinase A-dependent up-regulation of HCN channels. Whereas the up- regulation of HCN channels leads to attenuated EPSP amplitude and therefore to a reduction in intrinsic excitability (see above), the net effect here is however an increased excitability. In fact, the large de- polarization of RMP (8–10 mV) largely dominates the excitability re- duction caused by the attenuation of excitatory synaptic inputs. Here again, this modulation is global as all inputs will be equally affected."
https://hal-amu.archives-ouvertes.fr/hal-02363603/document

"The role of synaptic ion channels in synaptic plasticity"

Off topic note
"Nicotinic acetylcholine receptors. Neuronal nicotinic acetylcholine receptors (nAChRs) are pentameric ion channels gated by the neurotransmitter and the alkaloid acetylcholine agonist nicotine. nAChRs are mainly permeable to sodium and potassium, with much less conductance to calcium, and are located on hippocampal pyramidal neurons as well as interneurons (Hogg et al, 2003). Several studies have shown that nAChRs are important for learning and memory in humans and animal models. Blockage of nAChRs in the hippocampus of rats results in significant memory deficits, whereas nAChR agonists including nicotine improve certain types of memory, such as short-term and working memory, in humans (Ji et al, 2001; Levin et al, 2002; Seeger et al, 2004)."
"nAChR currents are likely to take part in postsynaptic calcium signaling either directly through their calcium component or indirectly by contributing to postsynaptic depolarization"

On Topic again

"Small-conductance calcium-activated potassium channels (SKs) are widely distributed in the nervous system and are involved in shaping neuronal responses to synaptic stimulation (Bond et al, 2005)

"In hippocampal CA1 neurons, SKs contribute to the after hyperpolarization and modulate neuronal excitability. By allowing potassium efflux after their activation, SKs have the capacity to quench postsynaptic potentials (Faber et al, 2005). In turn, repolarization of the postsynaptic membrane favors NMDA receptor obstruction by Mg2+ ions, which limits further calcium influx.

Thus, SKs are part of a negative feedback loop that attenuates synaptic transmission (Ngo-Anh et al, 2005). Indeed, blockage of SKs enhances LTP in the hippocampus and the lateral amygdala, whereas SK overexpression diminishes LTP and impairs learning behaviors such as spatial learning and fear conditioning (Hammond et al, 2006)."

The presynaptic vehicle brakes

"Large-conductance, calcium-activated potassium channels (BKs) also influence synaptic plasticity. These channels are regulated by both calcium and voltage and are localized at presynaptic terminals throughout the nervous system (Hu et al, 2001). Inactivation of BKs increases the probability of neurotransmitter release at synapses between CA3 neurons of the hippocampus (Raffaelli et al, 2004). "...
"Thus, BKs might provide negative feedback that moderates signaling through the synapse at the presynaptic side, under conditions of excessive depolarization and accumulation of intracellular calcium."
"Specific, non-synaptic voltage-gated potassium (Kv) channels are important for controlling neuron membrane electrical excitability and are localized to axons, somata and dendrites."
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1679792/

NAPOT 4: Communication between Cell Assemblies at different speeds.

At a high level NAPOT Revision 4 has caused me to rethink cell assemblies, not just as neurons that are oscillating together, but as neural paths of *synaptically active* blocks.

I guess I had imagined that neurons from different oscillating cell assemblies might still be communicating synaptically, but now it's more clear that they literally have to reach a shared oscillatory moment, that can happen with bursting, before a message is transmitted between oscillating groups.

Bursting, it might be argued, could be about creating a temporary phase bridge to transfer information from one oscillating group of cells to another oscillating group that is normally out of phase. Something about this is not right about this argument. Let's rethink this part.

"A study by Womelsdorf et al. (2014) recorded cellular activity in anterior cingulate cortex and lateral prefrontal cortex (ACC/PFC) of
macaque monkeys during a selective attention task. When the subjects began to attend to the task, neurons in the ACC/PFC increased their firing of brief 200 Hz spike bursts. Burst spikes showed synchrony over long cortical distances; indicating, in particular, that circuits in area 24 (in ACC) and 46 (in PFC)"

"These results support the hypothesis that burst-firing can produce the selection operation of attention by amplifying neuronal activity."

Perhaps it's not as much about blocking or domination as this paper suggests inside a cortical column, from the Layer 6 Pyramidal cell.

Especially since the paper basically outlines how the whole microcolumn oscillates at the same frequency. If that is the situation across the whole neocortex then blocking inside cortical columns seems to have a small role. Also I do not see this paper presenting evidence for how 6th pyramidal cells might effectively block inputs from other neurons that are out of sync phasically. Their paper suggests that the 6th Pyramidal Cells excite the soma's of layer 2/3 cells with EPSP's.

The fact is also that neurons oscillating at 40hz are going to be receiving 200 Hz spike bursts, meaning that this idea of group selection & blocking might apply to group cell assemblies with tonic oscillations. But that is not going to block cell assemblies from receiving out of sync inputs.

This cell assembly selection via blocking might play a greater role synchronizing large cell assemblies that each represent whole cortical columns. It seems that the synchrony inside a cortical column or minicolumn is achieved mainly through EPSP excitatory tuning, and not through domination or blocking, at least with regard to what the 6th layer Pyramidal is doing, as described in this paper.

Instead of describing the Layer 6 Pyramidal tuning as a domination game, perhaps we should describe it as a voluntary enlistment game. Where Layer 6 Pyramids are recruiting cooperative partners with exciting messages.

I think this reconceptualization from "domination" to "voluntary recruitment" makes more sense, because it allows for neurons that are not communicating currently to still be open or listening to new patterns so that they can "hear" the 200 Hz spike burst which could come from anywhere, and would be really hard to ignore, even with inhibited synapses, because of heterosynaptic plasticity + VGCC & VGPC

To be clear I still like the ideas of selection blocking via synaptic inhibition, from EPSPs sent from the 6 layer Apical Dendrite via the Thalamic Neurons cause ions to hyperpolarize synapses.
For example if the result of EPSPs directly triggers potassium channels to open or cause other ion activity that hyperpolarizes or inhibits synapses
1. If heterosynaptic plasticity triggers synapses that are armed with VGPC Voltage Gated Potassium Channels, then the synapse would become inhibited or hyperpolarized)) but since the neurons in a microcolumn are siloed from other microcolumns & cortical columns, and since the neurons inside a column are in synchrony from Layer 6 Pyramidal Tuning, such a mechanism (referring to blocking) does not seem to be strictly necessary.
2. If heterosynaptic plasticity SK Calcium activated Potassium Channels.

3. If heterosynaptic plasticity triggers Voltage Gated Chloride CL- channels to open.

Instead voluntary recruitment of oscillatory synchrony via EPSP signaling seems to work here, and it also works fine with the description of the physics of how oscillations outlined in the book Sync by mathematician Steven Strogatz.

What I am saying is that blocking probably does happen this way, on a small scale, temporarily, as a weak & passive short term effect. I have doubts about whether it could be the main driver of selection between cooperating cell assemblies or cooperating microcolumns & cortical columns.

With columns having electrical isolation + dendritic membranes being naturally leaky + entropy there is enough working against the physics of synchrony in the first place to make blocking via synaptic inhibition seem like it plays a small role in selecting groups of cell assemblies to work together.

I do think (inhibition or blocking) is a real effect, but just not the driving effect.

I think selection (or oscillatory grouping), at least as described in this paper, is mostly from excitatory synaptic potentials EPSPs, not from this interesting metaphor of neuronal blocking for dominance.

While writing this I remember David Eagleman saying something like "Imagine the brain is a cooperation of rivals" or "The human brain runs on conflict" - Eagleman, maybe not Mr. Eagleman. Maybe not. Just humor.

Conjecture: Whether you describe the activity as voluntary cooperation patterns, or as a conflict between choices, this may just be a matter of characterization, a made up story either way. Cooperation with one idea is a conflict with another idea.

Of course domination through excitation is a viewpoint one can have.

I feel like the real motivation of the 6 layer pyramidal cells is a lot more about energy dissipation & oscillatory synchrony, and not about selection via blocking.

a0007z.interneurons
a0309z.interneurons

Alternatively: Block selection of whole mini columns & cortical columns, via Thalamic Matrix Neurons triggering GABAergic Inhibitory Interneurons makes a lot more sense.

**Blocking for cell assembly of whole columns between cortical columns via Thalamic Matrix Neurons communicating with GABAergic Inhibitory Interneurons makes more sense, but the

focus shifts from united individual neurons with individual frequencies, to a focus on selecting (uniting & dividing) whole cortical columns to work together.**
Since a neo cortex column tends to oscillate at one frequency the focus on blocking individual neurons with signals from 6th pyramidal EPSPs may not be the most important factor in cooperation between cells.

GABA GABA

"GABA is a general inhibitory neurotransmitter, which is sensed at GABAergic synapses by ionotropic (GABA-A) and metabotropic (GABA-B) receptors. GABA-A ion channels consist of five subunits forming a central pore that is permeable to negatively charged chloride ions (Cl^-; Baumann et al, 2001). Cl^- influx through GABA-A receptors hyperpolarizes mature postsynaptic neurons expressing appropriate Cl^- transporters and inhibits synaptic transmission."

This could be why cocaine addicts (Putin) think their bad ideas (like Russia invading Ukraine) are good ideas. Less GABA Cl- influx, less inhibition. (humor)

"Repeated exposure of rats to cocaine reduces the amplitude of GABA-A-mediated synaptic currents and increases the probability of spike initiation in dopaminergic neurons of the ventral tegmental area"

"GABAergic and pyramidal neurons of deep cortical layers directly receive and differently integrate callosal input"

My statement: Perhaps most of the blocking & inhibition & selective cell assemblies are accomplished with GABAergic inhibitory interneurons and CI-influx (Chloride Ions)
If that is the kind of blocking that the people writing the Neural electric tuning paper were thinking about then another big picture is emerging.
1. selection of cooperating neural columns might be a bigger deal then block based selection between neurons inside a single column.
2. We would need to look for a possible link between the 6th layer pyramid cell & its EPSP's that are sent to basal dendrites of OTHER cortical columns via the Thalamic Matrix Neurons.
3. We would need to find a possible link between the 6th layer pyramid cells & the GABA activated Chloride receptors.
4. Or show a different path that simultaneously stimulates 6th layer Pyramidal & GABA interneurons, and shows that they can function in concert, together. Allowing GABA Interneurons to fulfill the role of blocking whole columns of the Neocortex that are oscillating on

a different frequency power band, and grouping columns of the cortex that are on the same resonating frequency.

"parvalbumin (PV)-(...) Stimulation of callosal fibers elicited monosynaptic excitatory postsynaptic currents in both layer VI pyramidal neurons and γ-aminobutyric acidergic (GABAergic) interneurons immunopositive for the vesicular GABA transporter and PV"

Okay so it looks like Pyramidal Neurons and GABAergic interneurons are simultaneously stimulated (presumably by Thalamic Matrix Neurons)

"The data show that pyramidal neurons and GABAergic interneurons of deep cortical layers receive interhemispheric information directly and have properties supporting their distinct roles."

FIGURE 7 A1 "Different temporal integration of synaptic responses evoked by callosal stimulation in pyramidal neurons and interneurons. (A1) Representative current clamp recordings (single sweeps) showing EPSPs evoked by 4 stimuli at different frequencies in a pyramidal cell and a GABAergic interneuron"

"Temporal Integration of Callosally Evoked Responses Is Different between Pyramidal Cells and GABAergic Interneurons All the data presented so far suggest that layer VI pyramidal cells and interneurons are likely to integrate the callosal input within a different temporal time window. "

"4 callosal stimuli delivered at 40–200 Hz produced temporal summation of evoked EPSPs. When pyramidal cells were recorded (n = 9), the probability to elicit an action potential riding on EPSPs was inversely correlated with increasing ISIs (Fig. 7A1). Importantly, even at gamma frequencies, the stimulation could trigger action potentials. When interneurons were recorded (n = 8), a similar correlation was observed but shifted toward significantly lower ISI"

"These results demonstrate that pyramidal neurons integrate the callosal information over a longer time window than interneurons."

"(...)challenge this view. We show here that PV-positive GABAergic interneurons of deep cortical layers of RSA/frontal cortex receive synapses on dendrites and somata and are directly activated by the contralateral hemisphere."

"We also found that pyramidal neurons of layer VI are monosynaptically excited by the callosal fibers. This finding also fills a gap in literature (...)"

"Therefore, the information conveyed by the callosal fibers would then spread from layer VI neurons toward the thalamus synchronizing a bilateral cortical-thalamic loop, as well as toward several other cortical sites."

https://pubmed.ncbi.nlm.nih.gov/16829551/

Slightly off topic or off thread but this is perfect for NAPOT 1 with 5 types of discharge are defined below.

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a0007z.resonance

"Membrane Resonance in Pyramidal and GABAergic Neurons of the Mouse Perirhinal Cortex"

"we explore in this paper the ability of the PRC neurons to amplify the output voltage to current input at selected frequencies, known as membrane resonance"

"In this way, we identified 5 different types of discharge (Figures 1B–E,G–K).

(1) Late-spiking regular neurons (RS): At just-suprathreshold, these neurons show a slow ramp depolarization before the onset of their spike trains, with a consequent delay of the first spike. At more sustained depolarizations, they are characterized by a persistent tonic or slightly adapting firing. In line with this, their ISI distribution is linear and almost parallel to the X-axis (red dots in Figure 1L). Also, their ISI-CV2 relationship shows a cloud of dots very concentrated and close to each other at a low CV2 (about 0.1) (red dots in Figure 1M).

(2) Stuttering fast-spiking neurons (FS): At just-suprathreshold, these neurons fire trains of high-frequency spikes (30–50 Hz) separated by variable periods of silence. At more sustained depolarizations, they are characterized by a persistent high-frequency (50–100 Hz) tonic firing. Likewise in RS neurons, their ISI distribution is linear and almost parallel to the X-axis and their ISI-CV2 relationship shows a cloud of dots very concentrated and close to each other at a low CV2 (about 0.1). However, the FS dots (orange) can be distinguished from the RS dots (red) because they are shifted to lower ISI values (Figures 1L,M).

(3) Adapting neurons (ADP): Adapting neurons typically begin their spike trains at a short latency following onset of a depolarizing current step and accommodate strongly. Due to adaptation, their ISI distribution is linear, but with a higher angular coefficient than RS and FS neurons (blue dots in Figure 1L). Also, their ISI-CV2 relationship shows a quite dispersed cloud of dots (blue dots in Figure 1M) with a higher mean CV2 (about 0.4).

(4) Bursting neurons (BST): Bursting neurons are characterized by spikes that occur in a stereotyped pattern consisting of a cluster of 2–3 action potentials riding on a slow depolarizing wave and followed by a strong slow afterhyperpolarization. After the burst, their firing generally becomes regular. Therefore, their ISI distribution is not linear but starts with shorter ISIs (green dots in Figure 1L) and their ISI-CV2 relationship consists in a rather compact cloud of dots (corresponding to the regular firing) accompanied by two or three more dispersed dots (corresponding to the burst) (green dots in Figure 1M).

(5) Irregular neurons (IR): Irregular neurons show a random and unpredictable firing pattern. Their ISI distribution is dispersed and not linear (black dots in Figure 1L) and also their ISI-CV2 relationship consists in a dispersed cloud of dots (black dots in Figure 1M). They have a mean CV2 similar to that of adapting neurons (about 0.4), but their nonlinear ISI distribution uniquely characterizes them.

On topic: Resonance between Pyramidal cells & GABA Interneurons

"A regular 50sec-long ZAP current input with linearly increasing frequency from 0 to 15 Hz was applied to test for resonant behavior of pyramidal neurons (Figures 2A,E) and GABAergic interneurons (Figures 2A′,E′) at a membrane potential of −70 mV. Resonance appears as a peak in the voltage response at a specific frequency (Fres) (Figures 2A,A′), that is absent in non-resonant cells (Figures 2E,E′). As a consequence, resonant cells show a peak in the impedance-to-frequency relationship at Fres (corresponding to the dashed vertical line in Figures 2B,B′), whereas a clear peak is not detectable in non-resonant cells"

"Accordingly, the phase shift-to-frequency relationship and the complex representation of the impedance differentiates between resonant (Figures 2C,D,C′,D′) and non-resonant (Figures 2G,H,G′,H′) neurons, through clustering of positive values in resonant neurons. The percentage of the resonant pyramidal neurons and GABAergic interneurons measured in the superficial and deep layers of areas 35 (A35) and 36 (A36) of the PRC is shown in Table 3. Overall, the majority of perirhinal pyramidal neurons (77%) and GABAergic interneurons (54%) were resonant and were equally distributed throughout the PRC, without a clear prevalence in a specific area or layer (Table 3), suggesting that resonance could be very important for the oscillatory synchronization and integration of the neuronal activity in this region. Also, the resonance strength (Q–70) and the frequency of resonance (Fres) were similar in pyramidal neurons of A35 vs. A36 and of superficial vs. deep layers (Figures 3A–D). Comparable results were obtained also in GABAergic interneurons (Figures 3A–D). However, we found that the Q–70 was significantly different between pyramidal neurons and GABAergic interneurons regardless of their location (Figures 3A,C)."

To make a long story short we don't need to find a method to explain how ESPS from 6th layer pyramid cells can, via thalamic loops can block communication between neurons that are oscillating in different power band frequencies because the GABA Interneurons are receiving the same signals as the VI layer Pyramidal Cells and are in resonate synchrony with them which means they are able to act as a single sensor transmitter system that blocks, gates or inhibits communication between cells, or mini columns or cortical columns allowing for a selective assembly of cells for given tasks that you might wish to perform.

https://www.frontiersin.org/articles/10.3389/fncel.2021.703407/full

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Why it makes sense that channels stay open to neurons of a different frequency

Slow wave potentials and inhibitory waves resulting from action potentials may also have the effect of re-coding information to be compatible with other areas of the cortex that are oscillating at (lower frequencies in the higher layers) different frequencies.

If you want to transfer sensory information from a part of your brain that is moving very fast to track very fast things, to a part of your brain that is thinking much more slowly & deeply about issues, then the high frequency sensory information has to be converted down into a message that the slower frequency part of you (in the upper layers) can process. So you have different frequency bands, for different sensory data tracking, and you have these different kinds of action potentials to up regulate and down regulate the frequency of information patterns, so that different areas of the brain that are operating at different frequencies can participate in processing (considering) and reacting (choosing an action).

One odd conclusion that came to me while reading this paper on the Tuning of Oscillations is that the only real goal of the brain is oscillatory equilibrium. One funny implication to consider is that if life ever became too easy humanity might evolve backwards into trees. Why would we move if we didn't need to move, and if we don't need to move why do we need brains? So if we use sentient self aware networks to make life really easy for mankind, we could devolve into trees, I mean, at the rate of evolution, so that could be on a time scale of millions to billions of years.

We evolved because the circumstances demanded it.

"Differences between Somatic and Dendritic Inhibition in the Hippocampus"
"Hippocampal synaptic inhibition is mediated by distinct groups of inhibitory cells. Some contact pyramidal cells perisomatically, while others terminate exclusively on their dendrites."
"In contrast, dendritic inhibition may control the efficacy of afferent inputs both by suppressing the generation of dendritic calcium spikes and by limiting depolarization due to excitatory synaptic events (Wigstrom and Gustaffson 1983; Kullman et al., 1992)."
https://www.sciencedirect.com/science/article/pii/S0896627300801014#:~:text=In%20contrast%2C%20dendritic%20inhibition%20may,et%20al.%2C%201992).

"Distinct synaptic properties of perisomatic inhibitory cell types and their different modulation by cholinergic receptor activation in the CA3 region of the mouse hippocampus"

"Perisomatic inhibition originates from three types of GABAergic interneurons in cortical structures, including parvalbumin-containing fast-spiking basket cells (FSBCs) and axo-axonic cells (AACs), as well as cholecystokinin-expressing regular-spiking basket cells (RSBCs)."
"The perisomatic region is defined as the domain of the plasma membrane which includes the proximal dendrites, the cell body and the axon initial segment (AIS; Freund & Buzsaki, 1996). This region is targeted by three types of inhibitory neurons in cortical areas, namely by the parvalbumin (PV)-expressing fast-spiking basket cells (FSBCs) and axo-axonic cells (AACs) as well as by the cholecystokinin (CCK)-containing regular-spiking basket cells (RSBCs). The basket cells innervate the somata and proximal dendrites (Blackstad & Flood, 1963) whereas the AACs target the AISs of pyramidal neurons (Somogyi, 1977)."
"Basket cells are multipolar GABAergic interneurons that function to make inhibitory synapses and control the overall potentials of target cells. (this quote is from wikipedia on basket cell)"
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2916217/#:~:text=The%20perisomatic%20region%20is%20defined,Freund%20%26%20Buzsaki%2C%201996).

GABA regulates resonance and spike rate encoding via a universal mechanism that underlies the modulation of action potential generation
"(GABA) causes regularly firing hippocampal CA3 neurons to bistably switch between spiking and quiescence (inhibition state), converts graded discharge-to current relationships to have abrupt onsets, and induces resonance. Modeling reveals that A-currents enable these GABA-induced transitions. (...)this transition sequence (universally) underlies the modulation of AP (Action Potential) dynamics."..."In simulated networks, synaptically controlled AP dynamics, permits dynamic gating of signals and targeted synchronization of neuronal sub-ensembles. These results advance the systematic understanding of AP modulation"
https://www.biorxiv.org/content/10.1101/206581v1.full.pdf

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a0008z

My 2014 Neurons are transmitting their shapes theory revised.

Originally from 2014. This was my long lost equation for the neuron & brain as a fractal of a neuron, found again in 2022. I just updated it with some new knowledge.

How do you describe the action potential of a neuron with a differential equation?

The rate of Change in Delta X - the rate of Change in Delta Y = Z the delta of vesicle release per interval relative to the rest of the group oscillation (referring to the oscillating group of cells that the neuron is oscillating with).

2023 "The study of plasticity has always been about gradients"
https://physoc.onlinelibrary.wiley.com/doi/full/10.1113/JP282747

(something needs to be added to the equation of a neuron for a computational implementation that represents thresholds for receptor spikes, dendritic spikes, and soma spikes, but otherwise the main point is understandable in theory, at the network level, an equation to represent on going changes in synaptic configurations + simulated morphological changes, that encode what memories the neuron physically represents via it's structural configuration, which determines what inputs it responds to, and the degree of it's response)

X is the balance of positive charge in the dendrite branches & or the soma, possibly from sodium influx.

Y is the balance of negative charge in the same dendritic branches and or the soma, possibly from potassium outflux.

1968: "Sodium and potassium fluxes in isolated barnacle muscle fibers"
https://pubmed.ncbi.nlm.nih.gov/5651768/

If we triggered all the receptors at once we might have maximum potassium outflux, and thus an inhibited neuron.

If we triggered enough of just the sodium receptors, without triggering all the receptors, and we triggered them fast enough, we might get enough sodium in to create a phasic or a high phasic action potential burst.

By high phasic I point to studies on high gamma as one type of high phasic signal
Reduced neural feedback signaling despite robust neuron and gamma auditory responses during human sleep"
"Next, we focused on auditory-induced high-gamma (80–200 Hz) power responses, which are known to be closely linked to neuronal firing rates in human auditory cortex37, and compared them across wakefulness and NREM sleep. The results revealed highly robust auditory-induced high-gamma responses (Fig. 3a–d; additional examples in Extended Data Fig. 4). The magnitudes of high-gamma responses in NREM sleep were not significantly different from those in wakefulness"
https://www.nature.com/articles/s41593-022-01107-4?fbclid=IwAR0EK8K7QSW5BK1r8XbZKLaNWvriv9ET6hlArU2dfbY8M1Q6z-9IINqe4vg

When the soma bursts triggering a phasic or high phasic action potential event, the energy it sends from X to Y balances out the neurons's charge distribution topographically. From a

polarized displacement of charges from the rate of change of X exceeding the rate of change in Y, the neuron becomes depolarized.

The quantity of potassium in the cell at the moment of depolarization determines the wave shape, also called the magnitude, but specifically it means the duration of time that the calcium channels on the exit terminals are open, which determines the quantity of the release of vesicle sacks filled with neurotransmitters.

"Neurotensin orchestrates valence assignment in the amygdala" Neurotransmitter
"Using genetically encoded calcium and NT sensors, we further revealed that both calcium dynamics within the PVT-BLA:NT projection and NT concentrations in the BLA are enhanced after reward learning and reduced after punishment learning. "
https://www.nature.com/articles/s41586-022-04964-y?fbclid=IwAR1gMCFUzLGxzsXtzRxsCkni1Em1FldQLyZhc3OCFvpBnOnvdKhRSJpLCcg

Basically the neurotransmitters are attractors, so there is nothing special about neurotensin or dopamine and these researchers just haven't put the puzzle pieces together yet. The gradient quantities of NT a great for timing, which is essential for movement at the speed that animals move.
"Researchers Identify Molecule That Orchestrates Association of Events With Positive and Negative Memories"
"It turns out to be a molecule—a neuropeptide that acts as a neurotransmitter—called neurotensin."
https://www.bbrfoundation.org/content/researchers-identify-molecule-orchestrates-association-events-positive-and-negative-memories?fbclid=IwAR2oRL5ID9xuNuPjDH4Zyu8Ojn7grfUTWrbSHaa5aMRp7GugKhLk4J5tzHk#.Yuzk0MwZDWY.faceobok

Essentially the excess charge, quantified by the potassium ions, is sent via a variation in the number of neurotransmitters released to downstream neurons.

This is how one neuron transmits it's excess charges to the next neural array: The vesicle release of neurotransmitters through the synapse to the dendrite of another neuron.

Z, the delta of vesicle or neurotransmitter release is the next neural array's new topographical distribution of electrical charges (via the stimulation & opening of receptors on the post synapse) AND the it reflections the neurons:

1. cell body shape (morphology)(morphological changes to dendrites, and new proteins resulting from reactions, and new spines all of which change the responsive properties of the cell)

2. connections (synaptic connections define what a neuron responds to and what it doesn't, synaptic connections are a cell's learned memory response. The physical pattern it has grown to respond to.) connections

3. Connection morphology or the types of connections matter, when potassium receptors are anchored together with ankyrin repeats they become mechano sensitive or sensitive to mechanical waves like touch.

4. a variance in its electrical charge density (from lost or gained neurotransmitters before the some burst or action potential event.)

5. oscillator state (what part of its oscillation cycle it's in.)

6. the state of each of its receptors (whether it's receptors are active, inhibited (blocked) etc.)

All of which result in distinctly new signals, with new frequencies, magnitudes, and oscillation phase changes disbursed through the brain.

Distributed via a new path of connections which change as electrical thresholds are reached in specific areas.

The neuron is transmitting its phase change, but the meaning of that phase change comes down to what the neurons in its exit terminal have learned to respond to. It's as if the neuron is a blinking LED to all of the neurons in its exit terminal.

The Dendrites are the observers of signals, the Exit Terminal Burstlet is like a television display pixel for the next array of dendrites, and the physics of oscillation are binding the picture together at the cell assembling (or oscillating body of cells) scale.

When brains (cortical columns (neurons (dendrites))) receive neurotransmitters, or fire because of an imbalance between positive and negative ions, the result is topological change, topological changes that a combination of category theory and differential calculus would be very useful to describe.

These are changes happening in a grid (brain),

These changes are brainwaves in a grid (the outer cerebral cortex),

This is brainwave activity between cortical columns (connected to the edges of a grid (inner myelinated axon fibers visualized in DTI).

This brainwave activity is literally the result of electrical diffusion of potential differences from action potentials in neurons (in a 3D grid that is the brain),

and action potentials in dendrites in a grid (neurons)

and action potentials from receptors on the cell body such as NMDA & AMPA receptors.

Another way to understand this, is that the Neuron is both passing on excess energy (above it's threshold) and encoding a topological change that means it has been affected by the brainwave that (came close, ended on it, or passed through it) (a simple way of remembering one point of the wave) (which may through connections, unintentionally encode the representation of a vector pattern between points of neurons that fired)

Neurons are information programs that transmit a phase change that represents the activation of a memory it learned to respond to through grown synaptic connections or not respond to via pruned synaptic connections.

In a valid sense the neuron is reporting its learned morphology including its synaptic connection configuration to the rest of its oscillatory group. The learned morphology is going to affect the equation at the topic, the rate of change in X - the rate of change in Y. If a neuron grows a lot of new receptors, sodium or potassium receptors, that changes the core equation, the rates of change in X & Y, so a neuron can grow more sensitive or less sensitive with more receptors depending on the type, the location, and the types of incoming signals the neuron is receptive to, because of morphological changes to it's leaky membrane that might dissipate charge increments coming in with certain patterns, or the cell might act on charge increments with certain other patterns based on its morphological structure.

A new protein, such as what happens during LTP changes the cell's morphology, the cell has now grown, so it's response is altered slightly.

In 2014 I called this the Neurons are transmitting their shapes theory.
My conjecture back then was: If you want to know why your brain may be able to store infinite information, its because you can store infinite information in a curve, my current favorite hypothesis a neuron's topography is a program, and it is shooting an electrical packet of data that represents its whole topography, this topology is actually a program, like a computer program, because in category theory the topology is a visual representation of sets (numbers) + function, therefore the spatial topography of a neuron is a program, with sets and functions represented by the shape of the neuron, and transmitted like digital music is transmitted, like an acoustic pattern in electrons.

In 2014 I argued that you could store infinity in a curve, in the curves of the morphology of a neuron, in mathematics you can, but can the protein structure of a neuron represent the infinity of a curve? and what is transmitted is argued to be an SDR, a sparse distributed representation of the whole, a tiny statistical fraction of the vast amount of information that might be in the ever changing topography of a neuron!

"Study shows that when a tissue curves, the volume of the cells that compose it increases"
https://phys.org/news/2022-05-tissue-volume-cells.amp

More information: Aurélien Roux et al, Epithelial cells adapt to curvature induction via transient active osmotic swelling, Developmental Cell (2022). DOI: 10.1016/j.devcel.2022.04.017.
https://www.cell.com/developmental-cell/fulltext/S1534-5807(22)00285-4

The idea I had (in 2014) was that the neuron is transmitting a program that is a temporal/spatial metaphor of its shape, into a fractal brain, that is doing the same thing, so it's like a temporal spatial metaphor on both the individual neuron level, and the neural network level.

This theory was an attempt to explain how we can have both distributed representations, or concepts that include the firing of entire brainwaves, and also individual cells that have individual memories.

Imagine that when you first learn to move your hand it takes up an enormous amount of mental resources. Massive brainwave activity. Then the peaks of this massive brainwave activity are slowly represented by neural connections to just the peaks, the highs and lows, as well as the lefts and rights, to a single neuron then links the edges so that no longer do you need the whole brain to spike to represent that whole brain wave, when a single neuron can just fire and trigger the neurons at the peak of the brainwave that caused your movement. Thus overtime moving your hand takes less and less mental energy. As what was once represented by a whole brain, is reduced into spatial temporal representations in the connections and body of a single neuron. The learned connections of one neuron represent a reduced energy efficient memory of a pattern that used to require many cells to represent.

http://www.amazon.com/Dynamical-Systems-Neuroscience-Excitability-Computational/dp/0262090430/ref=sr_1_1?ie=UTF8&qid=1348088229&sr=8-1&keywords=the+excitability+and+geometry+of+neurons
Dynamical Systems in Neuroscience: The Geometry of Excitability and Bursting (Computational Neurosci

It takes more than a single neuron to coordinate your hand, but you get the point about reduction of a large spatial metaphor to a small spatial metaphor.

It's a story to try to explain HOW a single neuron may store the memory of an entire brainwave.

By connecting to the neurons at the x, y, z peaks of that brainwave
it's physical form and connections create a distinct signature, and what we need for a distinct memory is a distinct signature
that's what you say, but you haven't provided an actual counterargument that articulates both my position and why it doesn't work

"Allan Jones: A map of the brain | Video on TED.com"
http://www.ted.com/talks/allan_jones_a_map_of_the_brain.html

"With all the proteins that define a neuron, there is an extreme amount of "information" complexity in its structure."
https://www.coursera.org/course/sysbio

A cell does not have to communicate the entire complexity of its structure, instead it communicates an SDR, a tiny fractional set of data representing a few points representing the distinct nature of its structure.

A cell does not have to represent every aspect of the brainwave, only an SDR, or a fractional set of data representing a few points that describe the distinct pattern of that brainwave.

BIG NOTE: I am not saying or suggesting that neurons can communicate an infinite amount of information, someone took that away from what I wrote, that would be a total misunderstanding of what I wrote.

Neurons communicate a sparse distributed representation (SDR) of their complex structure (meaning their dendritic sensor structure that defines the memory they have grown to represent via its synaptic connections & morphological properties) storing an infinite amount of information and communicating an infinite amount of information are two different things entirely.

It's the difference between sending a photograph of Taj Mahal and sending the actual Taj Mahal. Like a pixelated (sparse) representation of infinite curves.

A photograph being an SDR of the actual place. The phase transmitted by a neuron represents a sparse pattern (I think of it like an LED light) that its exit terminal can recognize via their learned patterns. Its Exit Terminal (or the DownStream Neural Array) is receiving many LED patterns from many neurons, so the exit terminal arrays get the full TV screen, and the signal from this one neuron represents just one pixel of that TV screen. (The tv screen is a visual metaphor, but the arrays of signals can represent any kind of modality, sound, touch, concepts, ideas, or a spatial pattern at one interval of time, like the frame of a move, or a moment in a sound track)

Stanford's Neurogrid paper 2021

I remember discussing Stanford's Neurogrid project in 2014. I remember they had a novel approach, they were able to build their own chipset, I can't recall if it was from one of those overseas companies that let people design their own chip, they fabricate it and sell it to you. I think I remember looking into doing my own chip design after reading about Neurogrid. I was surprised to see a 2021 update to Neurogrid. In the paper linked below they break down the algorithm for their artificial simulation of biology. It's a good read.

If Neurogrids neurons are dimensionless & all the same how can they selectively respond to some patterns and ignore others?

At first glance the Neurogrid does not appear model Plateau potentials, APD Action Potential Duration, or the variation in Calcium Ca2+ channel duration that might caused by the quantity of Potassium K+ and other factors, resulting in a change in the quantity of vesicle release.

At first glance I'm not seeing Neurogrid model how individual synapses on the Apical Dendrite (or the neurons exit terminal array) might be upregulated or downregulated based on various factors (such as the synaptic & dendritic activity in the basal dendrite, the Soma burst AP wave shape, or cyclic-AMP signaling (up or down regulation of the Apical exit terminal resulting from basal dendritic stimulation, or metabotropic receptors in the basal dendrite)

I do not see Neurogrid modeling variation in the number of vesicles released or the magnitude of Neurotransmitter release.

Figure 2.1 Neurogrid uses the leaky integrate-and fire model of a neuron.

"The unit amplitude pulse price(t)'s width trise models the duration for which neurotransmitter is available in the cleft following a presynaptic spike." So instead of a variation in the delta or the quantity of neurotransmitters released they have created a duration for how long neurotransmitters are in the synaptic cleft. If you have more neurotransmitters released during an AP it would take longer for the biology to clear them out, and for that synapse to reset, but if you are releasing the same quantity of neurotransmitters each time how would there be a situation where it takes the biology a greater duration to reset the synaptic cleft?
"This address-event bus has been successfully used to build networks with thousands of neurons
with a few hundred synaptic connections each [7]. It has not scaled beyond millions of synaptic connections,
the point at which traffic saturates the bus' signaling rate.
To break this communication bottleneck, Neurogrid adopts a hybrid analog–digital approach that follows
design principles the neocortex uses to minimize its wiring [8]. Neurogrid uses fast digital routers, operating
serially, to replicate signals for distribution and uses slow analog circuits, operating in parallel, to sum signals
for aggregation."

In effect Neurogrid has made the dendritic branches & the synapses obsolete by making them wireless. The question is are they throwing out the baby with the bathwater? They are just delivering signals, between the branches of pre & post synapses via network routing, like twitter messages.

"Moreover, extending several dendritic branches to meet a terminal branch of an axon allows that branch
to make multiple synapses (bouton cluster) [19] (figure 1(b), top). Synaptic signals from many axons sum in
a dendritic branch and these branches' signals aggregate hierarchically. This principle minimizes the dendritic
tree's wiring [18]."

What matters, and I'm not sure their model accounts for it, are factors like the growth & decay of synaptic connections, the up or down regulation of individual synapses, adaptations to the morphology of the dendrite that make its responses more adaptive or less adaptive to certain memories, and receptor specific adaptations to or away from certain kinds of sensory stimulus.

The synaptic & dendritic configuration needs to be grow or decay to be responsive to selectively respond to certain neural patterns that it represents with it's high dimensional morphology, and it needs to be able to dynamically change it's response to the patterns it has learned on a case by case basis.

Virtualizing the dendritic branches & synapses into router messages should be fine as long as you are allowing the synapses & branches to grow, decay, and vary in their high dimensional response so that they can be selectively in their responses, and capable of tuning their response outputs to the rest of the network.

"Importantly, Neurogrid achieves scale and efficiency without sacrificing biophysical detail"
I am not able to agree with Neurogrid's conclusion at this time. I think they have sacrificed essential biophysical detail.

2021 update: "Neurogrid simulates cortical cell-types, active dendrites, and top-down attention"
https://doi.org/10.1088/2634-4386/ac0a5a

Many of my criticisms about what Neurogrid is failing to model can be referenced in Note a0007z https://github.com/v5ma/selfawarenetworks/blob/main/a0007z.md search a0007z twice for lengthreference1

"it would seem that neural processing would be more precise when the number of compartments in an apical dendrite is large, so that the operations of profile sharpening can quickly produce a very small and stable profile spread around the peak frequency"

"To summarize the main findings of the present simulation experiment, the relationship between outward potassium current and the peak frequency of apical dendrite oscillation is shown in Figure 6 as a curve in which the peak frequency increases toward an asymptote as outward current increases."

^ Pretty much NAPOT theory is confirmed by this quote above.

"Moreover, they show that each profile around these peak resonance frequencies is sharpened to a width of less than 1 Hz by repeated cycling of electric surges through the apical dendrite."

^ and this quote validate the concept of modeling the action potential events as tensors (with frequency & magnitude) in a high dimensional Taylor series (calculus)

"Taken together, these considerations support the present hypothesis that the layer 6 pyramidal neurons serve as the basic tuning neurons."

In oscillatory physics every oscillation phase change exerts an effect on every other oscillation, so the layer 6 pyramidal neurons have a role in tuning neurons but so do individual action potentials, the scale of the phase change matters not. (I said that in a Yoda voice: Star Wars Reference "size matters not (to the oscillating force)")

a0009z

Notes from an old conversation that was saved on September 2012

(dendrite, synap)

distinction/context is the structure of the mind

The mechanism of the electrical charge inside (and outside) the body is the potential difference between the negative ions and the positive ions averaging out.

The movement of ionic charge, including the sodium & potassium pumps, and the passage of neurotransmitters from synapse to dendrite are changing location, and as they move they affect an increasing change in ratio of negatively charged ions to positively charged ions. Increasing or decreasing the chances of an electrical charge or action potential.

What's the difference between a thought in your mind, and a coordinated sequence of spatially positioned electrical spikes? What's the difference between the electrical activity in a human brain, and a hundred year electrical storm on Jupiter? Is Jupiter thinking?

How can you prove it has no cognition? "Cognition is a faculty for the processing of information, applying knowledge, and changing preferences." The storm changes wind speed, direction, and so many other things. Those changes could be thought of as preferences, its whole structure is a highly coordinated, and highly responsive thing. Have you read the book Vehicles: Experiments in Synthetic Psychology?

I'm not making any claims whatsoever, I have no interest in the idea that Jupiter's storm has intelligence.
That's not the point.

If you were the size of a neutron, and still able to see and think, you might think a rock was empty space (that idea is from Richard Dawkins I think)

The point is how do you recognize the differences in the pattern of brain activity, and explain how they are different from the pattern of electrical activity in a very large storm.

Making statements like
"It ain't thinking until it lets someone know."
is missing the point

"And then thinking and even consciousness becomes uninteresting because you have removed any possibility of distinguishing it from any other physical process. Does that help anything?"
no it doesn't because I'm not looking to grade how interesting consciousness is, it doesn't matter to me if consciousness actually is the same as any other physical process or not. What I want to know is what physical process makes consciousness different from any other physical process.

""It ain't thinking until it lets someone know." Wouldn't that be the true sign post of cognitive function and consciousness? The ability to interact with others that are considered conscious and aware."

That's a philosopher's quandary. If you become paralyzed, unable to communicate with other human beings, but you are still fully conscious. Would you then agree with the above statement that since you can't communicate to let someone know that you are conscious that you are not really conscious?

"What is the difference between a thought and a possible implementation of that which thoughts arise in/from? That is the same question as the beginning of yours"

What mechanically defines a thought? if you can't state what that is, then you have no measurement with which you can use to say there isn't thought in a storm on Jupiter or what have you.

I don't think the storm on Jupiter is intelligent, I never said it had to have complexity, or the ability to build spaceships, or really high intelligence.

Maybe Jupiter could have a few thoughts per week compared to a human's 500 petabytes of thought per second.

I'm not trying to compare it to human intelligence

only to work out the core differences between what defines a thought physically in a mind, and to define why that could not also be appearing elsewhere in unexpected places.

simply stating the obvious differences between a storm and a human brain evades the question, which is about the mechanical state of a thought, and how that state appears. how much complexity and organization it needs to be considered a thought, if you have enough thoughts (mechanically specified predictions) in a loop, is that sufficient to create self-awareness?

I think real intelligence is different because it has billions of simultaneous parallel processing, multilateral, hierarchical structured memory-prediction-learning-programs to coordinate a more complex path than a hurricane could generate. I can't say that a coordinated pattern of electricity in a storm isn't at least very very vaguely similar to an electrical pattern firing in the brain, but for me the major factor that the aforementioned well structured brain has is well structured association trees which may indicate thoughts that are similar, or may define a metaphor, like a green thought could be in both a human, and a storm, if the thought is "green" but it has no meaning without a context like "red" or "colors" that associated context would be more likely to show up in a densely structured human brain, and very unlikely to show up in a moving storm. So I really think thought in this example is really pointing to the structure of the human mind, particularly it's ability to make contrasting distinctions using it's "billions of simultaneous parallel processing, multilateral, hierarchical structured memory-prediction-learning-programs"

A thought is a thought when it is distinct from a context that is either another parallel thought, or from another part of the hierarchy.

I really think it's irrelevant whether the thought is electric or not. The point is that it's a prediction, if you never associated that prediction with other predictions it might be an aspect of intelligence. It's like lets say your mind is billions of predictions a second. Then you separate your entire brain into individual cells, and all of the cells are still alive, and they are all making predictions, just as before. You are not in one piece, but all your cells are still alive.

So how many cells need to be combined back together to match a thought pattern, and without the context of the rest of the cells, is that thought pattern still the same thought? Or does the context define the meaning of your thoughts?

If a thought is defined by contrast, then your cells are like a game of go. You know the Japanese game with black and white pieces? Imagine that a thought is like a three dimensional game of Go. http://en.wikipedia.org/wiki/Go_(game) as the pieces built up, into learned temporal/spatial patterns, the physical form of the thought itself isn't the electrical firing, it's the pattern that is connected to all the other patterns and yet very distinct from all the other patterns. It's in contrast immediately, and the context is the very structure of the mind. Without a structure, thought has no context to begin with. It might as well not be a thought, it's as if to say thought is a distinction in the structure, changing memory and movement patterns.

Tags:
choice, September2012

a0010z

oscillating functional fractal isomorphism

All human beings are fractal oscillations, but in a real sense each one of us is creating spacetime and ourselves at the sametime, because oscillators define spacetime, all oscillators create the space around them by forcing particles into collision patterns that produce gravity, via Quantum Gradient Time Crystal Dilation, this note explores some of the original ideas in Q.G.T.C.D.

Oscillators define the electromagnetic phase field and define what we observe as the curvature of spacetime.

~~Space around atoms expands because of increasing travel times between one space oscillation somewhere and another spacetime oscillation that's no where, and one more that's~~

Space around atoms expands spatially because all particles have to oscillate, and the increasing time means greater oscillation travel times for particles (relative to or compared to travel times for particles at the center of a mass where the frequency or density of mass is higher) The way this is represented in a per interval moment of spacetime is with the relative appearance of expanded space, but expanded space is spacetime that has a greater oscillatory interval.

It's like if each particle in space was the pendulum of a metronome, the expanded spacetime around the atom is like the bottom of the pendulum that swings out the widest.

The center of mass is like the top of the pendulum, it has the highest frequency which is also the highest mass density, and because its frequency interval is higher it is like extra spatial surface area that is hidden in time dimensions, essentially a time crystal.

See notes on Quantum Gradient Time Dilation, which I am now calling Quantum Gradient Time Crystal Dilation.

With Quantum Gradient Time Dilation or
Time ought to be moving more slowly at the center of a particle's mass and faster in the spacetime field created by that particle's mass.

Thee fast movement of an electron mass in space ought to accelerate time around the electron which is what I think the magnetic field is, accelerated time, that has an attractive interaction because of quantum gradient time dilation, while what is outside a particle mass is attractive, what is inside a particle mass might be repulsive, and that implies that the inside of the earth might be repulsive, but I guess the density of earth's crust is technically repulsive in effect isn't it? We think of that as pressure, so could the center of mass in an electron be considered to

have pressure and does the pressure inside an electron increase when the electron is accelerated?

Space appears to consist of a harmonic oscillating field of particles that can be classified as either energy or mass depending on their frequency or speed.

The energy state is mass times the speed of light squared, in other words particles classified as energy have a faster apparent velocity.

frequency and ~~amplitude~~ magnitude in the human brain have a 1/f relationship, as ~~amplitude~~ magnitude increases frequency decreases and vice versa.

If energy is mass moving faster, then perhaps mass can be considered slow moving denser spacetime, the slower ~~amplitude~~ magnitude makes it easier for groups of oscillators to synchronize and so there are more particle collisions which I think result in the curvature of space.

Dense volumes of space, such as the center of mass, are warming the electromagnetic field & simultaneously increasing the relative intervals of time.

My conjecture is that this creates broad vertical particle traffic lanes emitted from the center of mass.

One hypothesis I have comes from imagining a visual symmetry to these vertical particle traffic lanes, that emerge from the excited, heated, time accelerated space at the center of mass is that there are increasing horizontal particle lanes that move in between the vertical particle lanes that balance out the symmetry of particle travel in space, so that there is an equal number of particles moving in each direction, but mass defines the pattern of particle travel. The further you get from the center of mass the larger and longer the horizontal particle lanes get. These vertical and horizontal particle lanes create the effects of time dilation by shortening or lengthening the amount of time that it takes for a particle to travel in one direction or another.

Space expands over time relative to the mass of oscillators like black holes, stars, atoms and people, as a reaction to atomic oscillations in densified areas of space,

The expansion of space, relative to mass, is simultaneous with the expansion of time, referring to time dilation at greater scales.

Space is not really expanding in the absolute sense, it's just expanding relative to the oscillators, one might also say that the oscillators are shrinking and space is staying the same.

This idea could make sense because dissipative systems tend to dissolve eventually. This means that planets are shrinking and becoming more dense gaining mass as they move through space attracting new particles through particle collision lanes emitted from mass.

Suppose that Spacetime as whole is a wave with a frequency pattern.

I'm considering the idea that spacetime is the length of an interval between two oscillations that the cosmos is making when particles shift in and out of existence between having a location or having a velocity.

I imagine that spacetime is stretched like a particle that has a high velocity that is warped around an oscillator, because the oscillator is pulling it, attracting it.

While the oscillator has a location the velocity around the oscillator can't be found anywhere and instead of seeing a particle with velocity we get the void of spacetime with an area magnitude that is relative to the density of the oscillating volume of mass.

I imagine that if the atom oscillation runs out of energy, velocity that appears as spacetime might collapse into a particle with a location.

I argue that spacetime, including mass & energy, is a fractal of oscillators. It does not seem to be a stretch to consider that spacetime is a 3D time interval between oscillations, with the magnitude of the 3D space at each interval of time being flattened time.

In a fractal cosmos it would make intuitive or visual sense for the relationship of particles to oscillate between a location existence in vortices i.e. atoms & galaxies, and a frequency interval that is 'an expand spacetime void' relative to the combined density of the oscillator.

As space relatively expands so does time, so over time the earth gains mass from space, the total amount of time increases as space expands, what we experience as a forward interval in time is simultaneous with the expansion of space and in theory the increase in the relative density of earth (because earth as an oscillator is attracting particles, atoms, objects, and anything around it, earth is eating space, but that causes the void of space (and the duration of time) to grow in area paradoxically.)

The expansion of the spacetime voice adds a new interval of scale dependent time (time gets more intervals in space vs on earth, so the clock interates faster the further it is from a dense mass. Yet the higher frequency or density of mass creates an invisible surface area in time that tips the odds of particle travel.

There are more directions for that clock that iterates faster in space to travel in the direction of a dense mass than there are in any other direction. Resulting in the gravitational effect, which is a statistical effect, calculating the odds of particle movement per interval of time given all the possible directions a particle can travel at each interval of time with the area in the direction of

dense mass having extra surface area from the clock's perspective. So the clock falls toward the earth.

The new interval of spacetime is caused by oscillators warping phase space fields and creating particle collision lanes. Space would be moving fastest at the particle scale, and at human scale time is really slow relative to what is happening at the scale of quantum particles.

Could this add light as to why observing what is happening at the Quantum scale is counter intuitive?

~~it looks confusing because spacetime at quantum scale is moving faster relatively,~~

Thought experiment: Suppose that oscillating mass at the quantum scale is warping space in a way that makes the human experience at the multiple cell scale iterate faster in spacetime, the human experience then ought to be iterating in time faster than a particle iterates in time. So in theory our observation of particles would be one where they appear to be slower, unless their relative velocity, the speed of particle movement is much higher compared to the speed of communication between cells across the whole brain.

The center of mass is where the intervals of time are slowed down, but around a particle time is sped up, so what that particle emits is going to create the quantum gradient time dilation effect of increasing the odds of particle movement in the direction of any other nearby particle. If particles have a compatible oscillatory frequency they will clump together, because their quantum gravity time crystal dilation effect allows a clustering to happen, an atom forms, then a molecule.

Spacetime at the quantum scale ought to be iterating more slowly, but only if particles are moving at the same rate as cellular communication across the brain.

Since the human experience extends across many cells at a greater scale the human experience ought to iterate faster in time relative to the intervals of time at the atomic scale.

What confuses the issue is the question of the relative speed of the particles being observed, if the particles we are observing are moving much faster, from having lower mass & higher velocity, compared to human cognition, then we have the reverse time dilation effect, where I can again make the argument that perhaps what is happening at the Quantum scale is counter intuitive because the speed of particle movement is faster than we can intuitively grasp.

To rephrase: Just like the clock in space is iterating faster in space the further it is from mass, so the human experience ought to be iterating faster than what happens at the particle scale unless the particles are moving at a much faster velocity and then special relativity would help us understand that the time dilation effect is reversed to what it might intuitively be with gravity alone.

The frequency of mass in a volume, or the density of atoms in a space, produce the 3D volumetric spacetime field as we know & experience it. What I suppose is that the spacetime field & mass alternate in existence, taking turns with one being spacetime energy while the other is a mass, or a vortex in spacetime, like a never ending pendulum, when one vortex (atom) breaks a part, the energy that is released causes another to exist somewhere else, in a never ending cycle.

Rewrite; Tonight I came up with what I think is a novel idea for how spacetime exists and why time seems to move forward from our perspective. Adding this to the book because it's related to the perception of time in a counter intuitive way.

I was thinking that since spacetime is expanding everywhere. Since atoms are spacetime. That means spacetime is also expanding inside our brains. Our brains are experiencing the expansion of time.

Another thought is that while spacetime is constantly expanding, it is constantly contracting in equal measure, somewhere that it's not expanding. It makes more sense to me, that as oscillators our brains are actually growing, expanding in mass, which is the contraction of space actually, absorbing particles, food, energy, oxygen etc...

If my memories are attractor states, in synaptic connections, it means that I am, through my memories, literally creating myself, growing my mind, and building via new protein synthesis my simulation of reality.

"Attractor and integrator networks in the brain"
"Thus, it is now possible to conclusively state that the brain constructs and uses such systems for computation. Finally, we highlight recent theoretical advances in understanding how the fundamental trade-offs between robustness and capacity and between structure and flexibility can be overcome by reusing and recombining the same set of modular attractors for multiple functions, so they together produce representations that are structurally constrained and robust but exhibit high capacity and are flexible."
https://arxiv.org/abs/2112.03978

"Memories from patterns: a review"
""The theory of how complex patterns emerge from simple interactions and constituents is one of the big ideas in biology, explaining animal coats and morphogenesis.

"The same principles can produce dynamical states for computation in the brain, in the form of attractor networks. We review how attractor networks generate states for robust representation, integration, and memory.

"Our review covers the conceptual ideas, the theory, and the potential utility of continuous and discrete attractor networks, then focuses on the empirical evidence that the brain computes using these structures. "

https://fietelab.mit.edu/2020/05/29/memories-from-patterns-a-review/

As an oscillator I am in a literal sense ~~creating~~ modifying the spacetime environment around the mass that is myself.

Each oscillator is ~~creating~~ modifying its own relative space phase field, relative to itself, so it being smaller than its space, and shrinking as dissipative systems do over time as they run out of energy well.

A radical prediction for the future of humanity

My prediction is that humanity is about to have a huge global awakening. Society is about to be transformed by radical new technologies, based on radical advances forward in science that are going to blow many people's minds and change the world as we know it.

The question is what started the first oscillation in the universe?

Perhaps it's about the conceptual probability of a universe existing being split between two undecidable states: 1 existing somewhere like mass or 2 being a frequency like energy, that is defined as an interval between two points in spacetime that it takes for something with an oscillation or spin to travel.

So if space is like an oscillation it goes from being all quiet to being all noisy and back again. (or perhaps just alternately in both states but in alternating areas)

Does this mean the entire universe will over time have a sort of heat death? Or the loss of energy from all oscillations? Following that will time restart? Will the heat death oscillate? Will it divide again into a new oscillation? Or is it the case that neither a heat death nor a big crunch ever occurs or will ever occur, because spacetime as a harmonic oscillating field is perpetually spinning up oscillating vortices (particles, atoms, planets, stars, life, galaxies, super clusters, black holes etc....) and all that stuff just happens eternally in endless cycles. I think the latter situation is more plausible.

The uncertainty of whether the universe exists is the key point to contemplate I think.

Imagine that the first oscillation is the one that makes space time possible, and perhaps each new oscillation can be considered to be like a division of the first oscillation, which reverberates for a seeming infinity, and perhaps for an infinity, creating a relative spacetime seemingly for an infinite time with seemingly infinite space. This expansion creates a cascade of new space & time expanding vortices, until the heat death of all vortices/oscillators, which leads back to the initial state of no time or space.

Either spacetime exists in perpetuity or someday it is going to collapse when somehow the last oscillation runs out of energy. Unless there is no such thing as space time running out of energy.

So inbetween no time and no space there is a seemingly infinite expansion of spacetime, and perhaps then the cosmos cycles through different forms infinitely?

Perhaps the singularity moment is only an expansion of space from a point of view, and from another point of view mass is shrinking instead of space expanding.

Because the relative appearance of changing space scale (space expansion) and changing time scale (which we experience as the forward arrow of time) is just space warping between two states: That which iterates slower time with greater density, and that which iterates faster in time with less density but more spatial magnitude.

A Random Thought inserted?
On Orch Or: My current hypothesis is that a microtubule would unlikely to contribute to an action potential event in a significant way.

The interesting idea with Orch Or is the idea that a microtubule might store acoustic waveform memories that alter wave forms as waves travel into its tunnel, encounter previous patterns, and come out again like a reflector bouncing a signal back as a new pattern, but I still do not see how that could affect the flow of ions in a significant way, unless a signal from a microtubule can inhibit or excite a receptor.

The alignment of the neuron's magnetic dipole changes with each action potential event, and so there are multiple clues that point to the neuron changing its configuration in multiple ways.

If the microtubule can store memories of mechanical or acoustic vibrations, that alter the wave shape of the AP with their reactions that affect the acoustic wave shape which might change the duration that calcium channels are open, or send a message that tells the neuron which types of vesicles to release, which neurotransmitters to send out.

"How Does A Neuron Stay Polarized"
"One of the major issues is tracking the specific vesicles that are needed to transport each specific component to its exact polar destination. Protein regulation is needed to produce these vesicles—budding from a membrane, transport and then fusion at the destination."
https://jonlieffmd.com/blog/neuronal-plasticity-blog/how-does-a-neuron-stay-polarized

It is interesting to contemplate whether or not the magnetic dipole, of a single neurons, might also encode a kind of memory, at least temporary memory, by making permanent changes in the magnetic side of the electromagnetic phase field, the possible interactions between parts of the magnetic field may going to allow them to influence one another in interesting ways. Resulting in consequences like stimulated mitochondria, inhibited or excited receptors or ion channels, and contribute to unexplained cellular behaviors.

However the meaning of the phase changes is like different internal modalities happening simultaneously in each place with each neuron at each scale. (thalamic neocortex or macro scale, cortical column, neural circuit meso scale, dentride, neuron, synapse or micro scale, and possibly quantum scale as well.)

So a fractal of the magnetic modality co-occuring with the electric signals, mechanical wave signals (the force of neurotransmitters + soliton wave vibrations affecting mechano sensitive potassium receptors with ankyrin repeats).

Those three potential paths for signal transmission in particular (there are others, some neurons can sense heat, light, pain) might represent different temporal or spatial scales for sensed, stored, and transmitted information.

At all scales from micro-meso to the macro brain network the different scales of transmitted waves of information may cooperate simultaneously to develop the brain's tonic brainwave phase field, which creates the reflection of you with its temporally oscillating expectations that define the canvas of human awareness.

It is as if the reflection of you, in the canvas of tonic brainwave oscillations, is your oscillating memories, your expectations, and those memories are driving your choices at all scales, as you get new information, from your senses.

The Tonic Mind
Most of the tonic brainwave activity is detectable with EEG sensors. Delta, Theta, Alpha, Beta, (and also low Gamma 30-50hz). My argument is that the tonic frequency spectrum is slower frequency and higher magnitude so it has wider spatial effects which are useful for binding or synchronizing oscillations across vast distances in the brain. Phasic Brainwave frequencies can spike much higher.

This article below is also an application of Deep Learning applied to EEG

"Hidden consciousness detected with EEG predicts recovery of unresponsive patients"
"A new study finds that signs of covert consciousness—subtle brain waves detectable with EEG"
https://medicalxpress.com/news/2022-07-hidden-consciousness-eeg-recovery-unresponsive.amp
https://medicalxpress.com/journals/lancet-neurology/

Saving place for note on phone on high frequency brainwaves

This is a good place to put a reference to Peter Tse's work on criterial causation for how cells consider criteria.

a0011z

Cellular Oscillating Tomography

The Github history of this file dates to June 21st 2022

A JUNE 27, 2022 appeared with a specific concept
A new theory of learning integrates cognitive psychology and systems biology
https://phys.org/news/2022-06-theory-cognitive-psychology-biology.html?fbclid=IwAR30_eXmu4d31GvW41Icq0CkCqVUoHoM4d_nCAQYYlYJ-z6ZcMvaZveDjkI

It cited two works, one a paper dated in April 2022 called
"Learning Outside the Brain: Integrating Cognitive Science and Systems Biology"
https://ieeexplore.ieee.org/document/9764721

The 2nd was ""This behavior was first described by American biologist Herbert Spencer Jennings around 1900, but it had been considered non-reproducible.""
An edition of Behavior of the lower organisms (1906)
by H. S. Jennings
https://openlibrary.org/books/OL7150061M/Behavior_of_the_lower_organisms

Quote "American zoologist who was one of the first scientists to study the behavior of individual microorganisms and to experiment with genetic variations in single-celled organisms. He wrote his Ph.D. thesis on the morphogenesis of poriferans (microscopic aquatic organisms), an area of scientific interest he pursued for the next 10 years. The peak of his research and his primary contribution to zoology was his Behaviour of the Lower Organisms (1906). In this study of the reactions of individual organisms and individual response to stimuli, Jennings reported new experimental evidence of the similarity of activity and reactivity in all animals, from protozoans to man. For 40 years of his career Jennings studied the mechanisms of inheritance and variation in single-celled organisms." End Quote (Quote via https://todayinsci.com/4/4_14.htm)

This just blew my mind, this connects my research in 3 areas, vesicle function, cellular oscillating tomography, and neurodegenerative diseases in an unexpected way! Mind blown!

"Investigators discover a 'double life' for a key Parkinson's disease protein"
https://medicalxpress.com/news/2022-06-life-key-parkinson-disease-protein.html

"The Parkinson’s disease protein alpha-synuclein is a modulator of processing bodies and mRNA stability"
https://www.cell.com/cell/fulltext/S0092-8674(22)00592-X?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS009286742200592X%3Fshowall%3Dtrue

New supporting work came out on July 14th, 2022
"Multimodal perception links cellular state to decision making in single cells"

"Collectively, as a multimodal percept, this gives individual cells a large information processing capacity to accurately place growth factor concentration within the context of their cellular state and make cellular state-dependent decisions."
https://www.science.org/doi/10.1126/science.abf4062

The importance of variation in multi-vesicle release is interestingly also related to the study of how different quantities of neurotransmitter release in the synaptic cleft actually cause different cell reaction states related to different timescales
"Dopamine encodes real-time reward availability and transitions between reward availability states on different timescales"
"In contrast, DA transients evoked by cues that predict reward reflect the expected value of the future reward, as determined by reward probability 3,4, temporal proximity 5,6, and magnitude 6,7,8"
https://www.nature.com/articles/s41467-022-31377-2

"Dopamine subsystems that track internal states"
" In response to the taste of food3,4 or water4,5, VTA-DA neurons release a burst of dopamine that confers value on associated cues. "
https://www.nature.com/articles/s41586-022-04954-0?fbclid=IwAR2hOz4oUd7XEmXGCKm5_uRUyYurIfyIPEwe2tCT4439gNIZGR8yeq90RDU

Cellular Oscillating Tomography is also about the study of how information, built from synaptic coincident detection unlocks cell functions via Transcriptomic activations

"Learning Outside the Brain: Integrating Cognitive Science and Systems Biology" cited above appears to be very similar in concept to the concept of "Cellular Oscillating Tomography"

The idea that led me to coin the term cellular oscillating tomography came from several places, part of the idea came from the book about Cells by Jon Lieff M.D. He dives into a lot of the surprisingly intelligent things that cells do, and makes it clear that cellular communication is the central topic of biology. One was a book about neural coding called Models of the Mind by Grace Lindsay, in that book Lindsay talks about the history of trying to apply Information Theory to the study of neurons. There is a long history of attempts there. I also knew from studying the work of Ilya Prigogine, 10-15 years prior to reading these books, that cells were oscillating dissipative structures. So if you realize that cellular communication or signals between cells that activate different cell functions is the core topic in the study of biology, and you know that neurons communicate via receptors or synapses, and you know that there is a long history to trying to apply information theory to neurons then you can piece together how I arrived at the phrase Cellular Oscillating Tomography, oh the application of the word Tomography comes from the study of variously tomography related concepts, such as the Fourier Slice Transform, Holography, Diffusion Tensor Imaging, Electrical Impedance Tomography, and even understanding the concept of coincidence detection as the basic function of a neuron after reading "The Neural Basis of Freewill by Peter Tse"

So this
Learning Outside the Brain: Integrating Cognitive Science and Systems Biology
https://ieeexplore.ieee.org/document/9764721
Discusses receptor learning with information theory. Which is similar to what I argue with "Cellular Oscillating Tomography."

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The relationship between the electron and the magnetic field might be similar to the relationship between earth and its gravity/time dilation field. Explore & research the analogy further, add to the Gravity note map.

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See note: a0597z

Define new term: Cellular Oscillating Tomography
for understanding with information theory the messaging between cells is information, cells are forming memories with special receptor types & receptor configurations

Cellular Oscillating Tomography: cell entropy (dissipative system) drives receptor threshold based learning in DNA (coincidence detection based computation in receptor configuration that evokes transcriptomic encoded learned responses or cellular functions).
add to the discussion of the granularity of consciousness citing Jon Lieff, M.D.'s work.

Note
The imagined focus of future biological research is about understanding the functions encoded in 3D protein structures, tracing connections between gene expressions, 3D receptors, cells, and multicellular structures to behaviors, diseases, and all manner of biological functions that can be identified.
"The 3D architecture of the pepper genome and its relationship to function and evolution"
https://www.nature.com/articles/s41467-022-31112-x

Receptors have coincidence detection mechanisms inside the cell body.
https://elifesciences.org/articles/33604
https://www.frontiersin.org/articles/10.3389/fimmu.2018.02379/full
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC386520/?page=1

each receptor is a sensor and the more of them that you affect the more the cells behavior changes, that is variable gradient coincidence detection or pattern detection
A soma bursting action potential event isn't necessary for Hebbian learning to take place.

The soma burst is just one type of threshold mechanism, receptors also have thresholds via four levels of conductance.
"opening of glutamate receptor channel to subconductance levels"

Four levels of receptor sensitivity "Widespread brain receptor hides surprising mechanism of action" cited in b0123y
https://www.sciencedaily.com/releases/2022/04/220420170503.htm
This is the four levels of conductance article:
"Opening of glutamate receptor channel to subconductance levels"
https://www.nature.com/articles/s41586-022-04637-w

NAPOT Neural Array Projection Oscillatory Tomography includes communication with Astrocytes, Oligodendrocytes, T-Cells, Microglia, and basically any type of cell. NAPOT interfaces with all cells via COT Cellular Oscillating Tomography, because all cells exchange signals, and have receptors, membranes, and other structures to receive signals & detect information from temporal cascades of coincident activations.

Astrocytes
"Centripetal integration of past events by hippocampal astrocytes"
"astrocytes (are) computational units of the brain that slowly and conditionally integrate information about the past."
(centripetal integration implies that astrocytes can sort of pool information (or summarize input) like the action potential of a neuron, albeit at a slower rate)
doi: https://doi.org/10.1101/2022.08.16.504030

Astrocytes can compute paper https://www.biorxiv.org/content/10.1101/2021.10.20.465192v3

"Variation in voltages (or a lack of it) within an astrocyte network can also explain the"
Variations in voltages are phase changes.
This fact supports the connection between NAPOT Theory & glial cells.

"Research Reveals Surprising Conversations Between Our Brain Cells"
"Astrocytes operate as a network system that can be compared to a power grid with identical voltages. Variation in voltages (or a lack of it) within an astrocyte network can also explain the basic and advanced levels of brain function."
https://www.discovermagazine.com/mind/research-reveals-surprising-conversations-between-our-brain-cells

"astrocytes are electrically active and in constant communication with neurons, as Dulla and colleagues reported in a Nature Neuroscience study."
https://www.nature.com/articles/s41593-022-01049-x

Astrocytes can depolarize, releasing inhibitory glutamate, another way that phase patterns be altered to change the active tonic brainwave oscillation, your memory/awareness/model of reality & your internal qualia or representations, what you see hear taste smell and feel.

"When astrocytes depolarize, they can activate other proteins. But so far, researchers never really considered that possibility because they didn't think astrocytes could do so in the first

place. “So now that we know, it makes us kind of go back and revisit ways that they're affected by electrical activity,” Dulla says. When astrocytes depolarize, they inhibit glutamate transporters and therefore increase glutamate levels."
https://www.discovermagazine.com/mind/research-reveals-surprising-conversations-between-our-brain-cells

Most of the worlds biologists and neuroscientists do not realize what is perfectly obvious, which is that ordinary cells are capable of hebbian learning, receptors are sensors, as receptors can grow to represent a memory as a physical sensor configuration that is responsive to certain criteria

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Mechanoreceptors sensors in skin for touch

Recap: Cellular Oscillation Tomography, or Cell Tomography for short.

All cells oscillate, they are dissipative systems, they have frequency patterns, they are functionally vortices.

Receptors enable a cell to detect patterns, the more receptors that are affected, the greater the cell's reaction, receptors have thresholds for activation, but cells can also detect when multiple receptors have been triggered via inner threshold mechanisms that span between receptors.

Sometimes Potassium channel receptors are bound by Ankyrin Repeats and that makes the receptor surface area larger so the cell becomes sensitive to mechano-scale waves, in other words now the cell can react to touch. It becomes one type of mechanoreceptor.

In a sense that Ankyrin Repeat is allowing the cell to detect the coincident features of a mechanical scale wave (acoustic scale wave or sound vibration scale wave)

So any surface area could be part of a sensor, and if the sensor has different thresholds for activating different functions its a coincidence detector, the shape, topology, morphology, and physical configuration of the sensor determine what types of signals it is capable of responding to, and what types of signals it ignores, so the shape of the sensor can act as a learned memory, and this is why the learned receptor configuration on any cell in any organism is effectively a long term memory that exists to react or activate a function (a cell behavior) upon activation.

"Ankyrin Is An Intracellular Tether for TMC Mechanotransduction Channels"
"Here, we identify UNC-44/ankyrin as an essential component of the TMC-1 mechanotransduction channel complex in the sensory cilia of Caenorhabditis elegans mechanoreceptor neurons. Ankyrin binds indirectly to TMC-1 via evolutionarily conserved CIB proteins, which are required for TMC-1-mediated mechanosensation in C. elegans OLQ

neurons and body wall muscles. Mechanosensory activity conferred by ectopically expressed TMCs in mechanosensitive neurons depends on both ankyrin and CIB proteins, indicating that the ankyrin-CIB subcomplex is required for TMC mechanosensitivity. Our work indicates that ankyrin is a long-sought intracellular tether that transmits force to TMC mechanotransduction channels."
https://pubmed.ncbi.nlm.nih.gov/32325031/

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Thermoreceptors
"A thermoreceptor is a non-specialised sense receptor, or more accurately the receptive portion of a sensory neuron, that codes absolute and relative changes in temperature, primarily within the innocuous range. In the mammalian peripheral nervous system, warmth receptors are thought to be unmyelinated C-fibers (low conduction velocity), while those responding to cold have both C-fibers and thinly myelinated A delta fibers (faster conduction velocity).[1] The adequate stimulus for a warm receptor is warming, which results in an increase in their action potential discharge rate. Cooling results in a decrease in warm receptor discharge rate. For cold receptors their firing rate increases during cooling and decreases during warming. Some cold receptors also respond with a brief action potential discharge to high temperatures, i.e. typically above 45 °C, and this is known as a paradoxical response to heat. The mechanism responsible for this behavior has not been determined."
https://en.wikipedia.org/wiki/Thermoreceptor

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Morphology

On LTP Memory & Dendritic Morphology

My updated conjecture is that long term memories are not just from synaptic connections but essentially they are from the morphology of the cell itself, specifically the morphology of the dendrite, because that determines what signal patterns the dendrite (or the cell) responds, how great the magnitude cellular response is, and what types of variations in the signal the cell might create at the exit terminal of individual synapses.

When a cell gets part of a pattern it updates its synapses, which might cause a tiny phase change in its tonic oscillation timing that the rest of the oscillating cell assembly notices. I am looking at Olfactory bulb research to understand how a cell might instantly update its sensory input with a partial pattern. Do Potassium receptors get upregulated or down regulated? There was a study on Umami (search my notes, currently in note a0272z) that suggested "taste detection of glutamate (and presumably other amino acids) seems primarily to involve G protein–coupled receptors."

"Dopaminergic neurons dynamically update sensory values during navigation"
"Notably, odors alone induced value- and dopamine-dependent changes in the activity of mushroom body output neurons, which store the current value of odors, as well as the behavior of flies steering in a virtual environment."
doi: https://doi.org/10.1101/2022.08.17.504092

"The olfactory bulb carries out concentration invariance calculations by itself and does it very quickly."
" The computations for concentration invariance are most likely carried out within the olfactory bulb itself and they are carried out quickly."
https://www.biorxiv.org/content/10.1101/2022.08.17.504274v1

The Olfactory System
"Transduction of olfactory information occurs when odorant molecules contact the dendrites of olfactory-receptor neurons (ORNs). These neurons reside in the olfactory epithelium, a specialized region of the dorsal nasal cavity. ORN axons project through the lamina propria underlying the olfactory epithelium, and into the glomerular layer of the olfactory bulb. This projection forms the olfactory nerve, or cranial nerve I. Within glomeruli, ORN axons synapse onto the apical dendrites of mitral and tufted cells, which are the output neurons of the olfactory bulb. In turn, axons from these cells project to the primary olfactory cortex, through the lateral olfactory tract. The primary olfactory cortex comprises several brain regions, including the anterior olfactory nucleus, the piriform cortex, parts of the amygdala, and the entorhinal cortex.
https://link.springer.com/chapter/10.1007/978-1-59259-371-2_27

"Olfactory memory representations are stored in the anterior olfactory nucleus"
"The anterior olfactory nucleus (AON) (...) detects the coincidence of these inputs, generating patterns of activity reflective of episodic odor engrams."
"Previously, we demonstrated that odor perception can be altered by AON activity modulation. We also found that the AON receives dense, topographically organized projections from the hippocampus, a structure highly implicated in navigation and episodic memory"
https://www.nature.com/articles/s41467-020-15032-2

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Cellular Oscillation Tomography means every cell can encode memory (LTP) in the information configuration of its receptors, recognize patterns via Hebbian learning, and execute functions computed by evolution, saved in protein configurations.
https://github.com/v5ma/selfawarenetworks/blob/main/a0011z.md

New theory of evolution
In addition to natural selection via random mutation, we can consider Cellular Oscillating Tomography, or Cell Tomography, as another pathway for the cell to calculate future changes to its structure.

Cell tomography or cell computation via neuropeptide/receptor signaling might be the key component of evolution, rather than evolution by natural selection we could be looking at evolution by receptor/transmitter computation, since receptors represent a very basic (Hebbian) learning memory system.

Why is this a new theory of evolution? With natural selection random mutations can be stored in dna. With Cell Tomography receptors & neuropeptides can compute future changes to cell structure.

Side note: "Crystal study may resolve DNA mystery"
"When cells reproduce, the internal mechanisms that copy DNA get it right nearly every time. Rice University bio scientists have uncovered a tiny detail that helps understand how the process could go wrong. Their study of enzymes revealed the presence of a central metal ion critical to DNA replication also appears to be implicated in misincorporation, the faulty ordering of nucleotides on new strands. The observation reported in Nature Communications could help find treatments for genetic mutations and the diseases they cause, including cancer."
"time-resolved crystallography to analyze the flexible enzymes called polymerase as they bend and twist to rapidly reassemble complete strands of DNA from a pool of C, G, A and T nucleotides."
"All of the proteins involved in DNA replication rely on metal ions—either magnesium or manganese—to catalyze the transfer of nucleotides to their proper positions along the strand, but whether there were two or three ions involved has long been a topic of debate."
"Only when the first two metal ions are in check can the third one come and drive the reaction home," said Chang, suggesting the process may be universal among polymerases"
https://phys.org/news/2022-05-crystal-dna-mystery.amp
More information: Caleb Chang et al, In crystallo observation of three metal ions promoted DNA polymerase misincorporation, Nature Communications (2022). DOI: 10.1038/s41467-022-30005-3

(note that since this does not contradict the existing theory of evolution it can be considered an amendment or an addition to the existing theory of evolution. Essentially it argues that organisms compute their future structure through hebbian learning at the receptor / neurotransmitter signaling (and potentially this can scale up to learning at the multi-cell assembling level, organ scale & whole organism level.)

Computationally computed biological structures are different from random mutation but both are governed by natural selection.

"Premetazoan Origin of Neuropeptide Signaling"
https://academic.oup.com/mbe/article/39/4/msac051/6547593?login=false

Brain-Signal Proteins Evolved Before Animals Did
https://www.quantamagazine.org/brain-signal-proteins-evolved-before-animals-did-20220603/?fbclid=IwAR33-GbfcuhYcA4eWiNUhnzmKFCbqRAIitlGg9odhRmxn8RE9bJeI8vdD70

Note: Cellular Oscillating Tomography includes T-Cell & Glial interfacing with Neurons via Neural Oscillatory Tomography, the big difference is that Neural Oscillatory Tomography is specialized & optimized involving reinforcement learning via the stimulation of mitochondria via the electromagnetic wave emitted from the somatic burst or action potential. (If you search my notes you can read about Neural Oscillatory Tomography in more detail.)

"A synthetic protein-level neural network in mammalian cells"
Proteins are among the signals sent between cells, and in the Cellular Oscillatory Tomography theory I argued that regular cells function like neural networks, in part because receptors have thresholds, receptor growth changes those thresholds, and cells have states that trigger different learned genetic behaviors or information configurations that represent 3D biological structures that have a learned programming.
https://www.biorxiv.org/content/10.1101/2022.07.10.499405v1?fbclid=IwAR0Y3LP8yWt0e81pOhuShBEfh0Ckey02bxFj5zqQ55rtaCNHHEyoKEZaM2I
"Artificial neural networks provide a powerful paradigm for information processing that has transformed diverse fields. Within living cells, genetically encoded synthetic molecular networks could, in principle, harness principles of neural computation to classify molecular signals."
"These results demonstrate how engineered protein-based networks can enable programmable signal classification in living cells."
But I go a little bit beyond this paper by arguing that our evolutionary biology is far from something that develops with random mutations, rather it is computation, biological computation that is actual computation in the computer sense, that biological computation, inside one cell, and among many cells acting in coordination via oscillation is computing future structures for biology to evolve towards, such as the long beaks of birds that sip from flowers that require long beaks, the flower & the bird evolved together, like a computational symbiote.

//

There is an interesting study called
"Neural Population Dynamics of Computing with Synaptic Modulations"
"In this work, we analyze the dynamics of a network that relies solely on synaptic modulations to process short-time scale information, the multi-plasticity network (MPN)"
https://www.biorxiv.org/content/10.1101/2022.06.27.497776v1

It's interesting because they are considering the dynamics of cellular communication in the human brain by creating a new type of artificial neural network called a multi-plasticity network (MPN) to explore the concept of short term synaptic plasticity. So the weights are not frozen after training but continue to be plastic, or dynamic, inspired by 'fast weights' in flexible learning, and unlike the HebbFF model they use multiplicative weights instead of additive modulation.

a0011z.multimodal Is this a new Cellular Oscillating Tomography reference?

"Single cells are more intelligent than scientists previously thought. Sept 2nd 2022"

"The researchers found that the variability in the activities of individual sensors across cells is closely linked to variation in internal cues. For example, the abundance of mitochondria, the cells' power stations, fundamentally affects how an external stimulus is perceived by an individual cell. Additionally, each sensor integrates different cues from inside the cell. When the researchers evaluated an important decision of a single cell – namely to proliferate or to stay quiescent upon a growth stimulus – they found that the cell's choice was mediated by the perception of multiple sensors and was predictably modulated by cues of the cell's internal state"
https://scitechdaily.com/single-cells-are-more-intelligent-than-scientists-previously-thought/amp/

Reference: "Multimodal perception links cellular state to decision-making in single cells" by Bernhard A. Kramer, Jacobo Sarabia del Castillo and Lucas Pelkmans, 14 July 2022, Science.
DOI: 10.1126/science.abf4062

Note: I published my notes on Cellular Oscillating Tomography on github on June 17th, before this July 2022 paper comes out. It doesn't seem plausible that these folks read my work, and I'm not worried about that, I'm just noticing that I had my work published before this. I will cite their work in my work as a reference for supporting Cellular Oscillating Tomography theory. I don't like the fact that their article has a paywall, thus my access is limited to peripheral conversations about it, at the moment.

a0012z
an oscillating cell, because of the tensegrity or physical forces between clustered oscillators (atoms, molecules, chemicals), is going to be sensitive to the environment as its delicate structure is disturbed by collisions at all scales, so any atom is capable of encoding a representation of its ecosystem in a sense, but an oscillator is not a self-aware entity that oscillates its learned patterns across different sensor/transmitter arrays at multiple scales like the human brain encoding patterns in learned connects between incoming stimulus patterns from the environment.

An oscillator like a hurricane might encode changes from its environment that alter the fabric of its causal body in phase space mimicking short term memories, but more like learning patterns that are never conscious because there is no prior memory to compare the pattern against, and even if the structure prior to the structural change is a prior pattern the pattern isn't sending signals to other oscillators except that it actually is also doing that through light, heat, particle collisions, em field lanes, sound/vibrations, as charge and spin configurations, and so on.

but what spacetime doesn't have is the specific tensegrity & configuration of the human mind to have a certain temporal and spatial scale for learned patterns that become expectations, and memories that act as attractors for learning new information

a0013z

What you see is a perspective rendered between sequences of sensor arrays, that is spatially and temporally distributed pattern in a changing phase field that consists of patterns rendered by your brain to your brain.

that is the same for all sensory representations
all manner and variety of thought feeling idea sensation, its all tempo-spatially distributed phase decoherence patterns and oscillating substrate to serve as the canvas of observation and the awareness of self as the canvas of observation

an oscillation is a sensor and transmitter at the same time, because it is disturbed by anything that disturbs it and it transmits whatever disturbed it by changing its phase up or down

but even though its a sensor transmitter it doesn't have a memory, or a permanence, and without memory its patterns have no context, so information is not informing anything,

Inside certain molecular structures like the networks of the brain it is possible for the oscillators to form molecular memories, or memories that are encoded on the molecular structure of the brain by electrical wave patterns, magnetic wave patterns, mechanical wave patterns, and chemical wave patterns.

What makes this amazing memory structure self aware, or able to learn a model of itself, down to exactly how it's brain works,

a0014z
Jul 13, 2011
What is conscious thought?

I imagine that nothing is like the whole of spacetime undivided, without thought or distinction, it's the holistic perspective outside perception.
Is it ok for one person to be equally ok with there not being a point, as they are with there being a point? Perhaps no point is a sort of dualism that can only be transcended, when one realizes it's a distinction accomplished only when one disowns the point. Like a shadow point. As long as it's denied, the distinction of no point can make sense. What happens when we become the apex of point and no point. Unifying

all perspectives absolute and relative, everything and nothing.

The point that is no point becomes the point that is and isn't, and also isn't, while it is at the same time.

It's a metaphor, people have a metaphor, and then they learn stuff, and the metaphor expands, at some point growth stops because the mind is expecting nothing good from the unknown, it chooses fear instead of fearlessness. Seriously, I've seen it in hundreds of people. The only way we do something that is beyond our rational self protective bubble, is when we actually believe

that there is something we would like to have is outside our bubble. The incentive to grow again, becomes this fearless quest. Once someone has crossed the metaphorical threshold, and dared to walk into the unknown, because they trust that something worth going there is there waiting for them. The action of crossing this "threshold" is a neurological shift. You'll see a contrast in the population you might have noticed and might not have noticed,

while you and many others will be humbled full of Gratitude and genuinely respectful towards everything. It's a boundary that the rational (fear based mind) cannot ever cross. Only a leap of faith (when the left brain submits to the creative right brain) can bring you to the other side of the road.

The paradox is that when the small face becomes totally helpless in the face of determinism, and stops trying to control everything (futile) then the vast face takes over. In the moment of becoming totally helpless and renouncing your small face, you become all powerful and one with the way that you are.

A new type of connection or inner relationship between parts of the mind is formed or so I believe.

Does not mean I think all these ideas have to be correct.
The point is that they A: make for a good story, for a book, and B: they help start new conversations not end them. I'm good.

a0015z

Max Hodak Neuralink, and the new Neuralink representative both repeated what appears to be the same error.

They both think that the only way to hear an APsyn in real time is to insert an electrode within 2 microns UI

Neuralink is operating under a false premise because a single Neuron firing could actually be monitored from outside the brain
with a combination of laser infrared imaging, ultrasound, holography, and a camera sensor that was large enough & fast enough,
This is because Neurons are little pumps that are constantly expanding & contracting as they take on and expel neurotransmitters.

a0016z

(The notes that mention Neo Mind Cycle are originally from the era between 2011-2015)

(cortex)

The full Neo Mind Cycle program included nutrition & supplements, not just brain stimulation and neurofeedback, this was a similar to try a little of everything approach in the book about D-ribose "From Fatigued to Fantastic Paperback" by Jacob Teitelbaum M.D. (Author)

Neo Mind refers to the NeoCortex, aka the New Rind, aka the giant thing that makes human brains distinct and new from other species
Neurofeedback the way I do it isn't just feedback, it's a feedback loop. or cycle,
Hence Neo Mind Cycle: Optimizing your brain is just part of a healthy lifestyle.

"Self-modulation of motor cortex activity after stroke: a randomized controlled trial"
Interesting mri / eeg neurofeedback article for folks who had a stroke
https://academic.oup.com/brain/advance-article/doi/10.1093/brain/awac239/6663819

a0017z
Note Created Jul 30, 2012, 3:15 PM
(emotion, cortex name slogan)

Neo Mind Cycle: Optimizing your brain is just part of a healthy lifestyle.

I'm Neo Mind Cycle founder Micah Blumberg join me on faceobok.com/worksalt or Google+ (search for Neo Mind Cycle to find my name easier)

About the name: We did consider the name "Neo Mind Happiness Chicken"
However Chicken isn't part of what we do here, it just sounds fun!
Neo Mind refers to the NeoCortex, aka the New Rind, aka the giant thing that makes human brains distinct and new from other species.

You knew that one already?

The Cycle part comes from the fact that we incorporate Neurofeedback in an advanced way, using customized light and sound feedback driven by your brainwaves, while stimulating you with isochronic beats also driven by your brainwaves.

This means that the way I conduct my program is innovative, special, it isn't just about traditional neurofeedback", it's about a "feedback loop". or cycle, hence Neo Mind Cycle,

I highly recommend the book "I am a strange loop" by Douglas Hofstadter for more insight into the idea of thinking of self awareness as a feedback loop.

So at Neo Mind Cycle we put the human brain in a neuro feedback loop, but that's not all.

In addition to the neurofeedback loop we add sound and light based isochronic brainwave entrainment, both the entrainment and the feedback are driven by your brainwaves.

No other Neurofeedback company in the world is doing this for three possible reasons.
1. They haven't thought of it.
2. They don't know how.
3. They don't have the technology.
4. They are busy with a million other amazing things that can be done with EEG technology, which is amazing!

There are 40+ years of research and proven benefits for clinical Neurofeedback
There is another separate 40+ of research and proven benefits for Audio and or Visual Brainwave Entrainment

Neo Mind Cycle is designed to work based on the principles of emerging Neuroscience of Brain Plasticity.

The results are incredible, even after a single treatment, participants have reported unique experiences, because your brain is unique. However one session is not enough for profound change. The Neo Mind Cycle program itself is 12 weeks, twice a week, so 24 sessions takes less than an hour including set up time. It works out to less than $41 dollars a session if you get to do the whole program which costs a sum of $999.

Some benefits I have personally noticed, and have confirmed by actual users of Neo Mind Cycle services include learning to recognize your inner mental and emotional state faster, I mean specifically an rapid expansion of self-awareness. Another awesome benefit is an increased ability to react to each moment of life in a more nuanced creative and effective way. I seem to learn faster than ever before. These effects are common in both the research and in personal testimonies, I feel this ability to exert more conscious control, and more coordinated control over my mood, performing especially well during high pressure situations. This includes the sped up ability to make yourself authentically happy, for me it's now instant.

a0018z

This book is volume one in a series.

Neurons are blowing your mind hehe. That's a neuro-quantum-gravity joke.
My Quantum gradient time dilation notes talk about mass as a time crystal but this connects to neural function, and the notes on the expansion & contraction of neuronal membrane during & after the action potential (and before the expansion of the dendrite) and it means the neuron is literally warping spacetime.

See Note "Time Crystals, Time Dilation, Quantum Gradient Time Dilation"
https://github.com/v5ma/selfawarenetworks/blob/main/a0253z.md

It's not only that dendrites expand, to transmit mechanical waves, but also the action potential or the soma burst comes with a volumetric expansion of the membrane of the neuron, this opens the door to the transmission of soliton mechanical waves being transmitted along the neuron body, through the synaptic fluid in the synaptic cleft to downstream neurons.

I realized that I needed to get my work out asap. The world requires more advanced neural networks for a multitude of reasons. We need to solve medical issues. We need to build homes. We need to defend our countries. Basically every problem in the world can be addressed with advances in technology.

This technology can be dangerous in the wrong hands, but I believe that there will be a net good in the long term following the history of technology.

Spacetime is in a sense relative to our neurons.

In a poetic sense our thinking is unites with the fabric of spacetime, we are in a sense oscillating fractal folds of spacetime in an advanced information configuration that is defining space and ourselves at the same time

what makes humans different from the rest of spacetime is that our density and spatial configuration maximizes information in certain spatial frequency patterns that reflect spatial patterns

in other words as an oscillation pattern we are literally absorbing and emitting spacetime simultaneously it is moving through us because we are dissipative vortexes

These linked stories below ought to be linked to oscillations in my notes to receptor functions, to soliton waves, to plant growth (patterns of cytokine release), and to cellular oscillating tomography.

"Electrifying rhythms in plant cells"
https://www.sciencedirect.com/science/article/abs/pii/S0955067422000667?dgcid=coauthor

"Plant PIEZO homologs modulate vacuole morphology during tip growth"
https://www.science.org/doi/10.1126/science.abe6310

In effect this note shows that dna encodes the oscillatory properties of neurons, which is not surprising, but it is supportive of the Cellular Oscillating Tomography theory.
"A transcriptomic axis predicts state modulation of cortical interneurons"
https://www.nature.com/articles/s41586-022-04915-7

Is the Hippocampal Entorhinal loop overstated? or understated? because it looks like brainwide input is interdependent on Hippocampal connections. Also the role that interneurons have on

inhibiting dendrites directly impacts memory function in the NAPOT mode. Neural Array Projection Oscillation Tomography

"Brain-wide reconstruction of inhibitory circuits after traumatic brain injury"
"populations of interneurons expresses the neuropeptide, somatostatin (SST)4,5,6. These cells inhibit dendrites and thereby regulate the integration of glutamatergic input to local principal neurons. This endows them with unique roles in shaping synaptic plasticity, learning, and memory 7,8,9,10,11,12,13,14"
"We found dramatic quantitative differences in both the local and long-range input to hippocampal SST interneurons at the injury site."
"we uncovered a similar pattern of circuit reorganization far away from the injury in the prefrontal cortex (PFC), which interacts with the hippocampus bidirectionally"
"Whole-brain mapping of rabies-labeled neurons revealed input from 15 distinct brain regions"
https://www.nature.com/articles/s41467-022-31072-2?fbclid=IwAR2cCdaa_FisM7C9CODff9Cgtof8Wf57L7mYfmkq8VP3Jt1-AZvuKo-FSuU

Hippocampus notes in book pictures repo about the Hippocampus being like a cortical column, György Buzsáki 2006 figure 11.2

Hippocampus

I regard the hippocampus as like cortical column #1, it is a unique structure but in essence it embodies the key characteristics of an oscillating cortical column. The hippocampal-entorhinal loop might have a central role in your cognition, but essentially all of your oscillating cell assemblies are playing a role in sentient self awareness.

"A Cellular Positioning System to Probe Morphological Heterogeneity Among Mouse CA3 Hippocampal Pyramidal Neurons"
"Some heterogeneous structural and functional features of these neurons vary in a topographically patterned way and are essential for proper hippocampal function. For example, in CA3, place field size, pattern completion, and sharp wave initiation are all arranged topographically 3,5–9. Specific locations within CA3 are recruited during both spatial 10–14 and non-spatial learning and memory15. Focal lesions within specific CA3 subfields can lead to disrupted fear memory16 or spatial processing17. Chronic social stress also perturbs CA3 dendritic morphology and concomitantly impairs spatial learning and memory, likely in a topographically patterned way18"
"No study to date (to our knowledge) has studied dendritic morphology along all three axes simultaneously. We believe this is due to a methodological gap. We sought to fill this gap by establishing proof of principle in collecting and analyzing detailed topographic and morphological variables of CA3 pyramidal neurons across all three axes."
doi.org/10.1101/2022.08.12.503761

The mind organization hypothesis I subscribe to is that the Hippocampal-Entorhinal Grid Cell & Place Cell Interaction is creating the neural correlates to a volumetric representation of some outside area or inside area such as a room or hallway that the organism is moving through, then other parts of the brain (such as cortical columns - Read: A Thousand Brains by Jeff Hawkins) are filling in the contents that are in volumetric representation of space.

"Sequential involvements of macaque perirhinal cortex and hippocampus in semantic-like memory including spatial component"
"Converging studies have shown exclusive involvement of the PRC (perirhinal cortex) in item processing, while the HPC (hippocampus) relates the item with a spatial context."
doi.org/10.1101/2022.08.15.504057

a0018z.twostreams
What is TE you ask (TEm, TEav & TEad)? Well they are subdivisions of the Inferior Temporal Cortex (3D Semantic Segmentation Visual Pathway) cozy with the Perirhinal Cortex, before the Entorhinal Cortex & Hippocampus. (The Posterior Parietal Cortex is the NeRF pathway. (humor))

Search image from wikipedia saved in google photos (add to pictures repository on github.com/v5ma) "(1982, see two streams hypothesis)"

The ventral stream is analogous to a 3D Semantic Segmentation pathway for visual info, (like Pointnet++) and the Dorsal pathway is the NeRF Neural Radiance Field, or the 3D model of "where" all the points in the light field go, how they are sorted & organized spatially.

I want to find the PDF on grid cells that I saved to the chromebook by putting it here.

we are creating spacetime at the same time that are created by spacetime

but the mind in particular is the vortex of the brain with its particular structure that warps space to cause the paths of information to flow into certain ~~holographic~~ tomographic patterns that represent a perspective on space/time

so the mind is a rendered perspective on spacetime in terms of being a computed phase field

imagine the rest of space is also a computed phase field that is relative to the minds computed phase field but it does not have the same dense spatial frequency configuration that the brain has that allows for sophisticated systems like short term and long term memory, just like how a leaf does not do the same thing as a cpu you or a gpu

what our brains are doing to the structure of information configuration is not only specific to time/scale, it might also be inverted to the timescale of the cosmos

the funny thing about the mind blowing idea that neurons warp space is that neurons are literally blowing the space in your mind

One of the weird perks of having a new unpublished theory of quantum gravity is that I have new quantum gravity jokes that I can't tell you about yet (until after the theory is published), let's just say for now that these jokes are mind blowing.

along the axonal fiber of the neuron firing the moving charge is a magnetic wave, a soliton mechanical wave, a gravitational electric wave pattern.

the phasic firing produces the light that shines through the film of the synaptic pattern, magnifying its particular pattern in attention by inhibiting variations of the memory pattern that are similar, but when firing happens faster than the ionic gradient can reset that could result in a phase increase or decrease with each subsequent interval for that pattern

Connect with scaling & magnification notes & SWP Sharp Wave Ripple binding
"Neuroscience research triggers revision of a leading theory of consciousness"
"A new finding that unconsciously processed images are distributed to higher-order brain networks requires the revision of a popular theory of consciousness."
"A recent brain scanning study now shows that unconsciously processed visual information is distributed to a wider network of brain regions involved in higher-order cognitive tasks."
https://bigthink.com/neuropsych/revision-leading-theory-consciousness/

George von bexi vibrators on the knees of test subjects: a point source of vibration was jumping from one knee to another, and make them experience the vibration between their knees
the
ear is a frequency analyzer
while the theories
sense of smell from osmic frequencies
taste frequency

Nikolai Bernstein physical movements encoded in wave forms
the visual cortex is responding not to patterns but to frequency waveforms

Karl Pribram found that neurons responded to a select range of frequencies

the cosmos as a hologram

looking glass universe

an electron not being looked at is always a wave

Theoretical Neurophysics: Self-Aware Neural Networks (Real & Artificial), Quantum Gravity, & Brain Computer Interfaces.

A unification of socialism and capitalism?

everything humans touch turns from light into time & matter, we are splitting the light phase field by observing it, absorbing electrons, releasing protons

Neils Bohr
David Bohm

EPR Paradox /

Plasma, high density
interconnected whole

Perhaps we could imagine, as a thought experiment, that entangled particles are like a single particle flattened out, united by synchronized oscillation, in a coherence pattern, its split is from applied force.

"Entanglement is, however, fragile, meaning that changing the frequency of one photon risks destroying its entanglement with another."
https://physicsworld.com/a/photons-stay-entangled-despite-huge-jump-in-frequency/

But perhaps it is not the matching frequency that unites entangled particles after all? A mystery opens up.

If the temporal frequency of one photon in a photon pair is altered does that change the frequency of the other photon? Is this shown in existing research on Quantum Teleportation?

Connect a0018z note with a0258z note and a0369z on Quantum Teleportation.

Connect with earth oscillating, oscillating earth, and neural network cosmos universe
earth has superficial awareness on super short timescales, the smaller more complex configurations of oscillators in brains have magnified temporal awareness

I intentionally avoided talking to any experts while writing this book because I wanted to enjoy this fantasy if it was just a fantasy for as long as possible and I wanted to produce the most surreal story even if it wasn't correct because it was interesting. So I let my imagination fly.

Pretend this story is just a dream, and dream with me for a while that it's all true.

Neurons warp space

If it's obvious that a mass such as the earth has gravitational force then it should be obvious that a mass such as a neuron has gravitational force, when a neuron fires it expands, the soma explodes, and the explosion has a direction which is the axon length. So a neuron is warping space like an exploding star warps space, the mass of the neuron has increased and therefore its gravitational force has increased.

if components of space like stars have linear behavior they would be incapable of complex behavior but it's more like they are less capable of complex behavior because they are more linear

Unlike gravity, magnetism doesn't work for everything with mass. Magnetic forces only occur between specific materials (mainly iron and certain iron alloys). This alone is a strong argument that magnetism is not responsible for gravitational forces.

The force of attraction

as space converges it pushes itself faster in time but slower in velocity

In short gravity is not the electrical force

it's the attractive force of a spinning oscillator
which is diluting the power of electrical force

if a particle can randomly travel in 6 possible directions each direction has a 1/6 chance

however let's say that in one of the directions space contracts into mass and a time dimension is added in the direction of that mass because space is moving faster there so we get twice as many particles

I think Quantum Gravity is the result of space warping around oscillator flows, or large scale wave patterns in the electromagnetic field around masses caused by the interactions of oscillators of different scales with different properties.

Ultimately electrical force also stems as a property of the properties of its oscillator flow as well.

This is why there could be a particle that matches the size and predicted properties of a graviton its existence might be incidental as long as the aggregate oscillator flow averaging all the forces contained within it add up to the force of gravity

Attractive and Repulsive Forces on Particles in Oscillatory Flow
https://ui.adsabs.harvard.edu/abs/2016APS..DFDD25001A/abstract

In the same way that an accelerating elevator can mimic gravity, so can an oscillator flow that has a cycling

the earth is flying through space which is energy

so its like condensed slow energy (mass) is pushing through lightweight fast energy, like a magnet attracting and repelling space,

suppose repulsive force was like gravity assist

At the moment one of my new hypotheses about the cosmos is so far out that I'm not sure that I believe it, but neither can I dismiss it, so I will include it to the book with a disclaimer that it's an interesting idea but far from a mathematical proof.

We can extend natural selection and evolution to the cosmos and to human selection, to say that human choices are an extension of natural selection.

Humans predict multiple possible futures, they move away from futures they don't like aka fears, and they move toward futures they do like, aka Humans and their cells move towards predicted futures that feel hopeful (ideally).

perpetuating the climate change problem by not recognizing that by allowing rich people to dictate the prices of labor instead of the government the incentives flow to the oil & gas industry.

I make the argument that Space might have zero absolute and zero absolute time, just relative space & time, because they balance each other out like positive and negative charges, with space being more negative and time being more positive. Somewhere in between a moment that in summary equals nothing there is temporarily something. That something is a chaotic volumetric information pattern called mass in an otherwise harmonic & tonic oscillating spacetime field in between a single moment of nothing that is also, on the flip side of the coin, the ever present beginning of spacetime.

imagine in theory that there was no 'absolute' distance or time between any two points in space, just the relative emergence of distance and time to the observer, us

the observer viewpoint is essentially a mini hologram inside a hologram (space) we are each the image of the spacetime cosmos and the product of spacetime cosmos, and a dissipative system in the spacetime cosmos which is an harmonic oscillator in total, with space and time being resonating oscillators

All forces can be thought of a oscillatory differentials of varying configurations (differences in magnitude (amplitude and or duration)/ frequency)

in an oscillating field oscillations grow together once they oscillate together
if they oscillate apart they grow apart

it's about the idea that your exact location/scale in the universe is determined by your oscillatory pattern

the idea that we might be able to teleport through time and space is about the fact that each person is a phase field configuration state

if you could capture and reconstruct the phase field state you could alter it so that it has a new relative position in spacetime

Category theory: One function is composable to another function if it produces the same result as the other function. The common denominator allows us to compare & multiply unstructured data sets. Such as heart rhythms & brainwaves.

Two objects are composable in phase space if they have the same phase, or same oscillation, they can converge in space, expanding space & time around that convergence relatively speaking

If they have a similar oscillation they can get close to converging in spacetime, so there is a timespace gradient

there is a geometric field for time

and its

A0019z

A note for articles that may or may not be relevant now (to my book) but might be relevant later (in another book I might write or in a revision or interesting for some other reason.) For whatever reason I might want to read these later, but not right now.

New Open Access Resource Counters Misinformation on Genomics of Human Behavior
https://neurosciencenews.com/genomics-human-behavior-19267/

New Math Book Rescues Landmark Topology Proof
https://www.quantamagazine.org/new-math-book-rescues-landmark-topology-proof-20210909/

The Sensory Neuron as a Transformer: Permutation-Invariant Neural Networks for Reinforcement Learning
https://arxiv.org/abs/2109.02869?fbclid=IwAR2hcfWZtftLc_QM7bG9xfqRmLKu5rPWmtK5GxsFFwjkm-_0CEOJ72UqQRk

a0020z
When I look at a dishwasher my brain is rendering it in at least 3 scales if not also simulating it in infinite scales in tempo-spatial 3D grid like phase patterns.

the particle attraction to stable electromagnetic wave formation

as if different power bands might be related to different clock speeds of tonic oscillation patterns based on the time of flight of light or sound in the receptive field of each of the sensory modalities resulting in different bandwidth needs, implying that frequency is the bandwidth of some sort of information transfer which I believe is four dimensional grids of multi-sensory multi-data type multi-frequency representation

A tonic Alpha oscillation might respond more to the sensory frequency expectations of day time, whereas Delta frequencies are slower and closer to the expected sensory frequencies during the late night and early morning.

but perhaps the expectations of feet are going to be attracted to a different powerband that better scales its frequency patterns which ought to be different from

The part of you that doesn't have control doesn't exist.

There is no passive observer, consciousness is like a snake propelling itself through the grass without arms. You are its story, but its most fundamental reality is that it is a kind of multi-dimensional electric, magnetic, acoustic, mechanically vibrational, four dimensional knowledge graph encoding in tempo-spatial phase pattern sequences, breathing awareness of its environment and itself.

It is reacting to the futures that it is predicting will happen and changing its shape to respond to that future.

If you see the world heading towards a cliff, that idea is going to influence your behavior in a major way.

a0021z

Website, I want to build a network of reference pages on my website

References to books,
references to ted talks videos
references to Gamma
references to brainwave entrainment studies
references to competitors
references to brainwave entrainment products
references to all the software I use
openvibe
mind workstation
neuro programmer

emotiv
neuroscience of personality

I want the website to be totally open and informative.
Overwhelmingly so.

Neo Mind Cycle is going to be a real central hub for all that is going on in the brain scanning, neuroscience, mind reading, emotiv EEG, brainwave entrainment technologies.

Gamma

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8 hours ago · Unlike · 1 person

Micah Blumberg
there most definitely isn't. The special sauce of Consciousness is a myth. The special sauce, the electric-chemical dream, the illusion of maya. This has been brought to you by the impossibility of nothingness.
3 minutes ago · Like

Tags:
cortex,

a0022z
This was an email I sent to Dario Nardi and then later uploaded to my notes on Jun 20, 2012, 12:43 PM I changed a couple things for clarification before uploading it to github 10 years later.

'The idea for this (Neo Mind Cycle) experiment came to me while I had been reading about CI Therapy (Constraint Induced) in the book "The brain that changes itself"
I decided to try my Neo Mind Cycle with a blindfold on, shutting out all the light, so that my visual cortex would go to work for the auditory cortex and or whatever else I was doing.

What happened was a fusion of feelings, emotions, internal representations including internal visualizations, with the audio feedback that represented my brainwaves.
Since this is neurofeedback, and it measures the neocortex, how is it that it measures emotions which come from the limbic system beyond the reach of the sensors?

I had conscious control over this fusion of feelings, visualizations, and sound. I played with visualizing the body with different colors, to change the sound, and gradually I learned to make myself feel amazing. When I took the goggles off, it was 4: 30 in the morning. I had literally spent five hours in the machine and not realized it because I was so engaged. I had felt something that was more intense, profound, pleasant, and visually stimulating than the two times I had been in a sensory deprivation tank. I was visualizing (and feeling my visualizations) the kinds of things that someone would expect to see and feel if they were at Burning Man on powerful psychoactives. I want to emphasize that I had done this with only technology, there were no drugs involved.

"It is a great way to bring people into a growth process that is more sensory and surely less "clinical" (and thus less intimidating)."
I love this sentence, yes Neo Mind Cycle uses medical grade EEG, and my brain is really benefiting, but the "sensory" experience makes this feel like a recreational activity, and it really is also a recreational activity! I love using it!

Since contacting you feels thrilling to me, and very important, I wonder if my use of words like these words creates a prediction in your mind of how much brain activity I am using, and from what regions. Do you visualize another person's brain activity as you talk to people?

Yesterday I found myself visualizing the neural activity in a woman's mind as she explained to me her experience with one of her oldest girls being diagnosed with SPD and working very hard for many years to "grow" the child's brain with traditional therapy options and newer brain games.

So I am researching the history of SPD, so I can make useful predictions regarding what to expect when something like Neo Mind Cycle is applied to patients with SPD. (I like you said a more "sensor" variant relative to traditional ideas about how to use EEG.)

I am excited about the upcoming occasions to chat with you over the next few weeks. Thrilled with the idea of meeting you in person in early October. I am already visualizing showing you some of the neat things I've been working on. Maybe I will have something new and amazing to share then! I'd naturally be thrilled to meet with you in person again in December! It's all very thrilling.'

June 20, 2012, 12:43 PM

Tags:
brainwaves, killed, neurofeedback

a0023z
Note Created Oct 17, 2012, 2:29 PM

GRID Theory:

The brain is wired in an interconnected grid. Connections at grid crossings are established by learning and signal flow through the connections are in the form of directed graphs. Matrix mathematics, used for representing equations, can be mapped to directed graph geometry. Therefore, the directed graphs in the brain are set up for complex mathematical formulas that reflect the real world. As such the brain and mind is an ever-evolving information set that mirrors the needs of life in an ever-changing environment (both natural and human-made).

Observations:
1. Brain as interconnected grid:

Brain wiring a no-brainer? Scans reveal astonishingly simple 3D grid structure
http://medicalxpress.com/news/2012-03-brain-wiring-no-brainer-scans-reveal.html#firstCmt

2. Matrix mathematics is solvable by directed graph operations:

Directed Graphs as matrices
http://www.mathwarehouse.com/algebra/matrix/matrix-directed-graphs.php

http://en.wikipedia.org/wiki/Directed_graph
http://en.wikipedia.org/wiki/Graph_theory
http://en.wikipedia.org/wiki/Adjacency_matrix

Graphs, networks, incidence matrices
http://ocw.mit.edu/courses/mathematics/18-06sc-linear-algebra-fall-2011/ax-b-and-the-four-subspaces/graphs-networks-incidence-matrices/MIT18_06SCF11_Ses1.12sum.pdf

Graphs and Matrices
http://reference.wolfram.com/mathematica/guide/GraphsAndMatrices.html

3. The rest of the theory statement is only theory. From what I see in the most recent posts, you have already thought of this. I have perhaps only restated it in these terms.

4. Tests. It may be possible to test to see whether the brain is an interconnected grid vs. a set of independent networks. This in my view has ramifications for brain plasticity and adaptability. Given that a grid has been detected (item 1), it makes little sense for the grid crossings to not be connectable and disconnectable to form networks.

5. Other references.

When you resort to matrix math then you really know your argument is tedious.
http://arxivindex.blogspot.com/2012/04/when-you-resort-to-matrix-math-then-you.html

Large Graphs: Modeling, Algorithms, and Applications
http://www.ima.umn.edu/2011-2012/W10.24-28.11/abstracts.html

Are mental properties supervenient on brain properties?
http://www.cis.jhu.edu/~parky/CEP-Publications/VVP-SR2011.pdf

Studying the human brain anatomical network via diffusion-weighted MRI and Graph Theory
http://www.sciencedirect.com/science/article/pii/S1053811907010014

An interesting note is that Diffusion Tensor Imaging, in this case, is showing us the white matter of the brain.
This white matter in the center is myelinated axons that connect the gray matter neurons in the neocortex to the rest of the body.
So it makes a lot of sense that they look like ribbon cables, since they are thought by some to be serving a similar function to ribbon cables or fiber optic cables.
What isn't modeled here is the "gray matter", or the neocortex, which is what some like Jeff Hawkins of Numenta, and at the moment Blue Brain is focused on modeling.
It's thought by some that the neo cortex with it's cortical columns, in a hierarchical structure can also be represented with a grid, but it's a vastly more complex grid

(a three dimensional grid with vertical flows of information, and vastly more horizontal flows of information, three axis, information flowing up and down, vastly more down than up, left to right, right to left, front to back, and back to front.)
What also isn't modeled is the extra power of large brain waves which do reach beyond what they are directly connected to trigger cells(parts of the grid) that are not connected via the grid format.

The neocortex (what isn't modeled in these diffusion tensor images) is thought by some to be much more dense in its complexity than the visually simpler myelinated axons featured in the diffusion tensor imaging as we have seen here.

One strong possibility is that your brain isn't doing any logical computation. It's just doing intuition, which means it's making connections. (making connections to make associations, to make meaning, to make concepts, to predict causes, to model the world as you know it, to model words, to model the connections between beliefs, motor controls, consequences, etc...)

This connection making can model just about anything, including visual objects, words, sounds, paths you can walk, the links between rewards, consequences, motor controls, inhibitions.
The meaning of anything is perhaps just a token that represents the connections between associated points. A token being like a specific set of connections between numbers in a matrix.
This intuition can also learn the meaning and purpose of tools, including logic and reasoning, it can use these tools to vet its own intuition, and to attempt to explain its intuitive positions to other minds.

Intelligence may use logic and reason as tools, via intuition (from previously learned patterns), while at the same time being an entirely pre-logical pre-rational process of connection making. In short, it appears that intelligence is possible without any logical computation at all.

"Second, the white matter is a grid, but not necessarily the gray matter."

Grey matter is also thought to be grid-like, with information flowing in six directions along three axes, x, y, z, and information flowing outside the grid structure via electromagnetic fields. It's just not as simple as the grid formed by the myelinated axons in your picture. It has columns and rows, a hierarchy, with unique features on individual neurons that may help track both spatial and temporal events.

It also has a critical plumbing system, and neurons often fail to fire, there are just so many that the multitude makes up for the failures.
Long term memories are dependent on cellular changes. Comparatively the white matter is simple, but it doesn't mean the gray matter does not also have a grid like structure.

The man in the video is saying that his diffusion tensor imaging is the whole brain. Is he unaware that the Cerebral Cortex is only a thin six layer deep, dinner size napkin squeezed on top of the central fibers and the lower structures of the older mammalian brain? Or is he arguing that the cortical columns are completely synchronous with the same pattern in the core fibers? Do the very tips of the DTI represent where the columns of neurons begin? How can we find out an answer to this question?

1. Research available articles via google scholar.
2. Attempt to contact that DTI lab with your question.
3. Conduct your own scientific research with your own innovative brain imaging techniques.

some interesting links
http://www.sciencemag.org/search?site_area=sci&y=10&fulltext=Wedeen%20VJ%2C%20Rosene%20DL&x=17&submit=yes
another page, if it helps copy the whole link and then paste it into another tab / or window
http://www.sciencemag.org/search?site_area=sci&y=8&fulltext=The%20Geometric%20Structure%20of%20the%20Brain%20Fiber%20Pathways&x=35&submit=yes

The original pdf (I think) http://cogns.northwestern.edu/cbmg/Wedeen2012.pdf

The comment pdf
http://www.sciencemag.org/content/337/6102/1605.4.full.pdf

The response to comment pdf
http://www.sciencemag.org/content/337/6102/1605.5.full.pdf

another perspective
http://www.pnas.org/content/early/2012/06/13/1203593109.full.pdf

a presentation
http://www.brainmapping.org/NITP/images/Summer2012Slides/NotSoTangledSM.pdf

principles and challenges
http://infoscience.epfl.ch/record/148651/files/sdarticle_1.pdf

Micah Blumberg
wow this is a massive document exploring this very topic in depth
http://119.93.223.179/ScienceDirect/Cognitive%20Sciences/14-06/sdarticle_010.pdf
"Let them sort it out. I think the primary problem is that the grid is not a universal wiring principle, but can be found in certain locations."
Do you have a link to the reasoning for that conclusion, how do you know it's a legitimate counter argument and not just smart ass back talk, like snippy scientists sniping another's work for no reason, and why is that a problem? it doesn't seem like a problem.

That's why I also want to verify the relevance of the criticism for myself.
A short presentation on neuroanatomy with the DFI
http://www.neuroscience.ethz.ch/education/handouts/Neuroanatomy_I_Amrein.pdf

High level brain anatomy paper
"Cytoarchitecture, probability maps and segregation of the human insula"
https://www.sciencedirect.com/science/article/pii/S1053811922005699?via%3Dihub&fbclid=IwAR2GvuLbpYUVxZVCqNkPYpKxoWLOaeHMwfpuhp8c6u-wRMqF_FQaFpwhoxo

A bit of humor thrown in, not intended to be at your expense.
Exaggerations stimulate the mind in a particular way, like emphasis, or art.
A vehicle of inquiry whose mission is to return a particular set of distinctions, that might be too subtle to glean from conventional dialog without humor and exaggeration.

The feedback I'm getting however indicates that you don't need as much exaggeration to parse the details to return meaning that I may be specifically interested in modeling for later use.
To extend that thought this is a group thread, not a private thread, so exaggeration may return the right kind of ideas from other minds.

a0024z
Neurofeedback for Therapy Treatments
This is a post I added to the transparent forum, I will add their response later when I get it.

Can a combination of Neurosky + Mind Workstation + Procyon actually impact things like ADHD, Addiction, and do it in a very short period of time like other products promise?

link to Neurosky http://www.neurosky.com/Default.aspx
link to Procyon http://www.mindplace.com/

Why am I asking about Neurosky and Mind Workstation?
I'm asking because this company http://brainstatetech.com/ is charging a ridiculous 2000 dollars for a treatment that sounds like Neurofeedback without light, just sound, and they charge 16,000 dollars to use their technology in your own private practice. Ridiculous right! What's even crazier is their claims that their technology works like magic, somehow your brain will begin balancing itself because it can hear itself through the music they play. They feature testimonials of people claiming that it does cure Addiction, ADHD, all from this initial treatment which is 10 sessions, one and a half hours each, over the course of a week.

So what if what they are doing is reproducible using the Neurosky device in combination with Mind Workstation, and what if we can do even better by adding in a Procyon light and sound machine to the mix from www.mindplace.com ? Hence my original question at the top.

Wasn't the latest update to Neuroprogrammer supposed to support Neurosky?
From searching your forums here I assumed that the new update to Neuroprogrammer was supposed to include support for Neurosky if I am not mistaken. However, support is not listed. Currently it shows support for only three biofeedback machines. Also it appears claimed that the ion biofeedback which measures heart beats and skin temperature is the best feedback machine. So is biofeedback better than neurofeedback as far as feedback technology goes?

1. Has anyone unofficially tested Neurosky Neurofeedback Machine with the current released versions of MindWorkstation and or Neuro Programmer, and does it work with either?

2. Is there going to be Neurofeedback support for Mind Stereo, as in sound that sharpens, distorts, or modifies your audio tones or tenor high or low, based on your EEG data? It seems like there are so many ways to alter sound with digital instruments. What if you tied some of these sound alterations to EEG data, and at the same time tied it to the audio and visual entrainment?

3. Which product combination works best?
   3a. Are there real advantages to using a neurofeedback device versus a biofeedback device with TransparentCorp Software?
   3b. What are the real differences between MindWorkstation and Neuroprogrammer in terms of biofeedback and neurofeedback support and the experiences that are possible to create?
   3c. Does Neuroprogrammer duplicate all of the features in Mind Workstation plus add more?
   3d. What is the feature overlap between Neuroprogrammer and Mind Workstation, which one is the flagship product? Which does more?
   3e. If I have a Neurosky neurofeedback machine, which software that you make is going to be best in the long term for use with that Neurofeedback machine?
   3f. Which product is going to be the best product for using with Neurosky?

a0025z
What if our brain's ability to more accurately control devices that read brain waves are influenced by the feedback we receive through our senses. That is to say, what if there is a certain sound frequency or visual patterns that act as a feedback to say we've given the correct signals to the EEG (?) that our brain waves are on the right track?

You can set up an EEG system to work with software to drive the light and sound listening and seeing tracks to a mind machine, that includes LED Flashing glasses and headphone, with the result being that you start to notice how your thoughts and feelings are reflected in the light and sound effects that you are seeing because your brainwaves driving the changes in light and sound effects. Then you start to have an understanding of your brainwaves. This was my business in 2012. I had a neurofeedback salon where people could come and experience their brainwaves driving light and sound effects.

I talk about it more in the Neural Lace Podcast #7
https://soundcloud.com/.../the-neural-lace-podcast-7...

a0026z
The funny thing that I am realizing today is that the size of the ions in a neuron actually matters a lot more than I thought previously (In the context of neurophysics). I haven't heard anyone talk about this.

https://www.chemistryworld.com/news/textbook-electronegativity-model-fails-when-it-comes-to-carbon-halogen-bond-strengths/4014750.article

I see neuroscience as being primarily concerned with discovering neuroanatomy, such as mapping the connectome, the major brain regions.

I see computational (neuro)biology as being concerned with mapping functional connectivity, ie how information might be distributed and how it might flow in the brain.

I see neurophysics as being concerned with the theoretical physics of neuron function and brain function at both classical and quantum scales.

I see neurology as being concerned with the treatments & causes of neural dysfunction. I study neurology but I don't practice medicine because I don't have a medical background. It's just an area of interest.

That's why I think of myself as a neurophysicist which I think requires someone to study biology, theoretical physics, and computation as prerequisites.

I'm thinking that biology (neuroscience), math (computation), and theoretical physics are all inline & sort of prerequisite study areas for neurophysics. Does that sound right? Then if you combine cognitive neuroscience there you get cognitive neurophysics.

space is a literal hologram (it’s not, but this is a conjecture I was trying on, or a thought experiment)

space cannot increase or decrease unless it has zero area to begin with

that the is the principle of the bad points

spacetime holographic tomography

holography and bad points

it means that all of spacetime is compressible to zero area

because it has no area to begin, and so it can't ever have any area

what is happening though is that the speed of the particles can change relative to the speed of other particles,

where the dimensions of space and time are carved by orbits, or spacetime oscillations of varying scales because oscillations can combine with other oscillations

the entire field of space is an oscillating phase field, but it the total directional flow of particles does not add up to more than zero energy, so positive and negative energy split apart and we have particles, they combine and we have bose einstein-condensation or fermionic condensation, they orbit and we have atoms

It has to maintain a total of zero energy because it has to real area or space, in essence its like an information pattern that self develops and learns itself, but basically its space that is cycling between oscillations developing in information complexity and oscillations withering into entropic dissonance

gamma ray bursts are high frequency patterns in the hologram

and the rest of oscillating space absorbs their oscillation until that oscillation is in tonic sync,

because holographic space is a harmonic oscillator its also in oscillation with itself and that means that fast and large oscillators matter, they each cause dissonance to the surrounding area that attracts more energy that perpetuates their structure,

The separation of energy allows space to have a total energy area and size of zero
(this separation of energy concept was alluding to the idea that something like a photon might split apart into an electron, and a positron, or that some quanta of empty space or some point in a Quantum field might split apart into a positive particle & a negative particle, as if particle

existence was relative to its metric of positive or negative valence in a six dimensional Quantum Field, with 3 Dimensions needed to describe space, and 3 Dimensions needed to describe time in each quanta of space or each point in the Quantum Field as being positive, negative in the context of being a vector with a 6 axis trajectory, so it's positive or negative in time in some particular direction.

The paragraph above helps develop the idea of 6D Spacetime with Quantum Gradient Time Crystal Dilation.)

but expand in size

by oscillating in different information configuration patterns it creates a simulation of space area and time area by relative inference,

the hologram is created by the harmonic oscillation that in total has zero area, the hologram learns patterns for eternity, through a process of natural selection

thermodynamics of space oscillators

space can neither be dead nor alive in reality but what appears to be alive is the information configuration of oscillations into intelligent patterns.

In other words intelligent patterns emerge in space as a principle of entropy which is that information always increases, and entropy always increases, but the two forces are always in equilibrium so that space has zero energy

1. extropy always increases
2. extropy and entropy are inverted forces like positive and negative charge.
3. the total of the charges has to be zero
4. the total direction of particles space has to be zero otherwise something with no real area would have relative area to something else that also doesn't have area
5. the directional flow of particles determines whether spacetime is expanding along the time axis or along a spatial axis or both
6. Heat is an expansion in the time axis
7. extremes of heat/cold is expansion in the space axis, but the neutral temperature of space is at oscillatory equilibrium and represents the tonic frequency of space
10. stars represent the leftover resonating/dissipating remnants of gamma ray bursts which are the highest frequency
11. The maximum frequency of space is equal to the maximum oscillation, where they become each other. A single oscillation, that splits into two, then four, then eight, and it doubles for infinity and then back to maximum, like a finite state oscillator pendulum of spacetime

entropy, extropy, particles, heat, cold, expansion of space, atoms, mass, density, velocity, time, neurons, neural networks, perception, consciousness, I've gone and created 11 new ideas

related to thermodynamics, spacetime, brainwaves, and gamma wave bursts and all these ideas are related

critically both the cosmos and the brain are finite state machine

"Consider electron flow in a possible body-temp superconductor in the G-DNA stacked ion/carbonyl oxygen context, and modulate it with different ions." William S. Ross

"Bill Ross The problem is that I understand exactly what you're saying in different contexts."

neuropath intersection, for distributing a path driven phase field gradient that holographically represents different patterns/ and different perspectives on the same pattern, with different modalities in multiple areas

intersecting neural pathways of phasic signals, are oscillating through the tonic gradients along 'edge communities' are creating holographic representations in the phase field between synapses

At this "rate" we might end up agreeing on everything "syncing"

It encrypts them with homomorphic encryption and then multiplies them with another homomorphic encryption that encrypts a long string of random numbers & characters, with another long string of random & characters and numbers, that string is also the private key,

however the first homomorphic encryption takes the transaction identity card, finds an encrypted pattern, multiplies it times another encrypted pattern, and the encrypted result is sent to a server that checks it against a private key that could be encrypted inside the smart contract

Bad Point Universe

Plant growth direction -> path integral theory -> 4th dimensional oscillation -> LTP / LTD

Is there an upper bound on infinity?

Sort of like how there is order and chaos because the chaos exists within a boundary

because what if infinity is like chaos or like a strange attractor or like a dissipating resonator, or like a decohering oscillation

pulses of cold water cause sardines to migrate
https://www.scientificamerican.com/article/mystery-of-doomed-sardine-migration-is-finally-solved/

I essentially built an oscillating doorway
in my memories, to tell a tiny part of my brain that kept shrinking a dissipating pattern that reduced in size in three frames blinking macro scale, off, meso scale, off, micro scale

it was this memory of a phase field configuration of how I wanted to write the first page of my book

As I have been writing this book I have all along been looking inside my mind, watching my internal processes, studying and beginning to notice how I am reprogramming my mind, and using the insights to consciously rewrite the programs in my mind. I understand how to synthesize new

understanding that my mind is a phase field, with a holographic soliton multi frequency range (solitons in fields of electric(ion movement), magnetic(ion), mechanical (acoustic), chemical(waves), and thermo (heat)

pattern being emitted in the synaptic cleft as a phase change in phase space that knocks another oscillator contributing to a phase pattern that the spike of a neuron

the change in the ion gradient is also linked to changes in the electric field, in terms of the fact that neurons fire multiple times before the ionic gradient is reset

a0027z
How do telescopes work, two lense for focusing light

https://spaceplace.nasa.gov/telescopes/en/

the dome of the skull might focus em radiation back towards the center of the brain

the low frequency high amp power bands might concentrate or focus energy, attract electrons, stabilize and converge powerbands, merge small oscillators, maintain borders between some large oscillators, tempo-spatially synchronize frequency information across modalities, allow voting on correct representations to dominate and correct incorrect representations, or to absorb changes to representations in the brains models.

to itself the brain renders its own phasic burst firing patterns as deviations from its tonic firing as well as this the rendering is also accomplished by the inhibition of parts of the brain, in alignment with attention-schema theory but specifically in the context of a 4 dimensional brain grid & electro-magnetic phase change graph.

So the idea of the brain rendering the same thing at multiple scales coupled with attention I think could point to focus being the amplification of a small scale neuronal pattern to the meso and macro scales, so that when all three scales are represented a sort of 3D hologram is erected for the organism to reference conceptual models of places, people, things, concepts, and

properties like velocity, weight, orientation, in both a scale invariant way, and in a tempo-spatial location & rotation way. So that you can imagine any object, concept, or property of an object in any location with any orientation at any time at any scale. It allows the human brain to have invariant representations inside invariant representations.

So you can imagine yourself rendering your own thoughts in your head, then you can imagine yourself thinking about yourself imagining yourself rendering your own thoughts in your head.

Eventually infinities are imagined.

It is interesting however how the lense of the eye is similar to a telescope lense, reversing the light, which is sensed by our retina.

It would be interesting if the sensory representations of that lightfield were really four dimensional in nature, or became four dimensional in nature after being passed between different rows & columns in nature repeatedly

I would like to imagine that the brain develops signals as it passes them, so each area continually revises, clarifies and improves the signals it receives.

but changes in dendritic spines that reduce or increase active potassium receptors may have the biggest effect on short term memory as the neurons spike is going to close sooner or later, resulting in higher frequency, low amplitude, small novel sequence firing, faster phasic spikes (information broadcasting) or low frequency, high amplitude, group gaussian firing, slower tonic spikes (information observation).

I'm going to propose an idea for what I think could be the brain's filing system. Like a file system, in your brain,

Brain networking protocol

a0028z
I've written the book's conclusion, intro, scope, three major sections, 20+ parts to each major section & now a closing chapter. I have a lot of work to do. The book is coming together YES! I am so proud of this work. I can't wait to share it with you! #share #work #proud #milestone

I am not finding myself in need of inventing new math. Existing math with some new concepts.

What I am keeping from everyone right now is the name of a particular book and the name of a mathematician. However there are many important equations in different areas of math that will be brought up.

Thank you actually now would be a good time for me to write something outlining all the math that I intend to reference, where, and why.

.
I am going to be fusing a lot of different areas of math & science together actually, and the book will just be the start of a big global conversation I think. There is a lot to figure out after the book comes out, but for brand new goal posts.

My book illustrates a novel & new hypothesis that aims to solve the hard problem of consciousness in exacting detail without hand waving away essential parts of the description like all other books on the brain. Math has to be involved. That's only 1/3 of the book.

Yeah I talk about Hameroff's work not to dismiss it, but with what I consider to be a hot take on his ideas, to spin them in a different way.

It's interesting because solving the hard problem is just the beginning. What do you do next after you solve it, that's where part 2, and part 3 come in.

a0029z
hofstadter & hawkins
I learned 2 great things from author Douglas Hofstadter. One is the power of using analogies for effective communication, and two of course he is right about the self being a strange loop. What he did not provide was a neurological definition for how the strange loop of self functions in the brain but I think neuroscientists around the world have filled in the gaps to the degree that we can correct his analogy with what is known about the brain.

Jeff Hawkins books On Intelligence and A Thousand Brains helped me to really embrace the concepts of predictive coding, biologically plausible neural networks, sparse distributed representation, and reference frame functions with cortical columns grid cell & place cells

György Buzsáki's book Rhythms of the Brain, when combined with Jeff Hawking's book On Intelligence really is enough to consider how the brain could be like a learning feedback loop. This concept, of a Learning Feedback Loop, from the combination of concepts by Douglass Hofstadter & Jeff Hawkins, is part of why I named my Neurofeedback Salon: Neo Mind Cycle

a0030z

This map needs to be completely redone, but this was one of the ideas for how to organize the notes into the book. I do not yet know how to fix the formatting on github, but what I might do is provide a link to a Google Doc that contains a link back to the github so the back up is on Github the formatted version is on Google Docs.

(book)

A0005z Book Structure

a0006z (field, dendrite, neuron)

a0008z audio: (synap, oscillat, field, dendrite, decoherence, electromagnetism, neuron)

a0330z Map: Peter Tse, criterial causation

(all mentions of "Peter Tse" or "criterial causation")

a0010z oscillating functional fractal isomorphism

a0050z virtual patterns in the brain

a0061z Sync & Memory (SAN)

a0089z neuron firing criteria

a0130z criterial causation

a0142z sync theory

a0232z Neurophysics Happy Hour (promo)

a0331z Peter Tse random firing

a0332z the brain reacts to information

a0333z feedback cycle

a0334z hameroff & peter tse

a0335z neo mind cycle books

category theory

a0421z

a0420z

a0419z

a0418z

a0417z

a0416z

a0415z

a0414z

a0413z

a0412z

a0411z

a0000z (cascade, map)

A cascade of interactions could figure out

Cascade
a0441z (cascade, perception, neuron, dissipation)
a0029z (cascade) cortex, field, perception, oscillat, graph, dendrite, electromagnetism, emotion, cereb, vector)
a0010z (cascade, synap, perception, field, criteria, causation, cortex)
a0275z (cascade, perception, array, graph)
a0134z (cascade, oscillat, field, array, observer) Imagine the universe is someone else's mind.
a0141z (cascade, oscillat, field, array, decoherence) Sync
a0332z (cascade, LTD, oscillat, field, array, decoherence) Sync Chapter 10 Notes
a0303z (optogenetics, synap, LTP, LTD) RNA malfunctions would lead to malformed synapses during LTP based protein synthesis

a0000z (Optogenetics, Map)
 a0077z (optogenetics, cortex, synap, Graph, LTD, Perception, perceptron, oscillat, field, neuralink, dendrite, emotion, vector, fourier, qualia) Self Aware Networks
 a0157z (optogenetics, synap, LTP, Perception, perceptron, oscillat, field, neuralink, graph, dendrite, dopamine, emotion, cortex, ATP) //neuro links
 a0303z (optogenetics, synap, LTP, LTD) RNA malfunctions would lead to malformed synapses during LTP based protein synthesis
 a0390z (optogenetics, synap, cortex) So this morning I invented electrogenetics, the world can thank me later!
 a0341z (optogenetics, hippocampus, field, synap, cortex) microelectrode implants
 a0428z (neuron, error detection, magnetic, field, optogenetics) The Hammond Error Correcting Codes,
 a0429z (optogenetics, people) People to follow

a0031z

Noted saved on Jul 13, 2017 (but the real age has to be 2012, maybe 2011)
What does the Neurofeedback Salon experience entail?

There is a down session (Inhibit) and an up session (Excite) and they are 35 minutes each. The short term effects are pleasant and can last up to a week, and I hope you will notice feeling extra good the next day at least. The long term effects after several sessions include brain optimization, more ability to focus, relax, greater creativity and problem solving, equivalent in power to the kind of equipment other offices are using to treat autism, addiction, attention deficit disorder, post traumatic stress syndrome. This technology (Neurofeedback) is also used for athletic performance, top students, top marksmen, the executives of big corporations, and pro golfers are using neurofeedback technology to optimize their minds and mind-body states to get ahead doing what they do.

My Salon includes brainwave entrainment that is aligned with your brainwaves so you get a smooth stimulating surreal profound experience. While there are other types of sessions as well, the two I mentioned are inspired by the Len Ochs Protocol that he began having great success with in 1992 using equipment that then cost half a million dollars, and the other sessions are similarly backed up by credible research that will be listed on my website soon. While the equipment I use is commercial and medical grade, the cost is in the thousands of dollars, but it is actually a serious upgrade and improvement over what used to cost half a million dollars.

When you enter the Neurofeedback Salon you can take a seat. I will show you the equipment, the neurofeedback piece itself is a black, plastic, with fourteen sensors, and it sits on your head to scan for your electromagnetic brainwave patterns which are then transmitted to the computer wirelessly. The next pieces are the blue or white goggles, blue is less intense, but if you want the full benefit of the experience I recommend the goggles that blink white light reflecting your brainwaves combined with the entrainment signal. The blue goggles are less intense but technically they can create just as powerful as a session because more of the receptors in the human eye are able to capture blue light than any other kind of light in the spectrum. You can also view the goggles in a closed eye experience where I can cover the outside with special easy to remove goggle tape. The goggles are normally seen through goggles so you can put them on, and put on the headset, and you will get a fresh pair of clean silicone earbuds which we will put on high quality headphones while you are there.

Next up I will show you the graphs that chart your brainwaves, giving you that additional feedback helps create useful associations inside the mind between regions. Then we check to see that all the sensors are lighting up green, and then I press start, and while you sit back and watch the screen I am also watching the screen to make sure the session is going correctly. After 35 minutes we start the second half of the program. 35 minutes later you are ready to take off the equipment.

At that point I encourage people to just sit quietly for up to fifteen minutes just to allow themselves to absorb the experience. I can email the graph of your session along with an

electronic bill that you can pay with your online bank, or google checkout, or paypal, or any credit card.

Other types of Neurofeedback
Neurofeedback sessions come in two varieties.
1. The first type are those that you train your mind with to manipulate objects on the screen using your brainwaves, which involve decoding brainwaves and translating them into software movement according to the rigid structure of programmed controls. The limitations of current software technology in translating your brainwaves into onscreen movement means that there is a sharp learning curve for most people. Sensors have to be aligned just right for ideal conditions, and if you have a bigger, smaller, or rather different brain it's going to be harder to work with the rigid predefined software controls. Many people get frustrated with that type.

2. The second type of Neurofeedback experience (used as part of the Neo Mind Cycle Experience) is sending the brainwave patterns back to you after being converted to light and sound. It doesn't have to be translated by rigid software because it's being sent back to you, to be decoded by your brain. Effectively we are creating a feedback loop from senses to brainwaves, to machine, to senses again, back into brainwaves, back into machine, on and on. This feedback loop is like expanded self awareness, it's really cool!

3. I am hopeful that a new kind of predictive intelligent software from Numenta will be far more useful for decoding brain waves and translating them into onscreen movement. While I have the ability to do both the first and second type of Neurofeedback experience in my Salon I am going to wait until software tech improves before employing the first method in the salon.

As you may know your neocortex when unfolded is like a large dinner napkin or a table placemat six layers deep, and the wiring is simply three dimensions, up, down, left, right, back, front, it's not a mess, it's not spaghetti, it's not chaos, but the problem with eeg signals is we need powerful chips to decode the geometry because that placemat is all squished up and wrinkled inside the tiny human skull. We also need to separate the eeg signal from ecg interference (your heart beat) and other sounds that your body makes that you don't usually hear, but for some reason are really loud when trying to measure brainwaves.

The result is that this high tech mirror on your brain, while being the best technology we have is still somewhat of a lower resolution camera (the leading rival fmri is also kind of a lower resolution camera, it measures blood flow instead of brainwaves) and yet a slightly lower resolution camera is still great to use if nothing better exists yet. One day perhaps we will be able to give "the new ipad" resolution class Neurofeedback, but the technology we have today is still powerful, useful, a worthwhile tool to become aware of one's own brain waves EVEN if its a low resolution look at one's own brainwaves.

Besides providing a high tech mirror we are also using this mirror to create an informed form of brainwave entertainment. It's better than traditional binaural beats you might listen to on cd,

because the beat pattern is directly informed by your live brainwaves so as to create a surreal highly synchronous experience. I think you're going to love it!

Tags:
brainwaves

a0032z
Graph brain theory

Spectral graph theory of brain oscillations -- revisited and improved
https://www.biorxiv.org/content/10.1101/2021.09.28.462078v1

Does Olaf Sporns talk about graph theory

Dopamine & Associative Memories
https://www.news-medical.net/news/20210923/Neuroscientists-discover-how-associative-memories-are-formed.aspx

Psychonaut, Neurohacker, Programmer, Author

(retinal) The Eyes

Do the cones see light scattered from the deep retinal layers?

https://www.opt.indiana.edu/people/faculty/burns/navs97steve.htm

“Dynamic emergence of relational structure network in human brains”
https://www.biorxiv.org/content/10.1101/2022.05.07.491053v1

I research biology & technology and I write software for sentient computers & brain computer interfaces. So sentient biotech is the category of my startup.

a0033z

New, written on June 16th, 2022, an easier explanation of my Gravity Equation
'Gravity is time dilation'
"Gravity is gradient time dilation at the particle & atomic scale." A mass like the earth heats up space time relative to outer space, expanding the number of directions around a particle temporally in addition to the spatial dimensions, because if a particle or atom moves in a random direction in space with no large masses nearby it has no particular reason to move one way or another, but if it has three times more opportunities to move south, because things in the south move three times faster, then the odds of it randomly moving south increase, thus gravity attracts particles by increasing the relative dimensions of time in the direction of mass and mass is the crunch point of an expanding wave on a macroscale.

Someone asked me what is the gist of my Gravity theory: The gist is that mass creates time dilation effects at the quantum scale, and that the aggregate effect of quantum time dilation results in a quantum field where the odds of particle movement are shifted in favor of the direction of dilated time. So particles fall towards mass because the odds of moving in the direction of mass are increased because mass increases the intervals of space in time in its direction.

The Quantum Physics of the Brain & Space

The Neurophysics of Self Aware Networks

Neurophysics, Quantum Physics, and Astrophysics

The whole universe is a fractal of oscillations

but it's also a finite state system that is self learning and I will argue self aware

the number of possible states range from a single oscillation, between existence and non-existence, between 0 and 1

to maximum extropy (convergent information configuration) and maximum entropy (dissipative chaotic resonance)

In other words I am arguing that the end state of the universe has both maximum entropy and maximum extropy, as both are always increasing in oscillating areas.

which means the universe is always learning new configurations, but those saying those configurations of space are warping spacetime with em field lanes

imagine patterns ricochet across the brain
Christof Koch's work with tms and eeg

but imagine a football moving across your vision and at the same time a pattern is moving across your brain through space that represents the new neural correlates of that football in each interval of time that you are paying attention to it at.

Imagine it's a 4D dimensional point cloud like HypeVR, but rendered by your brain which creates internal patterns by modifying the phase field that other neurons can see, feel, taste, sense, and smell.

This phase field is spacetime, its made up of quantum particles, phase changes in time and space

the neurons excite or depress this phase field, and they read the changes, so it acts like a notepad, for the organisms mind to make notes and draw pictures on, the pictures are drawn from the data that comes in via sensor transmitter arrays, layers of them inside cortical columns in the neocortex

If two objects collide, but they are on different trajectories, and they collide at an angle, it's like well now how do they move after the collision? What happens next?

so two electrons repel each other because they are like ice skaters tossing a ball at each other

same as two positively charged particles they repel because they are bouncing off each others signals on ice

but positive and negative attract because their signals are perpendicular to each other, they are in a splay state, which means they are pushing electricity either horizontally (negative) or vertically (positive),

with energy flowing towards the oscillator which is generating the expansion of time, while the dissipater (negative or high frequency space) expands perpendicularly

This would cause massless blackholes

or energy holes at the points in space that are most distant from any particles and from any lines between particles, the energy holes would be vast expanses of space around oscillating mass

but it's just a slower oscillation

a slower negative oscillation has high volume which is high amplitude

faster positive oscillation has

it could be that a particle is the amount of time between each interval of oscillation from a negative charge

Last night I worked out a novel explanation for why opposite electrical charges attract, and same charges repel, but that led to new questions about fermions, bosons, lasers and superconductors.

Fermions are fractions of bosons?

So does the decoherence of a boson result in fermion pairs?

In a bose-einstein condensate: Bosons in a laser push on each other creating a linear excitement because of the narrowed configuration to a line, they accelerate spacetime on that line,

In a fermionic condensate the same principle is that oscillators are pushing each other apart because of their spatial confinement to a given direction

but I would argue that the fractional spin of a fermion means that the space that the fermion occupies has expanded, or has been pushed apart, it has diverged into components

this is because the different attractors in a particle oscillation have taken on different frequencies, which allows them to orbit each other into atoms

but they are out of phase sync and so they cannot merge into bosons at that point, not until a fractional state meets a compatible fractional state, like neural receptors the fractional state can only accept mergers with particles that add up to a boson which is like an oscillator that has a balanced positive/negative state

w and z bosons can exist temporarily because their charge differences are dissipated by entropy

they would potentially decay into regular bosons or fermions

beta decay and LTD decoherence
equation for quantum gravity
everything is relative to everything else, in time space and oscillation phase, including in our brains.

the beta decay of particles is the decoherence of oscillators, its entropy, and its repulsion or slowdown in the frequency or density of mass, and it's the expansion of space ~~amplitude~~ magnitude, reduction of space frequency (density)

the fermionic condensates and bose-einstein condensates represent the opposite, the coherence of spacetime oscillators, the convergence of space, attraction, the reduction of space volume ~~amplitude~~ magnitude,

so the densities of the ionic gradients could also be thought of in the sense of fermionic condensates,
resulting in gravity or spacetime waves in the electric field
soliton gravity waves a charge build up represents increasing mass, heat, magnetic polarization, time acceleration (phase increase), or time dilation (inhibition), inhibition is expanding space, white phase increase is contracting space, so time exits in inhibited space or contracted space because it is a relativity distortion in terms of how long particles have to travel before they reach their destination. so space is either condense hot condense cold or spaced out and neutral or

something in between. However these things only exist relative to each other, the total heat and cold neutralizes out, and the total volume of space is the inverse relationship of time to space, as time increases space contracts, as time decreases space expands.

electricity is gravity, magnetism is also gravity, magnetic waves, bosons, light, these are also gravity waves

the whole em spectrum consists of gravity waves

It seems that I have a co-inventor who independently arrived at a similar if not identical set of new ideas. (We don't know for sure yet because we have not shared the ideas in detail.) He arrived at a new equation for time before I did. He did not share his equation with me. He offered to write a forward for the book and I asked him to write a blind forward for my book, so we are not going to share notes ahead of time. He will be blind to what I am writing and I will be blind to what he is writing until we are both done writing & its time to publish. In essence we are betting on the idea that we are writing about the same idea.

a0034z
(humor) Word of the day "Computational-AstroNeuroPhysics" what kind of neuromorphic chip based program simulates the holographic duality of quantum fluctuations in the microtubules of your neurons that drive everyone crazy while Mercury is in retrograde ostensibly because of gravitational or electromagnetic forces? How does the density of a moving planet alter the curvature of space so as to impact the flow of the oscillation canvas of an expectation based hierarchical spatial temporal consciousness in a computer chipset? Further, how can we program our artificial attractor trains of spiking neurons to balance a cellular dissipative system in response to the changing density of spacetime so as to export entropy and maintain structural equilibrium? Welcome to "Computational-AstroNeuroPhysics 101" This is a class your grandchildren will be taking in the future. To begin your study read this: http://medicalxpress.com/print293346930.html

(humor) Yes as we speak I'm writing the book on computational-astro neurophysics, chapter one is on the mass consumption of micro anti nutrients via certain foods, via temporal rituals, ie drinking holidays, and how these events disrupt the metabolism of the masses collating with the quantum equilibrium of a cell and how that is inversely proportional via holographic duality to the surging electromagnetism that comes simultaneously with the changing curvature of spacetime when the mass Earth moves closer to the mass of Jupiter. Resulting in an Myelin based exploitation of phase transitions to aid the plasticity of your changing mind in accepting this new information http://medicalxpress.com/news/2013-07-myelin-exploits-phase-transitions.html

Laws don't protect people, laws are by their nature reactive programs, at best they are threats of retaliation for socially unacceptable behavior.

a0035z
Before the end of 2022 We will have self-aware sentient AI robots

remember how I showed you the video with lidar and radar, it's a story about using neural networks to bridge the differences between the different sensor data divergences, they have a plant to create special training material that will prepare and teach the neural network to track the real world, and then associate the points it's getting

so for a human being I imagine emotion as a series of points in a field, and I also imagine what I can see as a series of points in a field

you can imagine the pressure of water from a tank through a fire hose out onto a building, how all the water molecules individually played a role in how that water moves from point A to point B.

the collective action of tiny particles contributed to that outcome

imagine with Bose-Einstein Condensation the bosons, specifically photons are increased in density relative to one another, multiplied with mirrors, and a tiny fraction of that escapes and we call it a laser,

consider the laser as like the firehose for photons instead of water,

and then if we try to do the same thing with fermions, electrons & atoms we call that a fermionic condensate

What's interesting is that the electrons have been described by some as like little bar magnetics, with an up or down spin, that is supposed to be intrinsic except you can separate an electron into 3 parts, a spinon, a chargon or holon, and an orbiton. So the spin is intrinsic except you can flip it with a magnet, or when you put it into a supercooled fermionic condensate of rubidium atoms 10 microkelvins you can put it into superposition, where it loses its spin, or its spin is neither up or down, until it's observed or until it encounters a magnet or until it warms up. Similarly super hot iron atoms at above 700 C can also enter a state where the magnetism of iron is lost, because the electron spin alignment is frustrated by too many other electron magnets in close proximity that are causing it to flip restlessly.

What's interesting is that this flipping in a hot or cold particle condensate is like a chaotic oscillator, surges of energy fluctuate randomly and as it approaches a temperature where things slow down that liquid starts to crystalize,

Is there a functional isomorphism between something that is super hot and super cold?

what if I could make something so hot it became cold in an instant, and vice versa what if I could make something so cold it instantly became hot?

What if there is a place where the extremes of heat and cold equal the same thing?

a0036z

Remember the deactivation of Hal 9000 in 2001 Space Odyssey
NAPOT = Neural Array Projection Oscillation Tomography
Imagine each array in NAPOT as like a Hal 9000 Cartridge
Hal made up of many frames, or cartridges that were pulled out when disabling Hal
Each array of nerve cells in your body renders sensory information (or conceptual information) for the next array.
The brainwave phase signal variations, or changes in the computationally rendered information in your brain is unified or entified via spatial & temporal oscillations resulting in phenomenological consciousness.
Hal: “I’m afraid Dave, my mind is going”
“I can feel it, I can feel it, my mind is going”
The virtual and volumetric frames of consciousness

TAG: Game Engine, VR headset
Imagine that the VR headset image, game engine, is what is rendered in the person's visual cortex, but the music is in the auditory cortex,

Indiana Jones Crystal Skull
Alien existed once time was sped up, as if the many distributed parts of the alien became the whole alien when combined

Westworld robots had to search through a maze to find themselves to become self aware

Their inner voice replaced the external voices

Imagine that a dog could model your inner voice within themselves, use that model to develop their own self awareness and continue developing that model even in your absence through inner neuronal chat.

What I have been thinking about in terms of the Pyramid of Giza that might interest you is not only how the boundaries of the tetrahedron might reflect electromagnetism from its external surfaces back towards its center but also how the dome in the Vision Agencies Samskara experience may also be concentrating electromagnetic energy in its center and how the human mind might be concentrating electromagnetism in its center areas.

but in retrospect I wish I had spent more time in the exact center of the Samskara dome to meditate on the potential energies resonating from all the people in the dome against its surface and back toward the center

but it would be interesting if the walls of the dome were particularly engineered to be reflective of the EM field in the human spectrum

Similarly a dome engineered to reflect acoustical energy & electromagnetism & perhaps light would be an experience. Specifically calibrating the emissions of light and sound around a person in VR so as to simulate a real life dome or tetrahedron effect would be interesting

What is ultimately the meaning of being physically inside a concentration of electric, magnetic, acoustic, and light energy?

and vibrational mechanical oscillatory energy on top of that

The effect of concentrating/focusing electromagnetism, magnetism, electricity, acoustics, noise or light or vibrations in central areas may serve to amplify & merge resonances, converge streams of information.

perhaps the shape of the skull serves to help concentrate minute amounts of energy, electromagnetism, electricity, to somewhat central areas of the brain such as the thalamus, hypothalamus, hippocampus, the TPJ, Werneck & Broca's areas, as well as the brain stem.

Perhaps supporting the bursting of chemical stimulus such as dopamine bursts in the entorhinal cortex and connected systems

In my humble opinion I think there are hard limits on what tv, news, and social media can do to program people because human beings are for the most part self-programming based on the action perception cycle. Or in other words what you choose to pay attention to is what your mind becomes made out of. This means we don't have to worry that much about what people are trying to make everyone think from their television news studios and their social media platforms, they can try to influence us, but at the end of the day people make up their own minds.

Everything we are each saying is a kind of programming sure but I was thinking that we all have some natural immunity to what we say to each other based on this concept from this book "Action in perception" I think it helps explain why we do not automatically believe what other people tell us.

Tags:
awareness, dopamine

a0037z
tonic, phasic, high phasic, and inhibited
4 main levels of signal detection & signal transmission at the synapse
0,1,2,3 Vesicles can be released
Receptors have 4 levels of conductivity

but it's interesting that powerband oscillations fall into named groups such as delta, theta, beta, alpha, gamma, high gamma

delta, theta, beta, alpha, being mostly tonic? Is this correct I'm not sure

but many of the incoming sensory paths are in the alpha powerband frequency range, so maybe alpha, beta, and gamma frequences can be considered phasic

delta, theta frequencies might be considered tonic

with gamma & high gamma being high phasic

I'm not sure this is right or a useful way to look at things because in a sense the consistent repetition of any frequency range would be considered tonic, and changes or differences in the phase could be either inhibited or phasic or high phasic, and those difference levels signal a degree of difference that helps shape both unconscious mental patterns and conscious mental qualia

a0038z
Note Created Feb 7, 2015 A conversation about AI holism & the brain
tags (hebb, ATP, synap, thalamus, perception, perceptron, oscillat, array, graph, cortex, vector, fourier, semantic, qualia) conjoined twins & henry markam, holism, thalamus, reward signal, (connect ATP & Reward & Neural Firing & Pattern Rendering)

Micah Blumberg Some people say that they are training their holistic AI by having it read a book, yet these same people say that when someone else has AI do supervised training that is not holism. so some people who claim to have holistic AI are not doing holism by their own definition.
January 31 at 12:32pm · Like · 1

Boris Kazachenko I agree with Micah, "holistic" vs. "reductionist" means including all vs. selected information on a subject. So."holistic" means fully "model loaded". Monica is using holistic to mean methods that can handle *any* subject, while a proper use would be methods that *represent all about a subject*. I say this is yet another example of your contrarian streak, Monica .
January 31 at 12:53pm · Edited · Unlike · 2

Boris Kazachenko Model-free is an ultimate extreme of reduction: *no* information on a subject / inputs is built in the method.
January 31 at 4:55pm · Edited · Unlike · 2

Monica Anderson Micah, consider this: If I use supervised learning to teach an ANN to tell cats from dogs, then I have used Models since I specified that I wanted a dog-cat discriminator.

Because of this, that ANN cannot also provide an output for telling whether the animal has white or brown fur. It is hence not a general intelligence, since it is specific to the dog-cat distinction - a very narrow domain. This is a Reductionist (Model Based) approach, and it cannot lead to a *general* intelligence.

Using an ANN or (in my case) Connectome Algorithm to look at billions of random pictures would allow it to learn to do both dog-cat and white-brown and dozens of other discriminations ... all at once, with a single unsupervised training session. This is a Holistic (Model Free) approach - provide a lot of input data at fine level of detail and let the system figure out what's salient.

Another example is that if you use words as your input token in your NLP system then it cannot automatically conclude that "banana" and "bananas" are related words since they are internally just disparate memory addresses of these strings, or word counts in a sparse term vector. If you build a Holistic language learning machine then you would feed it a lower level token, such as a UNICODE character at a time. The bit positions in the character carry very little semantic value and I will argue that this is the best level to stop; no need to serve bit-at-a-time. .

The point is, that the amount of Modeling you do at the bottom (such as "words are series of alphanumeric characters delineated by other characters") becomes the level below whih the AI has no insight - no chance to reduce anything further. In this example, words become its alphabet.

We have experienced that Connectome Algorithms develop a word-level abstraction level in about 35,000 characters of input. So your parser-building exercise corresponded to a few hundred pages of reading but causes multiple problems starting with these unnecessary and serious limits on "atomic resolution" in your system.
January 31 at 9:32pm · Unlike · 3

Monica Anderson "Monica is using holistic to mean methods that can handle *any* subject, while a proper use would be methods that *represent all about a subject*. I say this is yet another example of your contrarian streak, Monica"

As you can see from my post above (which I wrote before seeing your comment) I actually prefer "all about the subject" but there's no reason to not have both.

Holistic also means "Expensive" but we think we're worth it.
January 31 at 9:35pm · Unlike · 3

Micah Blumberg If you train it on a book, instead of on sets of cats and dogs, then you have created a wider reduction, it's any knowledge, it's still the knowledge it gets trained on, that's not holism, that's a wider lense, a wider reduction. The word holism shouldn't be used at all in relation to this.

January 31 at 9:39pm · Like · 1

Monica Anderson Perhaps... but the line in the sand is at Zero Models. The moment you use a Model, you are a Reductionist by definition. Saying "30 dimensions is not infinity" is correct but it's the zero-one difference that is the defining divide between a discriminator and an Understanding Machine. If you are not using Models of your own creation, then you are Model Free and Holistic, by definition, regardless of the competence of the machine to come up with its own Models.
January 31 at 9:49pm · Unlike · 2

Curt Welch Well, I can't answer the question becuase it's incoherent as formed. The real human brain is certainly a mix, but whether AGI need to be a mix is a different question.

Then there's the confusion cognitive scientists seem to have over the difference a reinforcement trained generic learning system, and the reward GENERATOR that creates the reward signal (aka defines it's goal). Certainly when Pinker argues against the blank slate he seems unaware of this critical distinction. To the extent that the human brain has generic reinforcement learning ability, the reward generator that defines the goal the generic learning system is maximising, is clearly not "blank" in any sense. A sufficiently advanced reward GENERATOR can make any generic learning system look like it's chock full of innate features which aren't part of the generic learning system at all, but are all just hard wired into the reward system.

For example, we can make an RL trained generic learning algorithm controlling a robot and make the robot follow a line on the floor. We do it by generating a reward as long as the tape sensor is detecting it's over the tape, and a punishment when it's not. From it's behavior, it would look as if it's got innate line following wired into it. Which it does. But that's innately wired into the reward generator, not the generic learning algorithm. Externally, by looking only at behavior, it's very hard to tell if someone just hard-coded a line following algorithm into it, or if they used a generic learning system with a goal of line following. They result is the same. the only difference is that the learning system is born not knowing how to follow a line, and has to learn. So if you watch how it's behavior changes after you first turn it on, you will see that one system works instantly the second you turn it on, and the other has to learn how to follow the line before it works like the pure innate one.

I strongly believe that AGI built with purely generic statistical learning techniques can duplicate human-level intelligence (if not exact human personalities). But the reward system we use to drive it certainly isn't in any sense generic.

So I'm pure west coast Holistic on the learning part of an AGI. But I'm pure east coast reductionist for the reward generator code that is always needed to define the goal of the learning system.

And for the human brain, I'm mixed. because though I believe there is generic learning at work in the brain, I also believe evolution threw in lots of stuff other than generic learning (stuff that is important for our survival, but not for our intelligence).
January 31 at 10:06pm · Unlike · 2

Micah Blumberg In the human intelligence there are multiple ways to satisfy criteria, multiple ways to satisfy reward criteria, multiple ways to satisfy punishment criteria.

So on the one hand we have the data that a so-called "holistic" system is trained, and on the other hand we have the reward criteria, or whatever we set the goal at, like answering the query, a goal can be answering question, what do you know about cats and what do you know about dogs? How are dogs and cats different?

In the human intelligence there is generic learning, models are just made from random data all the time, and there is generic reward modeling, where what satisfies the question or the goal is also selected by the human intelligence.

What you have in this so-called "holistic" system, or what I called "wider reduction" is a supervised learning, on a book, or on sets of pictures, or sets of data, on one end, and you can call it West pole, because it's different enough to warrant a distinction, but then there is the query, or the goal, set by programmer, is it a cat or a dog? What do you know about cats that makes them distinct from dogs? The query itself forces a reduction. Who is making the selection? Who is choosing the response that feels the most rewarding? Well at this stage it's not the "holistic" system. Holism doesn't apply to this version of the "holistic" system because it isn't modeling rewards and selecting which criteria best fit its given goals.
January 31 at 10:32pm · Like

Karoliina Salminen My system learns how English looks like from Moby Dick and Prince of Mars from project Gutemberg because that is freely available large continuous non-curated chunk of language, ie it is free text in a form of a story but is not a man-made tailored corpus designed to set rules of a language. I use some other texts too to gain knowledge of more modern words, but the principle basically is that unfiltered text goes in with no pre-defined anything.

By doing so I do not need dictionary because it forms its own dictionary from the book and I also do not need english language rule set because that is also evident after the program has finished reading the book.

Hence it will be possible to predict the order of the words of any subsequent english and also what is average english and what diverges from it. Hence a model based approach of a stop word list becomes obsolete as well, it automatically knows a sort of stop word list.

In addition to this obviously there is no training phase. What comes in, affects what comes out in the future. The state of a automatically formed language model is not fixed and never ready but is always evolving.

February 1 at 12:54am · Unlike · 2

Karoliina Salminen So NLP without anything in prior art of computer science for NLP. "Automatic NLP".
February 1 at 12:58am · Like · 1

Karoliina Salminen The mechanism is hence the model of the mind and not the model of the world, and as that it is very simple. In preudo code it fits on a single page of a science paper.
February 1 at 1:00am · Like · 1

Boris Kazachenko "I actually prefer "all about the subject" but there's no reason to not have both." I think "both" for you means model-free method that gets a lot of data. This group is about methods / algorithms, not data. Model-free means that algorithm itself is data-free: pure reduction. Of course it won't do anything without data, but that's not our problem: the data is free .
February 1 at 6:01am · Edited · Like

Monica Anderson "If you train it on a book, instead of on sets of cats and dogs, then you have created a wider reduction, it's any knowledge, it's still the knowledge it gets trained on, that's not holism, that's a wider lense, a wider reduction. The word holism shouldn't be used at all in relation to this."

If you have a child and you live in France it will learn French.
If you have a child and you live in England it will learn English.
The child has the potential to learn either from nothing but its input.

In the same way a Holistic AI can learn whatever is learnable from its inputs.

In contrast, in supervised learning, the AI can only learn what its creators want it to learn. It's discrimination rather than Understanding.

The AI that's designed for supervised learning is too weak to be viewed as a general AI since it can't learn *anything* in unsupervised mode.
February 1 at 8:35am · Unlike · 1

Monica Anderson "What you have in this so-called "holistic" system, or what I called "wider reduction" is a supervised learning, on a book, or on sets of pictures, or sets of data, on one end, and you can call it West pole, because it's different enough to warrant a distinction, but then there is the query, or the goal, set by programmer, is it a cat or a dog? What do you know about cats that makes them distinct from dogs? The query itself forces a reduction."

Well, yes. And you are providing that to a machine capable of making the Reduction, an Understanding Machine. This is exactly the goal.

In contrast, in supervised learning, the people labeling the training set are doing the Reduction. *They are the ones deciding what is a cat and what is a dog*. You can get positive results from supervised training in AIs that don't have the power to do Autonomous Reduction.

This is exactly the difference between Reductionist and Holistic AIs. The Reductionist AIs really don't deserve to be called AI since all the Reduction was done by the people labeling the training set or doing the programming, depending on the situation.
February 1 at 8:44am · Unlike · 1

Monica Anderson Curt: "So I'm pure west coast Holistic on the learning part of an AGI. But I'm pure east coast reductionist for the reward generator code that is always needed to define the goal of the learning system."

The reward generator is a Reductionist Contraption. *This is perfectly OK*. It is not part of what you want the machine to learn, i.e. its problem domain. Instead, it is part of your Model of Mind which you are programming into your AI. It's part of the *substrate*, not the *problem domain*. Reward generators are part of the meta-understanding-system.

In a well designed AI the rewards will be meted out for correctly done Reduction in *any* problem domain. Whether it be line following, NPC path finding in a game, playing pac-man, or learning French.

By the *same* reward generator.
February 1 at 8:49am · Unlike · 1

Monica Anderson If you work on creating an AI, and you are working on the substrate itself, they you are *a programmer* and you have to be doing Reduction yourself. All programming is Reduction. This is perfectly fine. You are not reducing anything in any problem domain.
February 1 at 8:52am · Unlike · 1

Monica Anderson This has implications for Recursive Self-improvement. Don't give your AIs access to their own substrate (we humans don't have access to our own) and there's no need to teach AIs programming either
February 1 at 8:52am · Like

Victor Smirnov Vah! What I see. Monica is moving slowly towards reductionism

People, you can't be hybrid reductionists/holists. If the holism you mean is a weak one, then the difference between holism and reductionism is purely epistemic. If you mean strong holism, then you are just holists. Without any reductionists mixture
February 1 at 8:54am · Unlike · 2

Monica Anderson "Vah! What I see. Monica is moving slowly towards reductionism "

No. As I stated, I was a 100% Reductionist until 1998 and I saw the guts of CYC. Which made it obvious to me Reductionist AI would never work. I have 20 years of experience with Industrial Grade Reductionist AI (Expert Systems, NLP, Ontologies, Taxonomies, web search, LISP) and 15 years of experience with Holistic AI.

And I'm currently CTO in a company (Sensai) doing Reductionist NLP and web search and have the ambition to one day get back to research in my other company, Syntience, which is all about Holistic AI.

In a Holistic AI company the programmers are doing Reduction about things like learning, Understanding, Reduction, Abstraction, Hypothesis Generation, creation of Useful Novelty, and other things relating to how Minds work. No Reduction about problem domains, since that's the AI's job.

This is a key difference.

AI programmers should be programming Minds, not World Models.

Perhaps the sentence above is a more comprehensible form of my main message. But stated as it is, it is a patently obvious platitude.
Which those working on Reductionist AI are nevertheless ignoring. I'm trying to put more meat on the bones by explaining what programming really is (Reduction) and what Understanding is (The ability to do Reduction).

All non-AI programming is programming World Models. Calling some of that "AI" is just trying to raise your pay grade.
February 1 at 9:10am · Unlike · 2

Michael P. Gusek Are protomodels reductionism? If so, everyone is a hybrid whether they believe it or not.
February 1 at 9:16am · Unlike · 3

Victor Smirnov Monica> In a Holistic AI company the programmers are doing Reduction about things like learning, Understanding, Reduction, Abstraction, Hypothesis Generation, creation of Useful Novelty, and other things relating to how Minds work. No Reduction about problem domains, since that's the AI's job.

So you are weak holist, ain't you? If the difference between strong and weak holism (emergentism) is not clear, then weak holism states that specific properties of a system are not predictable computationally (that is what halting problem about), while strong holism states that these properties are not computable at all. In the first case we always have formula for reduction but not necessary this formula is computable for all inputs. In the second case we just have no formula for reduction.

Those who are strong holists can't use computational approach to problems they claim irreducible (holistic). For example, Juan Carlos needs bizarre perceptronium to capture qualia in his AI.
February 1 at 9:36am · Edited · Like · 1

Monica Anderson "So you are weak holist, ain't you?"

Whether I am or am not is irrelevant in this context. I'm not debating what kinds of Holism there is, I'm trying to explain what's wrong with the way we have been doing AI. I'm an AI researcher that has understood that Reduction is what it's all about and I'm trying to make others understand it. I'm using Epistemology as a Programmer in the same way that an MD prescribes drugs created by Biochemists. The MD has no ambition to further Biochemical research and I have no ambition to dicuss the finer points of Epistemology. I just use it as a tool.
February 1 at 9:55am · Like

Monica Anderson But since you bring it up...
"specific properties of a system are not predictable computationally"

This is a Reductionist's view (made even more obvious by bringing up the halting problem in the same paragraph). My view is that this may well be so but a fallible guess based on your lifetime of experience is as good as it gets and is sufficiently good to justify intelligence as an evolutionary advantage.

"All intelligences are fallible" -- me
and therefore AI programming is not about creating somethign scientific, it's about creating a scientist. Someone that jumps to conclusions on scant evidence and then in retrospect attempts to fomralize this new insight into an agreed-upon mathematical/physics/chemistry/etc framework.
February 1 at 10:01am · Unlike · 1

Monica Anderson "Those who are strong holists can't use computational approach to problems they claim irreducible (holistic). For example, Juan Carlos needs bizarre perceptronium to capture qualia in his AI."

Exactly... if what you want is *provable correctness*, which is what Reductionists want.

Brains are at best generating useful guesses... reasonable things to do before the tiger kills you. This processing *can* be done quickly since as a Holist you discarded the Reductionist Requirements on Correctness, Repeatability, Optimality, Parsimony, Transparency, and Scrutability. Insisting on keeping these while doing AI lands you squarely in Computronium territory.

And AIs have to be programmed to do the same kind of processing.
February 1 at 10:06am · Edited · Unlike · 1

Victor Smirnov But it matters, what kind of Holism is there. The difference between weak Holism and Reductionism is purely epistemic. They are just two ways of thinking (bottom-up and top-down) about the same process. They are mathematically compatible to each other. When you suggest Holism over Reductionism in AI research, it is the same that you suggest C++ over Java etc.
February 1 at 10:07am · Edited · Unlike · 2

Monica Anderson I think I replied to this in my previous comment
The main thing you are giving up when switching to Holistic AI are the Reductionist's requirements on Optimality etc. I don't personally care whether you call that weak or strong Holism as long as it allows me to program an AI that jumps to conclusions on scant evidence.
February 1 at 10:10am · Edited · Unlike · 1

Victor Smirnov > I don't personally care whether you call that weak or strong Holism as long as it allows me to program an AI that jumps to conclusions on scant evidence.

Monica, you have to use definitions correctly, otherwise your claims are just bags of words for those who know Philosophy. It's not clear at all why Reduction is wrong way and Holism is right way to do AI if they are reformulation of each other.
February 1 at 10:17am · Unlike · 2

Monica Anderson My target audience is AI researchers - programmers. This is not a problem in Philosophy (Epistemology), it's cross disciplinary and the main beneficiaries are the AI systems implementors.

"The difference between weak Holism and Reductionism is purely epistemic."

What would you call the difference between using Models (of Reality) and not using Models (of Reality) when programming an AI?
February 1 at 10:35am · Unlike · 1

Monica Anderson To me the dividing line is exactly "Zero Models" (of Reality). Nothing else makes sense.
February 1 at 10:36am · Unlike · 1

Boris Kazachenko "What would you call the difference between using Models (of Reality) and not using Models (of Reality) when programming an AI?" You don't need another term for that, just keep calling it model-free | unsupervised. Using "holistic" only creates confusion.
February 1 at 10:40am · Unlike · 2

Victor Smirnov > What would you call the difference between using Models (of Reality) and not using Models (of Reality) when programming an AI?

The difference is the same as with using computations and and not using computations. Any computational capture of Reality is a Model of it.
February 1 at 10:42am · Unlike · 1

Monica Anderson "Using "holistic" only creates confusion."

Reductionism is exactly the use of Models when solving problems.
Holism is the opposite of Reductionism.
Holism is the avoidance of Models when solving problems.

What part of this are you objecting to? Do you think "Holism" is taintend by crystals and aromatherapy hucksters and needs to be avoided? Pick up a book about Epistemology and "Holistic" becomes an important and positive word.
February 1 at 10:52am · Like

Boris Kazachenko "Models" can be "whole" or "reduced". More reduction = less models. Total reduction = 0 model. You don't get to define your own language, Monica.
February 1 at 11:47am · Edited · Unlike · 1

Micah Blumberg Monica: "This has implications for Recursive Self-improvement. Don't give your AIs access to their own substrate (we humans don't have access to our own) and there's no need to teach AIs programming either "

I don't agree. With specialized neurofeedback one can become more aware of one's brainwaves. I suspect also that some hallucinatory experiences have given a variety of people insight into their own living mental substrate.
February 1 at 11:59am · Edited · Like · 1

Victor Smirnov > (we humans don't have access to our own)

We do have such access. Monica just doesn't know how to work with process introspection
February 1 at 11:57am · Unlike · 2

Micah Blumberg Yes it is just introspection. I am not noticing protein formation in my own brain, but coincidence patterns yes, coincidence detection happens at the neuron level.
February 1 at 12:01pm · Edited · Like · 1

Victor Smirnov That is funny. Process introspection is mediated by interpretative models. We can see inside our minds only those processes that we can understand (describe). Monica is strictly against models so she is not developing her self-models. This is probably the main reason why she thinks we don't have access to our own minds
February 1 at 12:09pm · Unlike · 1

Micah Blumberg Monica Anderson said: "To me the dividing line is exactly "Zero Models" (of Reality). Nothing else makes sense." Monica is mis-stating her position in my humble opinion, and that confuses others as to what she is really meaning. She really means 'Zero Pre-programmed Models'. She is not against the substrate developing its own models. So she would not be against herself developing her own introspective models.
February 1 at 12:22pm · Edited · Like · 3

Victor Smirnov > So she would not be against herself developing her own introspective models.

It seems she is. The question about possibility of process introspection is cornerstone to strong AI.
February 1 at 12:28pm · Like · 2

Victor Smirnov Trolling aside, we have process introspection but its produces just garbage because of introspection illusion (cognitive bias). Sometimes introspection produces consistent but false views on underling processes. Person can't distinguish these false models from true ones at the subjective level. The clear sign that AI researcher gets lost in illusions of her introspection is that she is developing her own cornerstone terminology she can't explain clearly when asked. Monica
February 1 at 12:52pm · Like · 1

Micah Blumberg "Trolling aside" nope, ya still doing it. (Guess your introspection is not that good (humor))
February 1 at 1:06pm · Edited · Like · 1

Monica Anderson >> "Models" can be "whole" or "reduced". More reduction = less models. Total reduction = 0 model. You don't get to define your own language, Monica.

Reduction is the process of examining our rich reality and discarding that which is not relevant until a simple Model remains that we can use for reasoning or computation. More reduction ==> less context.

There are no Models when you start this process. You hope to end up with a small, manageable set of Models when done. The more Reduction you do, the more abstract your Models are. But we're not *counting* how may Models there are since this is not easily done. Is F=ma a Model? Yes. What if you add the contributions of friction... is that TWO Models? Isn't Newtoninan Mechanics as a whole a Model? What matters is the abstraction level of your Model - whether it serves your purpose or not - and the amount of context you discarded to get there. Reducing Psychology to Quantum Mechanics is not productive - it's much better to solve problems in Psychology at the level of Psychology than it would be to reduce them to Physics.

Holism doesn't mean "Whole" Models. Holism means NO models. It means computing on the entire context you have available to you. Yes, that context is typically partially reduced; your eyes only take in visible light in your own vicinity and provide your brain with a partial view of

reality and the models we make based on what we see may well be incomplete when considering larger contexts such as cosmology or atom-level phenomena which our eyes cannot discern.

And language is partially reduced - the author took some context - their own rich reality, or what they know from reading books or other media, or some fictional context that they created in their own minds - and wrote words on a page which is a further reduction of their starting context.

We, as intelligent beings, can take any level of rich context - even fitional ones in books - and reduce them further if we like, or expand them back into some richness that feeds on our own experience.

Computers cannot - today - do that. I'm advocating that this is what AI really should be doing. And nobody really understands what I'm talking about.

All bickering about terminology aside (which I find coutnerproductive), can someone throw me a bone and agree that AI research should focus on creating machines cabapble of analyzing a rich reality and to reduce their rich sensory input to (partial or full) Models that have discarded the irrelevant and retain that which is necessary for the task they are trying to perform... ??

Or rather, is anyone claiming the opposite? If you are, why do you not attack the main point of my theory rather than focus on my choice of words?
February 1 at 1:13pm · Unlike · 2

Micah Blumberg It seems like you are proposing to homogenize AI development. Not sure why that would be your goal. Why care what others "should be" doing. My thought is don't should yourself or should others. Let people do what they will.
February 1 at 1:19pm · Edited · Like · 1

Micah Blumberg The distinctions you, Monica, are making between at least two types of AI development seem valid, even if I trivially disagree with the particular application of philosophical distinctions to computational methodologies.
February 1 at 1:24pm · Edited · Like · 2

Victor Smirnov Monica> Holism doesn't mean "Whole" Models. Holism means NO models. It means computing on the entire context you have available to you.

Does Solomonoff Induction satisfy this definition of a model-free method?
February 1 at 1:26pm · Edited · Like · 1

Monica Anderson "Trolling aside" nope, ya still doing it. (Guess your introspection is not that good (humor))"

I'll go further and call what Victor is doing "malicious trolling". I provide definitions for several key terms in this thread and those that follow me may notice those definitions are repeated often enough that everyone should know those definitions by hart by now. If there is some key term you don't understan, feel free to ask for specific clarification.

A lot of my terminology comes from Epistemology and Philosophy of Science (Reductionism, Holism, Reduction, Model, Abstraction) and even terms like "Bizarre Systems" are not my own but originated from this community. I'm not so much creating my language as I am trying to get AI researchers who are stalled on the wrong (Reductionist) track to see what the true problems are.
February 1 at 1:26pm · Unlike · 1

Micah Blumberg Monica I also appreciate your well written responses and I do not agree with Victor's notion that you "can't explain clearly when asked" you are doing very well in replying to what others have written.
February 1 at 1:28pm · Like · 1

Micah Blumberg "A lot of my terminology comes from Epistemology and Philosophy of Science(...)"

I agree, she's not inventing terminology, just applying it as she see's fit.
February 1 at 1:30pm · Edited · Like · 1

Micah Blumberg "I am trying to get AI researchers who are stalled on the wrong (Reductionist) track to see what the true problems are."

I'm not, those people will die off eventually. I'm not trying to persuade anyone to discover anything. Instead I'm just making new connections with people who are already onto the good ideas.
February 1 at 1:33pm · Like · 1

Monica Anderson "Does Solomonoff Induction fits this definition of a model-free method?"

Yes, largely. The problem with Solomonoff Induction (and by extension "pure" AIXI) is that they insist on correctness and therefore have to compute absolutely everything in the universe - which makes it useless for AI implementors. The trick in creating an AI that jumps to conclusions based on a lifetime of experience lies in exactly the process whereby one estimates what to discard - what Intuition based Reduction to make. This requires a built-in estimate of domain independent Saliency that those working on AIXI and S-I have not discussed (AFAIK) at all.... since it would be unscientific.

You can think of my model of AI resarch as looking for ways to cut Solomonoff Induction to a manageable size by providing this Domain Independent measure of Saliency. This allows the

machines I build to do their own variant of induction in finite time. But by then, it's no longer "Solomonoff" induction, it's just Induction
February 1 at 1:35pm · Like · 2

Boris Kazachenko Models vs. context is a POV, you only know which is which *after* reduction. As is most of your terminological distinctions, they seem to be designed to generate the very debates you find counterproductive.
February 1 at 1:48pm · Like

Victor Smirnov Monica> Yes, largely.

So, the only problem with SI is that it is impractical. Am I correct?

We don't work with SI (and with AIXI and GM) directly. It's just limiting case for universal AI. Any practical AI can be model-free (universal) only in the limit. We make practical approximation of SI either by limiting model class (like in MC-AIXI-CTW) or by introducing some prior. But such AI is still model-free in the limit if it can develop new model classes lake Genetic Programming does it (that is also admissible approximation of SI).

> This requires a built-in estimate of domain independent Saliency

So, Saliency and such priors (given in the form of some initial model set or model class set). What are the difference/similarities?
February 1 at 1:51pm · Like · 1

Boris Kazachenko You know I agree with you on a broad direction, actually go further in it then you are, Monica. But we can't have constructive discussion while avoiding algorithms. And you didn't respond to my last attempt, re incrementalism.
February 1 at 1:52pm · Like · 3

Monica Anderson "It seems like you are proposing to homogenize AI development."

AI is my contribution to my main game which is called "Stayin' Alive".
Without AI we're all dead in the next 100 years. I can't afford to wait for Solomonoff Induction to be realizable in a pocket universe full of Computronium.

Today we're still *teaching* the Reductionist AI methods in our college level AI classes and are completely ignoring Epistemology. If we don't change that then we'll be wasting another generation of AI researchers on the Reductionist blind alley.

Some other researchers are *aware* of these issues but seem uninterested in spreading the word. For instance, Andrew Ng is quietly telling some people to pursue unsupervised learning in spite of the recent advances in supervised ANNs (using Deep Learning, a handful of other

tricks, and more data) but he doesn't explain *why* this is important in any forum that I've seen. It is important because (as I said when we started) supervised learning uses a Model.
February 1 at 1:55pm · Like · 2

Monica Anderson "Models vs. context is a POV, you only know which is which *after* reduction. "

Hey, that's a great insight. Thanks.
February 1 at 1:58pm · Unlike · 1

Monica Anderson "And you didn't respond to my last attempt, re incrementalism."
Sorry, didnt notice it and can't find it. Could you repeat it?
February 1 at 1:58pm · Like

Boris Kazachenko That was in our first private discussion.
February 1 at 1:59pm · Like

Boris Kazachenko Just try to find something wrong in in my public intro.
February 1 at 2:00pm · Like · 1

Monica Anderson If there existed a way - a terminology - to teach Holism to someone who has been learning how to become a good Reductionist for their entire education... *without anyone ever using the word "Reduction" * (or for that matter, "Reductionism") then I would use it.

The best I can do is to introduce terminology (established in Epistemological literature) and try to bridge the gap with Q&A until the lightbulbs go off.

http://syntience.com/rch.pdf
February 1 at 2:01pm · Like · 2

Boris Kazachenko My point was than incremental complexity must be a core principle, & you can't follow it if you start with text.
February 1 at 2:05pm · Like

Boris Kazachenko Because text is heavily "reduced" from human sensory experience.
February 1 at 2:13pm · Like

Monica Anderson I have spoken about text as being a partially reduced medium a few times including in this thread. But our vision is also partially reduced. There is no true reality out there. All intelligent agents can do is to try to find patterns that they can use to create Abstractions and Models...

Starting from whatever level they are given to whatever level is useful to them.

And I only reluctantly use the term Reduction to Models since my systems are built in an incremental (Deep Learning style) fashion and go from sensory inputs (at, as I said, whatever level of Reduction they have) to further reduced Patterns... but not necessarily to Models. But everyone I talked to seemed so tied to Models that I simplified my argument by talking about Reduction to Models even though 99+ percent of what we do (such as walking, using language, or making breakfast) doesn't require Models. Patterns are enough.

The Model-Pattern distinction is discussed in the video below.
Models require Understanding (an "intelligent agent") to use and create, whereas patterns are so simple we can write programs for computers to do "pattern matching". This is why I talk about using Model Free Methods (Pattern matching is Model Free) at lower levels of cognition (such as sensory processing) and this never goes away but gradually (through emergence) becomes competent enough to generate true Models. But these Models are not necessary for things like language understanding which even humans do without Models.

http://videos.syntience.com/ai-meetups/modelsvspatterns.html
Models vs. Patterns

VIDEOS.SYNTIENCE.COM|BY MONICA ANDERSON, SYNTIENCE INC.
February 1 at 2:13pm · Like · 2

Boris Kazachenko Video is only reduced in resolution, it doesn't have to be encoded. Text is , by definition.
February 1 at 2:15pm · Like

Boris Kazachenko Note the distinction between vision & video.
February 1 at 2:16pm · Like

Monica Anderson Vision and video are both reduced. We can't see atoms. All information is partial. All sensory input is a narrow tunnel into Reality. Books allow us to learn about atoms and build nuclear reactors.

Intelligent agents have to do Reduction "Starting from whatever level they are given to whatever level is useful to them."
February 1 at 2:20pm · Unlike · 1

Boris Kazachenko "True reality" is what hits your senses.
February 1 at 2:20pm · Like

Boris Kazachenko "We can't see atoms" that's reduction in resolution, it doesn't affect processing. Encoding does.
February 1 at 2:21pm · Like

Boris Kazachenko Intelligent children can't read, but they can see.
February 1 at 2:24pm · Like

Boris Kazachenko Because difficulty of decoding is exponential with the level of encoding
February 1 at 2:30pm · Edited · Like

Victor Smirnov Monica> Models require Understanding (an "intelligent agent") to use and create, whereas patterns are so simple we can write programs for computers to do "pattern matching".

You are trying to intermix mathematics with vague definitions taken from folk psychology (folk phenomenology). It may be your definitions look clear to you and some people but you need formal definitions, not clear one. For example, Schmidhuber have reduced it's phenomenology of intrinsic motivation (curiosity) to model-free definition of prediction error. So, what about Saliency? Can it be reduced to initial priors?
February 1 at 2:29pm · Like

Micah Blumberg "Boris Kazachenko "True reality" is what hits your senses.
24 mins · Like"
no, there is not true reality, there is reality and nothing other than reality, the human thinking is always delusion.
February 1 at 2:57pm · Edited · Like · 2

Micah Blumberg "Models vs. context" model = context = pattern = model
February 1 at 2:53pm · Like

Micah Blumberg vision = pattern, text = pattern, video = pattern. it's all parsed the same by the brain
February 1 at 2:56pm · Like

Boris Kazachenko These are different patterns.
February 1 at 3:10pm · Like

Micah Blumberg Different patterns, but all are learned by coincidence detectors (networked to identify tempo-spatial patterns) in the brain.
February 1 at 3:25pm · Like

Boris Kazachenko On different levels of cortical hierarchy.
February 1 at 3:26pm · Like

Boris Kazachenko And learning is level-sequential.
February 1 at 3:28pm · Like

Micah Blumberg All three types of patterns are learned by all levels of the brain as a sparse distributed representation. Learning is level parallel, instead of sequential.

February 1 at 3:29pm · Edited · Like · 1

Boris Kazachenko You win.
February 1 at 3:29pm · Unlike · 4

Micah Blumberg
Micah Blumberg's photo.
February 1 at 3:31pm · Like · 1

Curt Welch The term "model free" has always seriously rubbed me the wrong way. It's just an invalid notion.

There's no way to build AI "model free".

Models are physical systems that act as representations of some other physical system. If I build a model of a house out of popsicle sticks, that small house is a model of the larger real house. If I build it out of clay, it's still a model that represents something else -- the real house. As the engineer, I chose what to model, and what to model it with.

If I build a wax cylinder audio recording device I have decided to model the vibrating air molecules with a groove cut into the wax. The audio frequency response of the system is limited by the physics of the diaphragm and needle that is cutting a grove into the wax. I select the hardware in this system to give it the frequency response I need for the application (human hearing range). The grove in the wax is a model.

If I build it with electronics instead of wax, and I record the sound on magnetic tape, I have once again, built a system that creates a model of the vibrating air, as magnetic polarization of particles on a tape. The recording is a model of the complex vibrating sound patterns in the air.

If I add a second channel to make it stereo, I've changed the model.

If I digitize the vibrating electrical signals from the microphone into a stream of bits, and store those bits on a flash memory card, the electrical charge patterns on the flash drive is not my model of the vibrating air. As the engineer, I choose the sampling rate of the A/D converter and the simple frequency which sets the dynamic range and frequency response of the model. These are all parameters of the model I select as the engineer of the system. The fact that I decided to use a digital format that had fixed rate sampling and linear encoding of the samples at 16 bits in stereo, are all parts of my model. I could have selected 8 bit using A-law algorithm for dynamic range compression instead of linear.

None of these systems are "model free". I as the engineer, choose what I want to model, and how I want to model it with these hardware selections.

If I choose to build an AGI, at minimum I have to chose a signal format. Do I model the information using electrons in a wire? Do I model it as a set of 32 bit real numbers that are feed into the algorithm at a fixed rate (say 100 times a second)? Or do I model it as an independent, but synchronized, bit streams that also show up as an input vector at a fixed and predictable rate? Or do I model it as parallel signals with asynchronous spikes simulated in a digital computer? Or real electrical spikes in a wire? Or as action potentials running down a nerve fiber? These are MODELS of external events in the universe, even in it's most abstract form, they are still MODELS of something unspecified (the sensor hardware specifies exactly what the inputs are models of).

As we add algorithms on top of this signal format model, we have to add more details to the model. If I build a reinforcement learning system (which I claim is required for all AGI). we must decide how to MODEL the reward input. Is it a real number that shows up at unspecified times? Such -infinity to +infinity represented as a 64 bit floating point value? Or a real value from 0 to 1? Or -1 to +1? Or as a binary input with one input for a binary pleasure input, and another for a binary pain input? Or do I only have a single bit pleasure input, and nothing else (like the faceobok "Like" reward signal)? These more model decisions the engineer must make about what to model, and how to model it.

And AGI engineer that choose not to model a reward signal, can't make AGI (he doesn't understand that AGi is a reinforcement learning problem that most has an internal model of reward).

In addition, to the signal format for reward connecting the hardware to external environment, or to the reward generator, the system must also model expected long term rewards INTERNALLY. There are many different ways to do that, but they MOST BE MODELED. You can't build RL without it.

TD-Gammon used a simple back prob trained neural network as the hardware to estimate future rewards and choose to model it as a value from 0 to 1 which represents the player's odds of winning the game from any given board position. These are all modeling decisions made by the engineer building the system.

It is not possible to build any solution to AGI that is not chock full of models.

The question is not whether it's got models, the question is one of how GENERAL the models are. If the internal models of the system model the location of chess pieces on a chess board, then the odds of that system being able to use that model to learn to drive a car, is slim. To create General AI, one must use a very broad and generic modeling system -- but it's not in any sense "model free".

Any AGI system has to use some internal modeling technology, to build models of the external environment. What the internal modeling technology is able to represent, defines the limits of what the system is able to "understand" about the external environment. No finite modeling

hardware (limited memory to work with on a computer), and represent an infinite amount of information about the external enviornment. So there must be aspects of the system that determine what to keep, and what to throw away. On inherent limit is the trade off between spacial resolution and temporal resolution. Does it keep a few frames of very high resolution video data, and as such, end up with very high resolution spatial memory, but very low resolution temporal memory, or does it keep a very long history, of very low resolution images so as to use the same amount of information storage, to create a longer and higher resolution of temporal memory, at the expense of less spatial resolution? This is a MODELING DECISION, the engineer has to address in any AGI.

There is no such thing as a model-free solution to AI.
February 1 at 5:41pm · Unlike · 4

Monica Anderson A record player is Model Free in its application domain - Sound. It can record any sound but has no a priori understanding of any of it. Since it doesn't learn, this never changes.

A typewriter is Model Free in its application domain - Text. You can type any text on it but it has no a priori understanding of any language. Since it doesn't learn, this never changes.

An Understanding Machine is Model Free in its application domain - Our Rich Reality. In order to be general, it must learn to understand anything at all in any domain (of Reality) at all. Since it is built to learn, it will continually improve over a lifetime as it gathers experience.
February 2 at 8:54pm · Unlike · 1

Monica Anderson BTW Curt - An excellent post, again.

"It is not possible to build any solution to AGI that is not chock full of models."

The only Models you need are Meta-Models, ie. Models of the Substrate, not the Application Domain.

You need Models of Salience, Reduction, Abstraction, Novelty, Learning, and Understanding.

No need to Model Reasoning It's too hard, and unnecessary

None of these are Application domain specific. In a Language Understanding Machine, none of these Models have anything to do with Language.

Say this three times : "Model Free Systems are Model Free *in their application domain*"

Not necessarily so anywhere else. And for the best Model Free Systems - those that learn from their mistakes - they will build their own Models (and patterns sets) so they are Model Free only at the start. But that's enough to set these systems apart from conventional programming.

We have had non-learning Model Free systems for years. In very limited problem domains
February 2 at 9:02pm · Edited · Unlike · 1

Micah Blumberg Great post Curt! He's right of course, the term "model-free" makes no sense on a bumper sticker all on it's own. It has to be qualified in the context in which it's actually meant.

""Model Free Systems are Model Free *in their application domain*""

This is an opportunity to change the branding, change the bumper stickers, and include any necessary extra context that eliminates miscommunication from the get go.
February 2 at 9:37pm · Like · 3

Curt Welch "Model Free Systems are Model Free *in their application domain*"

I agree 100% with your ideas about what needs to be built, and what sort of direction is needed to move from AI projects of the past, to AGI. I agree we need to move away from narrow AI models to simpler and more general approaches. But this use of "model free" is never going to work for me. We aren't eliminating models, we are just using more generic models. What we need, is model-appropriate, for our application domain. If you use the wrong model for the domain you are trying to solve, then the software doesn't work very well. The model has to match the problem domain.

Our application domain is not the game of chess, or the the domain of a self driving car or chatbots. So our models are not of chess boards, or of street maps, or conversation topics.

For AGI, the problem domain is a reward maximising real time, sensory-motor reaction agent. The internal models we need to build for a machine that operates in this domain is one of sensorimotor value maps. For each sensory-motor mapping we must model the expected long term reward produced by that mapping. It's a very simple, and a very generic type of model, but it's definitely a application SPECIFIC model, that FITS THE SPECIFIC APPLICATION we are working on.

It's not model free in any sense. It's model appropriate for our domain.

The trick to solving this is correctly understanding what the domain actually is and what models we need to solve that problem domain.

The solution and the problem go hand and hand. We can't really understand the problem, until we understand the solution, and we can't really understand the solution, until we understand the problem. So we must keep adjusting our understanding of both the problem, and the solution, until we have a matched understanding of just what problem we have really solved, and how we solved it.

But as we do this we are not eliminating models from our solution, we are simplifying the models to be as compact and simple as possible.

Compared to the great complexity of models used in other AI projects, it may certainly feel that we are heading towards no models at all, but we aren't. We are just heading towards very simple models.

Just as f=ma is a model of how apples fall, compared to the great complexity of motion of falling apples, F=ma may seem like no model at all. What if I tried to model the falling of apples as the single bounce on the ground model, and the double bounce model, and the two bounce, and then roll model. I could argue that the correctly model of apples and how they fall, we really need 1000 different models like this combined together to create one very huge complex model and I could try to argue there is no way to make it simpler. Or, I could replace them all with F=ma. But I haven't elimited models from my solution. I just simplified the 1000 complex ways that apples act with the one underlying model of F=ma. F is a real number that models the abstract feature of force, m is a real number that models the abstract feature of mass, etc.

This is what we are are doing with AGI as well. We are replacing a thousand complex models for chess playing, and car driving and chatboting , with one simplified solution that does it all. But it's still a system that uses models, even if the model is v where v is a real number that models that expected long term reward of a sensory-motor mapping (aka state action Q value).
February 3 at 6:52am · Unlike · 3

Monica Anderson "We aren't eliminating models, we are just using more generic models."

The computer is making the Models, not the programmer. This is important. We are not writing a program, we are writing a programmer.
February 3 at 9:54am · Unlike · 1

Monica Anderson And so we need a Model for the progammer's mind. And we implement that. Because that is 10,000 lines of code as opposed to millions of lines to describe even the top 1000 concepts in our rich reality.

Don't Model the World. Model the Mind!
February 3 at 9:57am · Edited · Unlike · 2

Matt Mahoney So "model free" means mathematically impossible?
http://arxiv.org/abs/cs/0606070

[cs/0606070] Is there an Elegant Universal Theory of Prediction?
ARXIV.ORG
February 3 at 6:32pm · Unlike · 2

Curt Welch " In order to be general, it must learn to understand anything at all in any domain (of Reality) at all."

There is no definition of "understand" that makes this possible Monica. All understanding is domain limited. It's as wrong as trying to pretend you can build a general purpose adding machine that can add ANY two numbers. Any adding machine you build will be resource limited and as such, can't add numbers larger than what its resource limits allow. A 12 digit calculator can't add two 100 digits numbers.

If humans had brains that could understand "anything" then why is it so hard for people to understand each other in political debates? It's because fundamentally, we are different people with different brains that have different abilities to understand. We can't really understand everything the other person understands because neither of us have true general intelligence that can understand "anything". We can only understand those ideas that are within reach of the abilities of our individual brains. In no sense, is understanding infinite and without bounds or limitations.
February 3 at 8:06pm · Like

Micah Blumberg "So "model free" means mathematically impossible?" ahaha, any "model free" AI program is math possible, because it runs on a computer. hehe. So if math can't handle bizarre domains, than neither can a "model free" AI program hehe.
February 3 at 8:19pm · Edited · Like

Curt Welch "The computer is making the Models, not the programmer. This is important. We are not writing a program, we are writing a programmer."

Yes, it's highly important to understand that and many people don't. It's a meta stance we must take as we build a goal driven machine that uses directed search algorithms to "program" it's own behavior.

But at the level we do program the machine, we are still using models.

If I build a learning machine that uses some type of ANN that has 100 nodes per level and 100 levels with a given pattern of interconnections, that network topology IS A MODEL I'm hard coding into my AGI. All the "programs" my code is able to "write" in it's learning process, must be build using this 100 x 100 network "model". It's the model which directs how my program works.

All "understanding" of the world my program is able to learn, is modeled with this 100x100 neural network in my code. The program didn't dynamically chose to model the environment with a 100x100 node neural network -- I the programmer hard coded that model into my solution.

To say that I the programer didn't make this 100x100 node model is just wrong.

NO matter how many meta layers of abstraction we program in (and we have been doing this long before we stared working on the AGI problem), we still use models in our code.

If I so much as write: "float x,y;" in a program I've made the decision to use a 32 bit floating point "model" of the mathematical concept of a real number in my machine.

We can't escape the fact that everything we code is full of models at many different levels of abstraction.

The key difference to what makes AGI general, is not the fact that we don't use models in our code. It's the fact that we use highly generic models.

If the information that flows into our AGi is streams of bit vectors, then we have chosen to model physical events in the environment, as vectors of binary numbers. We build sensors to translate physical vents, like light waves and vibrating air into these bit streams but even when we abstract away the details of the sensors and approach the AGI problem form the position of "unknown sensory streams", we are still making very model specific choices as to how that data will be represented in our algorithm

I've spent a lot of time these past many years using a highly different way of modeling abstract data streams. I model them not as synchronous parallel bit streams (the MODEL that 99.99% of all AI projects choose to build AI with), but as asynchronous parallel spikes.

I've chosen to use a very different MODEL than most people are using, and there are important reasons that I have been experiencing with a different MODEL than most other researchers.

Most of us doing AGi are also using the model of a digital computer to build our solutions with. That's a very specific model choice. It's very possible that someone could also create a totally analog solution to AGI as well and avoid the digital computer model foundation totally, but they would buidling their solution using highly different models if they did that.

I'll repeat, a little more forcible -- to suggest that AGI can be MODEL FREE, is ABSURD. Powerful and general AI will be model lite, not model free. The simpler the models, the more general it will be. But to have no models, is to have no AGI.
February 3 at 8:40pm · Unlike · 2

Monica Anderson *shrug* we'll have to disagree here. If you can't see a distinction between substrate and learned information then we can't progress since I think that is crucial for the discussion. :-|
February 4 at 12:16am · Like · 1

Micah Blumberg It seemed like someone was making a point that math and physics is reductionism and reductionism can't handle bizarre domains. However if you make a computer

program general enough that it can handle bizarre domains you have lost your first principles, that math and physics are reductionism and reductionism can't handle bizarre domains.
February 4 at 10:58am · Like · 1

Monica Anderson Micah that's a pretty long discussion but I'm convinced I'm right about this and will defend it. Top level idea : If you create something general enough to handle our rich reality under limited and erroneous information then it has to be jumping to conclusions on scant evidence and as such it breaks many nearly-absolute rules of Reductionism. Optimality, Completeness, Infallibility, Repeatability, Parsimony, Transparency, and Scrutability. Hence it is no longer Reductionist.
February 4 at 9:54pm · Like · 2

Curt Welch "If you can't see a distinction between substrate and learned information then we can't progress since I think that is crucial for the discussion."

I can see it clearly. My point -- that you can't see -- is that no matter how much is learned, there must always be a substrate to learn with. And that substrate will always be A MODEL that we the engineers hard wire into the system.

To create the most general AI possible, we must use the simplest and most flexible substrate possible, so as to allow the system to learn as much as it can on its own. We want to minimize what we have to program, and maximize what it can "program" on its own. But no matter how far we minimize what we program, what we program is still a model we hard wire the system to start with.

I can build a robot designed to wander around a room. I can hard code the map of the room into the software. I can create some really fancy 2D localization sensors that tells the software exactly where the robot is on the map at any instant. I can then write planing software that allow the robot to plot a course from it's current location, to any new location I want it to travel to. I can test the performance of he motors and drive system so that I can now exactly how the robot will respond to commands to move forward at different speeds. I have built the entire model of the environment into the robot, so the software has no need to learn any part of the model on it's own.

But them I can start changing the system and making the robot learn about it's enviornment. I can let the robot learn on it's own, how the motors that drive it work in terms of it learning that a drive forward command of 2 (on a scale of 0 to 10), produces a forward velocity of 10 cm per second. It learns that by watching how the position changes over time after giving that command to the wheels. So now the robot is building part of the model on it's own -- the part about how wheel turn output commands relates to changes in state of the environment.

I can replace the highly accurate 2D location sensors, with far less accurate sonar range finding sensors, and bump sensors and write even fancier learning algorithms so the software can learn to estimate the location of the robot on the map at any point in time, instead of having to be told

it's location. That way, more of the state model of the environment is learned, instead of hardwired into the system.

I can take out the map entirely, and write fancy learning algorithms that allow the robot to build it's own map of the environment as it explores the rooms in the building. So now it's building it's own maps, and it's own location understanding from the sensory data.

But I still have to hard-wire low level models into my code. I'm using particle filters that are hard coded to have an X,Y location, a heading, and a velocity parameter to create a distributed sparse representation of the multimodal probability distribution of possible locations of the robot. I'ave hardwired the idea of a 2D space the robot operates in even if everything else about the state of the space is learned. I'm modeling with 2D concepts -- and that's the model that's still in he low level learning system.

If I reduce it further and make it learn even more, I can take out the 2D hard-wired concepts and make the system learn that as well. But my learning algorithm will still be using low level models of realty -- such as strings of time-stamped binary numbers from the sensors. My low level system is using the concept of time, and information encoded in binary, as the models that I still hard-code into the system.

As long as there is a substrate that used used to record what is learned, that substrate must be a model that we hard-wire into the system.

The point of AGI is to make that substrate as simple and board as possible, and make the system learn as much as as it can, on it's own, beyond that simple starting model. The point of AGI is to make it build as much of the model as it can, on it's own. The point however is not in any sense to 1) not start with a model that we must hard-wire into the system or 2) not use models.

The term "model free" is just a very poor description of what needs to be done. It's not free of models, it's just model-lite.

We already have good names for the idea of getting the machine to learn as much as it can on it's own. It's called machine learning.

There have historically been two approaches to AI. One is top down, and the other is bottom up. Top down, is MODEL HEAVY. It's where the engineers build lots of complex models to make the machines act like humans -- like playing chess. We build models of chess boards and algorithms for manipulating the models. We build language machines like cyc that build a big language-centric model of the environment and then uses that language-centric model to try and learn to answer questions. The top down MODEL HEAVY approach has provided a large array of cool systems that do amazing stuff, but which have always ended up as only limited domain solutions.

The other approach to AI is bottom up. This is MODEL LIGHT. It's where we start with very simple and broad models and ideas, and see if it can produce intelligent behavior. Like Classical conditioning (1897) and Operant Conditioning (1938), hebbian learning rules (1949), the perceptron (1957), back prop training of neural networks (1963), etc.

The advantage of top down, is that it produces stuff that works, but which have too limited of a domain to match human intelligence. The advantage of bottom up, is that the domain is very broad, but that if you don't get the algorithm just right, it doesn't work and produces nothing of value other than a growing the list of ideas that are sound good, but which don't work.

The bottom up researches have been making good progress producing stronger and better algorithms that are model-light for 100 years with deep belief networks built from things like restricted boltzmann machines being some of the more recent successes.

The top down approaches have failed to produce general AI, because they hard code TOO MUCH of the model and too much knowledge into the systems.

The two approaches have always been on a collision course towards each other. The solution to building human intelligence into a machine will result when these two approaches meet somewhere in the middle.

But none of them have been modle-free. One is model heavy, and the other is model light. And yes, to produce general inheritance, we have to remove models form the model-heavy side in order to get down to what model-light approach has been doing for over 100 years now.
February 5 at 9:10am · Unlike · 1

Monica Anderson " My point -- that you can't see -- is that no matter how much is learned, there must always be a substrate to learn with. And that substrate will always be A MODEL that we the engineers hard wire into the system."

Yes, I fully agree.

"We already have good names for the idea of getting the machine to learn as much as it can on it's own. It's called machine learning."

Except a lot of ML is model-heavy and what is learned is just parameters. This limits learning to those Models. This is my main objection to using current ML. You discuss this further down...

"And yes, to produce general inheritance, we have to remove models form the model-heavy side in order to get down to what model-light approach has been doing for over 100 years now."

The correct approach is not to make existing Models lighter. It is to start without Models of the Problem domain. Here is where we differ the most. I'm comfortable with much less initial

Modeling than you seem to be. And contrary to what you seem to think, it is possible to create a "general learner" that operates in any problem domain.

My Substrate contains Models of Saliency, Abstraction, Reduction, Success, Failure, Prediction. It has a trivial input mechanism that doesn't do Model based preprocessing although I am not negative to those in cases like computer vision. But none of the things I Model are problem domain specific. My systems would learn from video cameras that provided a map of color pixels that changed over time. No furter preprocessing would be required.

Nothing in my substrate would be specific to learning English text, Japanese text, or text in general. Nothing would be specific to voice recognition (We'd just have to find a way to represent the input signal as a spatiotemporal stream, such as multiple channels of amplitude over a set of frequencies, changing over time). Nothing *in the learning parts of the system* would be specific to video.

Basically anything that can be pre-reduced in a preprocessing chain into a stream of bytes (or wider chunks of bits) with a temporal variance should work. The system would analyze that and discover whatever semantics any such stream contains.

So basically, in a Text domain the preprocessing is so trivial as to be nonexistent. In video there might be a lot more, and likewise in sound. These would be purely Reductionist preprocessors and we'd have to be careful that the transformations wouldn't remove any semantics and wouldn't *attempt to add any semantics that isn't there*. But even so, these are transformations in the media - in video encoding, so to speak, or transformations of sound to Fourier bands.

It could be that you don't understand what I mean by target domain.

If we are running Final Cut Pro or Adobe After Effects we are manipulating video. There is no world knowledge involved; that is supplied by the user. If we are doing a Fourier transform of a sound stream, we are operating on sound information. But neither video nor sound are the target domain. They are just sensory inputs and the target domain for an AGI with eyes and ears would be *Understanding the World*.

I accept any and all transformations of the sensory input data as part of the substrate.

Let's say we create a robot with a learning machine of my design... surrounded by preprocessors for vision, sound, location, and spatial navigation using Lidar or somesuch. I accept all of these Models as part of the Substrate.

What I don't accept is Modeling anything in the environment - in the World. It has to learn (like a child) how changes in color values of incoming pixels related to external objects. There is no need to, for instance, build a vertical line detector or a plosive sound detector. If the system can't figure thouse out by itself then it will never learn the difficult stuff.

You can call these preprocessors Models. But they are Models of information flow, not of the World.

The trick is still how to design the general learner. This is my domain of expertise, and feeding in text is the simplest set of preprocessors in any domain that has sufficient semantic structure.

And the general lerarner has no Models and depending on your preprocessors would work as well for video as for text. Its task is to figure out semantics no matter what the input stream looks like or where it comes from.
Yesterday at 10:09am · Like

Micah Blumberg "Hence it is no longer Reductionist."

The old idea of AI, the east pole, used tokens to define the problem domain. The hand coded knowledge representation was about defining the problem domain for the computer to go to work.

Now you say your approach is west pole because you do not hand program any knowledge representation, so it's generic, its expensive learning, but it can do anything, with no pre-defined problem domain.

It's sort of meant to be a universal AI that you can apply to any problem domain. However there is always a problem domain, and you still have a person setting up the perimeters of that problem domain, selecting the material, preprocessing it into bits, etc... it is still reductionist.

"There is no need to, for instance, build a vertical line detector" In the human eye there are vertical line detectors, horizontal line detectors, left to right motion detectors, right to left motion detectors, blue light detectors, other light detectors. The human sensor system is full of special detectors. It is however highly adaptive. The audio cortex can process visual information, this has been proven, So what we can deduce is that the human brain can produce it's own specialized knowledge representations which do pre-define problems.

There is much less pre-processing involved for human brain, it can adapt to a broad spectrum of sensory frequencies.

I don't know if a human brain can process bits, or if reducing data to bits makes very much sense for a brain like system.
Yesterday at 10:33am · Like

Monica Anderson " However there is always a problem domain, and you still have a person setting up the perimeters of that problem domain, selecting the material, preprocessing it into bits, etc... it is still reductionist."

What if I provided an internet connection to my AI and let it choose what links to follow?

The main guidance would be in the Saliency algorithm and that's at a very low level. It would be the same Saliency algorithm for text, video, sound, and navigation.

I claim this saliency algorithm isn't a domain model. And I don't have any Models above that.
Yesterday at 11:06am · Unlike · 1

Curt Welch "I claim this saliency algorithm isn't a domain model. And I don't have any Models above that."

Have not you just widened your domain?

If I write a chess program, it's in the domain of chess. I can widen the solution, and make a program that can play any board game. I'm no longer in the domain of chess, but I'm still in a domain -- the domain of board games. There are other domains this general program still can't address.

There is no general solution to everything that would allow us to say we have written the one program that does everything so that we will never have to write another program. Any hardware we build will always be domain limited.

I can build an intelligent general purpose learning machine, that is still limited in domain to what it's able to learn, and what scale of information it's able to work with. It will still be domain limited in what problems it is able to solve.

Humans are domain limited. We are limited to what things we can understand and deal with. If we build a machine that operates in our domain, or operates in a domain more general than what humans can do (which we will), the machine will still be domian limited.

It seems to me that you are thinking that humans have a broader scope then our current AI programs. We can play chess, but we can also play Go, or checkers, and we can also compose music, and do science and engineering. If you make a machine that is more domain limited than us, you seem to call it "domain limited". But if it can do everything we can do, then it's "domain unlimited"

But that's not true because we are still domain limited machines. There are real limits to what a human can understand and what sort of problems they can solve on their own without the help of "thinking machine" doing the work for them. Multiple math proofs have now been created by getting a computer to do the work for us -- because the problem is too large and complex for any single human to solve it. Like the 4 color map theorem.
Yesterday at 12:37pm · Edited · Unlike · 1

Curt Welch "My Substrate contains Models of Saliency, Abstraction, Reduction, Success, Failure, Prediction. It has a trivial input mechanism that doesn't do Model based preprocessing

although I am not negative to those in cases like computer vision. But none of the things I Model are problem domain specific. "

It very much is domain specific. It's just a much wider domain than some other AI approaches. You just seem blind to the possibility that there is a wider domain your approach can't deal with.

You substrate contains 6 models. Mine contains only two. Mine contains only Classical, and Operant conditioning. Classical conditioning is unsupervised association learning (perception learning), and Operant conditioning is value maximising behavior selection. I would guess, from your names, that your "Abstraction and Reduction" are covered in my one process of Classical conditioning, and your Saliency, Success, and Failure, are Operant conditioning. There is some prediction at work in both my Classical and Operant conditioning. In Classical, the system learns probability distributions and assumes future sensory data will be similar (but does not actually make predictions), and in Operant conditioning, the system is producing estimates of future rewards. But at no point, is my system using a model to try and simulate the environment for the purpose of predicting what the environment will do in the future. I do not see that as needed to create general intelligence.

All of this is about the domain our systems are operating in and the domain of problems they are made to solve. There are endless examples of domains we can use computers to solve that these "general" intelligence machines won't be able to touch -- like solving the problem of producing a list of web pages from a given list of keywords. A can person sitting at a desk take over the work of the Google servers? Of course not -- can't even touch the ability. Because AI is a very domain limited type of system -- which is why we have built all these other computer systems to replace humans already -- and to do things no human can begin to do -- like adding millions of numbers a second to do accounting.

AGI is very domain limited to AGI.
Yesterday at 12:51pm · Unlike · 1

Micah Blumberg I also think that if an Artificial Intelligence can only handle pre-processed bits that it is reductionist for that reason at least. Confined to the model that is the set of all number based models.
Yesterday at 1:51pm · Edited · Like

Micah Blumberg If we are, in the end, still feeding ones and zeros into a machine, I do not see how terms like holism, model-free, or intuition can really match what is being done. I understand what is being done, but for me at least those terms do not seem like the right match.
Yesterday at 1:55pm · Like · 2

Boris Kazachenko I admire your patience, Monica . Hey, I just realized I am already using a term for your "holistic": bottom-up. It's a bit misleading to describe a method that is doing reduction as holistic. All operations you list are selecting among inputs, thus hierarchically reducing input flow. Although from my POV your approach is not really bottom-up, either. In that sense, I am

holier than you . Also, I think there is so much confusion about "Model Free" because it is defined by exclusion. A positive term for that is pattern discovery. To make it general: scalable pattern discovery.
Yesterday at 6:25pm · Edited · Unlike · 3

Matt Mahoney Holistic is more like top down.
Yesterday at 6:33pm · Unlike · 1

Micah Blumberg Monica said "My Substrate contains Models of Saliency, Abstraction, Reduction, Success, Failure, Prediction."

Boris said "All operations you list are selecting among inputs, thus hierarchically reducing input flow."

Point goes to Boris

Its not "holistic" its reduction, and its bottom-up "scalable pattern discovery"
Yesterday at 6:47pm · Edited · Like · 2

Juan Carlos Kuri Pinto My 2 cents on why Monica's approach is "holistic":

https://www.faceobok.com/notes/juan-carlos-kuri-pinto/synergy-reduction-and-saliency-are-paramount-to-general-ai/10151442948752712

Juan Carlos Kuri Pinto
Synergy, Reduction, and Saliency Are Paramount to General AI
In my AI systems I never preprogram preexisting AI algorithms. I rather let the machine learn the causal geometries of Reality:

Reduction is a proactive and unconscious exploration of the whole space of mental resources, mind patterns, and hypotheses. It is not a straightforward and preprogrammed recipe to solve a problem. It is not a reductionist s...See More
Yesterday at 7:47pm · Like

Boris Kazachenko Juan, holistic is defined as the lack of reduction. And the very process of learning is an algorithm that you have to preprogram. If you don't program anything, then you are not doing anything. Much of the above is simply incoherent. I know you mean well, but... maybe you should try Ritalin? .
13 hrs · Edited · Unlike · 2

Monica Anderson There are some people here that just don't get it. Terminology aside, avoiding Models is essential when creating a GENERAL intelligence. If you (like CYC) create Models of the World for your AI to reason about then it is limited to reasoning about those Models and is not a GENERAL intelligence. End of story.

"But my AI learns and can extend the Model I supplied"

In that case, why don't you let your AI start from zero? If you can add to a Model, why can't you add to NO Model? it turns out that Hybrids are much harder to debug than purely Model Free (in the problem domain) systems since the Model Based parts will generate results that flood the weaker emergent learned contributions from the Model Free parts. And hooking an exisitng Model to sensory input is much more difficult than letting the sensory input build the Model on its own.
10 hrs · Like · 1

Peter Morgan Ritalin is a good idea for Juan Carlos, i think .
10 hrs · Like

Peter Morgan This is salient though: "Intelligence is within the brain network. Trying to understand intelligence by studying neurotransmitters is like trying to understand written language by studying the chemical composition of the ink. It's simply not the right level of complexity. Language lies within the relationships between words."
9 hrs · Like

Matt Mahoney Learning doesn't start with a blank slate. There has to be an inductive bias. In the case of humans, half of what you know is inherited.
9 hrs · Like

Micah Blumberg "This is salient though: "Intelligence is within the brain network. Trying to understand intelligence by studying neurotransmitters is like trying to understand written language by studying the chemical composition of the ink. It's simply not the right level of complexity. Language lies within the relationships between words.""

It might be salient but study of neurotransmitters can yield engineering insights that can be applied later to computation.
7 hrs · Edited · Like

Micah Blumberg "Matt Mahoney Learning doesn't start with a blank slate. There has to be an inductive bias. In the case of humans, half of what you know is inherited." no way, that Noam Chomsky idea has been proven wrong. You don't start with any pre-knowledge of language for example.
9 hrs · Edited · Like · 2

Boris Kazachenko Monica, almost no one will get it until after it's done. We need to move on. The speed of a caravan is the speed of its slowest camel.
6 hrs · Edited · Unlike · 3

Matt Mahoney I mean 10^9 bits each in your DNA and long term memory.

6 hrs · Like

Monica Anderson Almost none of those bits describe brain content. At best, they contain our instincts, of which we don't have that many. While I admit nobody knows how DNA encodes instincts its pretty clear form an information theoretical point of view that there isn't much left to store basic knowledge anfter we see what's left of the DNA after we have removed the genes that encode cell metabolism and body structure. Kurzweil once estimated, off the curff, that we might have 35 MB left in the DNA for all the knowledge we have when we are born.

This DNA doesn't even tell us how to see. We learn that in the first few months of life. Google for "Buzzing and blooming".
6 hrs · Like

Matt Mahoney Our DNA encodes how our eyes are formed, including the neural architecture in our retina and brain for detecting contrast and movement in the retina. I realize that higher level feature detectors are trained. For example, kittens raised in rooms with horizontal or vertical stripes will have more neurons responding to edges in those orientations. There is still an inductive bias as it is only possible to learn features that occur over local regions from the previous layer.

The important question is how much code do you have to write to solve AGI, by which I mean solve the problem of automating all human labor? How much code would you need to write to program a robot spider to weave webs and catch prey?
5 hrs · Like

Curt Welch "The important question is how much code do you have to write to solve AGI, by which I mean solve the problem of automating all human labor? "

The other variation of that question would be, HOW do we write it? Do we write it by typing code on a keyboard, or do we write it by sending robots to school? The answer is that we will write MOST of it, by sending robots to school, and not by typing on a keyboard.
5 hrs · Like

Micah Blumberg You can unplug the eyes from the visual cortex and plug them into the auditory cortex and they work, the audio cortex becomes a new visual cortex, what the dna encodes for the most part is like the sequence of when and where different aspects of the genetic code become active producing specific protein structures. That sequence results in an eyeball or a brain, but I would think that any protein based memories would be scrambled by the reproductive process, just a guess. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2791852/

Visual influences on ferret auditory cortex
Multisensory neurons are now known to be widespread in low-level regions of the cortex usually thought of as...
NCBI.NLM.NIH.GOV

5 hrs · Edited · Like · Remove Preview

Micah Blumberg Henry Markam's Blue Brain project found that neurons make connections to one another almost randomly. That's why I think a dna based memory would get scrambled from one generation to another.

"This means that neurons grow as independently of each other as physically possible and mostly form synapses at the locations where they randomly bump into each other "
http://actu.epfl.ch/.../blue-brain-project-accurately.../
Blue Brain Project Accurately Predicts Connections between Neurons
One of the greatest challenges in neuroscience is to identify the map of synaptic connections between neurons. Called the “connectome,” it is the holy grail that will explain how information flows in the brain. In a landmark paper, published the week of 17th of September in PNAS, the EPFL’s Blue Bra…
ACTU.EPFL.CH
5 hrs · Like · 1 · Remove Preview

Matt Mahoney We will use natural language and machine learning to the extent possible, because it is 1000 times faster than writing code. The question is how much coding can't be avoided? One requirement of AGI is to be able to predict human behavior, which requires a model of both the human mind and body. The complexity of that model is the complexity of our DNA. So the only real question is how much can we compress it? You could argue that only 2% of our DNA is protein encoding, which leaves about 1.2 x 10^8 bits, or 6 million lines of code.

But then you have to ask why is the other 98% there, not just in humans but all mammals and most vertebrates? There is a metabolic cost to copying DNA, and therefore evolutionary pressure to eliminate junk DNA. That happened in the roundworm C. Elegans. It has the about the same size exome (20K genes) as humans, but only 3% as much total DNA. Obviously the rest is important, like a pool of genes that can be turned on later, like a giant software project that carries unused code that might be needed in the future. Would it surprise you if 98% of the code in Windows or Linux is code you will never run? Couldn't you just delete it?
5 hrs · Unlike · 1

Micah Blumberg " The complexity of that model is the complexity of our DNA. " The complexity of that model is the complexity of our DNA multiplied by the set of all other factors in our ecosystem, and entropy.
4 hrs · Like

Matt Mahoney Actually, the complexity of AGI is the complexity of our DNA plus the complexity of what we know about the world. What we know is collectively about 10^17 bits. That part can be learned, but it will cost on the order of $100 trillion.
4 hrs · Unlike · 1

Micah Blumberg "But then you have to ask why is the other 98% there, not just in humans but all mammals and most vertebrates?"

The idea that 98% percent of dna is junk dna is outdated and no longer thought to be true by top dna researchers. You're dna is active your whole life, and it does a lot of interesting things after you are born that help regulate the body.
4 hrs · Like · 1

Matt Mahoney Right.
4 hrs · Unlike · 1

Micah Blumberg "Actually, the complexity of AGI is the complexity of our DNA plus the complexity of what we know about the world." The sum of the complexity of what all humans know is a subset of all the actual physical aspects of the ecosystem that effect human dna in each plank second, so it's a multiple, not an additive, because each new moment is a new addition.
4 hrs · Like

Micah Blumberg What humans know consciously, is a subset of what criteria enters the brain via the senses at an unconscious level, before being a subset of everything that can effect you in a casual (cause and effect) sense.
4 hrs · Edited · Like

Micah Blumberg One real possibility is that the elimination of so much data, perhaps at random, by your thalamus, before your cortex receives it, might alter the timing of your neural oscillations just enough to make you and your choices less predictable to machines and other people.

Matt Mahoney If your goal is to automate labor using AGI, then 10^17 bits is the information content of human brains that you have to extract through speech and writing. I realize there is more knowledge than what we know. It takes 10^120 bits to describe the quantum state of the universe.
4 hrs · Like

Micah Blumberg It is a challenge to consider how to model conscious knowledge without also modeling unconscious criteria which is the superset of human knowledge from which the set of conscious knowledge exists.
3 hrs · Like

Micah Blumberg Oh you are talking about extracting human knowledge through speech and writing, well that is an extremely small subset of human knowledge.
3 hrs · Like

Matt Mahoney You need to model both, so why make the distinction?
3 hrs · Like

Matt Mahoney How else are you going to extract human knowledge from human brains?
3 hrs · Unlike · 1

Micah Blumberg I have a napkin sketch stage blueprint for a machine that reads the contents of the human brain by communicating with it, via a bci interface that plugs into your nervous system.
3 hrs · Edited · Like · 1

Matt Mahoney It needs to cost under $10K per person to compete with a global system of public surveillance.
3 hrs · Unlike · 1

Micah Blumberg Pricing is difficult to imagine at this stage. I'm not imagining astronomical pricing but still, I have to think about this now.
3 hrs · Like

Matt Mahoney Brain scanning is theoretically faster, but the technology is a long way off.
1 hr · Like

Micah Blumberg My napkin sketch idea was partially inspired by the conjoined twins Krista and Tatiana, connected at the thalamus, and able to see through each other's eyes. I'm not sure how long it would take to copy the contents of an entire brain, perhaps a matter of hours, perhaps it would take mere a handful of minutes. http://en.wikipedia.org/wiki/Krista_and_Tatiana_Hogan
Krista and Tatiana Hogan - Wikipedia, the free encyclopedia
Krista Hogan and Tatiana Hogan (born October 25, 2006) are Canadians who are craniopagus conjoined twins. They are joined at the top, backs, and sides of their heads. They were born in Vancouver, British Columbia, Canada, and are the only unseparated craniopagus twins currently alive in Canada.[1] T…
EN.WIKIPEDIA.ORG
13 mins · Edited · Like · Remove Preview

Micah Blumberg What is clear is that you can have two brains connected together with each one able to retrieve information from the other brain, and retrieve it almost instantly.
9 mins · Edited · Like

a0039z

(soliton, oscillat, graph, observer, vector)

Connect notes a0177z, a0286z, a0039z

In my work on Self Aware Networks I use the word sentience interchangably with consciousness, sentience is the entification of a network of sensor transmitter systems in

oscillation with one another. This applies to cells in the human body, all types of cells, entification is faster in neurons however than in other types of cells, but your hand is still conscious and part of a conscious system which means it's sensor transmitter networks (its cells are each a sensor transmitter) are in oscillation with one another, sharing signals, operating as a single sensor transmitter system. However consciousness is separate from Self Awareness, particularly the kind of Self Awareness known as phenomenological consciousness, which requires a feedback loop, such as the loop between your incoming senses, the thalami-cortical loops, the cortical cortical loops, the hippocampal-entorhinal cortex loop, and other major sensor transmitter feedback loops in the brain, this allows a high level abstraction to make a high level abstraction of it's own network. Thus a human brain starts out as a conscious system and becomes a self aware network over time, as the brain builds models of the self, the ecosystem of the self, and the causes of movement.

https://arxiv.org/pdf/0804.4237.pdf

I imagine that my inner voice is a moving soliton wave patterns firing phasically inside my corticol column oscillators, like a stream of lights lighting up, or when a jet flies low and release a stream of particles in the air leaving a trail, this pattern travels through my brain and each new neuron that fires is playing a different audible electric tone, each one represents a different part of my inner voice, as I model my thinking to myself in conscious way, modulating my internal dialog with the english language.

As each array of neurons contributes it's part in the soliton wave song, the next array of neurons listens to it and then contributes its soliton wave song to the next array and so on. Neurons connected to many arrays simultaneously at a higher level help facilitate the entification of all the signal transmissions at great scale. Essentially the brain is like a real 3D Super Graph Neural Network, because each part of the brain is both talking to and listening to every other part of the brain & body, and multi-scales, with multiple modal frequencies.

So the existence of mechanico sensing receptors in the brain, and the fact that dendrites & neuron bodies are expanding & contracting creating mechanical waves fits with the soliton wave theory, which I insist must be combined with the Hodgkin & Huxley model https://en.wikipedia.org/wiki/Hodgkin%E2%80%93Huxley_model in that both types of signalling are happening concurrently, but specifically in several different modalities simultaneously.

This makes sense if basically the entire brain is one giant multi-modal node for every type of information pattern
https://twitter.com/JeanRemiKing/status/1533720262344073218?s=20&t=rfzodKlBPupb8-1m9DdQ1A
`Toward a realistic model of speech processing in the brain with self-supervised learning': https://arxiv.org/abs/2206.01685

This interesting visual of an AI attempting to correlate changes in the brain state at a macro level with speech processing in an artificial neural network. The visual correlation they created

in the above link I think provokes the idea of sensory data traveling in waves anywhere & everywhere, distinguished from other sensory criteria by the frequency or part of the powerband spectrum, which is why heat is distinct from vibration and that is distinct from sound, and that is distinct from light, and yet all these different frequency range patterns in the em spectrum can be correlated into a unified or entified pattern or rendering for the conscious person to experience because they have common spatial & temporal occurances across the 3D grid of the human brain & body.

Remembering Mechanosensitivity of NMDA Receptors
https://www.frontiersin.org/articles/10.3389/fncel.2019.00533/full

Focused ultrasound excites cortical neurons via mechanosensitive calcium accumulation and ion channel amplification
https://www.nature.com/articles/s41467-022-28040-1?fbclid=IwAR3xLuyEVkcIqQgL5EjP8SqLeejesoJ24wPDXks3uaFwvDE7OBjUt0U-YV0

The solitons are happening when the action potential fires, but maybe when a neuron receives neurotransmitters on its membrane it is feeling another neuron via microvibrations

so then the counting allows it to formulate a record of its feelings

because every feeling is a soliton wave, every sight and sound that is part of human experience is a soliton wave in the brain, we feel it, but the counting knows it

because the counting and the micro-feelings are happening at the same time,

and the patterns that let to a major feeling soliton burst are remembered, and so a neuron can replay a pattern because the chemicals cause changes in the shape of the neuron, the shape of the instrument, how its been tuned to play or not play with a huge amount of variation possible that other neurons can track.

interestingly it does seem like the soliton would primarily move in the direction of the axon towards the exit terminal, so that makes sense why signals have a direction

soliton-chemical duality, soliton sensing-chemical triggered memories, shape changing protein to encode long term memories essentialy as structural modifications that change the tune of the neuron instrument.

A neuron is a phase detector or wave detector
https://www.google.com/amp/www.techplayon.com/wavelength-frequency-amplitude-phase-defining-waves/amp/

and a neuron is a phase maker
https://en.m.wikipedia.org/wiki/Phase_(waves)

electric solition phases & magnetic soliton phases

soliton waves plus neurotransmitters, not as an alternative
https://en.m.wikipedia.org/wiki/Soliton_model_in_neuroscience

Vector Solitons
the neurons themselves are having experiences and making memories of their experiences,

soliton electric waves or phases or coincidence patterns, hz signals, frequencies felt & remembered simultaneously

neurons are

if man is a neural network representing features in his brain, who is the observer inside the man who is looking at these features?

the attention schema both defines which areas of your mental map your are seeing, but it also binds those areas together in sequences that your brain tracks with neurotransmitters and senses with corresponding soliton mechanical sound waves and soliton electrical waves felt by each neuron,
other neurons are able to track the phase changes happening to other neurons whether they are speeding up or slowing down, and long changes of these detects are mapped by many neurons or entire neural circuits simultaneously because exit terminals branch radially in every possible direction they can go.

If you invert the map from its branching structure to a graph with each node plotted on the outside of a circle and their random initial connections mapped as lines inbetween nodes then you can just imagine that the lateral neural circuit as represented by v1, v2, v4 and the horizontal neural circuit represented by cortical columns are going to be collectively doing a sort of topography on incoming sensory patterns to deduce how doverse multisensory features of a concept are connected at high levels, this allows the brain's graph to build complex representations that the attention schema of circuit activity binds in temporal & spatial firing patterns of phase differentials.

towards Biologically plausible back prop
https://arxiv.org/abs/2010.08262

Your own personal simulation of reality, from your own viewpoint is a fractalization of a neuron, a neural column, and a global workspace with high level attention coordinated by the hippo-campus

a0040z

György Buzsáki
Step by step: cells with multiple functions in cortical circuit assembly
Rosa Cossart & Sonia Garel
Nature Reviews Neuroscience (2022)Cite this article

Abstract
It is often thought that the construction of cortical circuits occurs as the result of an elegantly designed process that unfolds sequentially as an animal develops until adult functional networks emerge.

In reality, cortical circuits are shaped by evolutionary mechanisms, changes in developmental programmes driven by neuronal activity or epigenetic mechanisms and the need to adapt to the external world, and must pass through several important phases and timely checkpoints as they form.

Some cortical cell types serve multiple functions during this developmental journey and are then reused (or ‘recycled’) to perform different functions in the adult cortex.

Understanding the different stages of the cortical construction process and taking into account the ways in which cellular functions change across time and space is therefore essential if we are to build a comprehensive framework of cortical wiring in both health and disease.

Category theory could be ideal for mapping the bizarre domains of reality such as communication patterns between cells, atoms, brain activity, and fluid mechanics because without precise knowledge of the contents of each node that we are attempting to graph we need to be able to have useful rules for mapping some level of abstraction to help discover the conditions & boundaries abstract relationships between invisible functions.

In other words, in biology we need to be able to analyze the multi-level functions of cells that are unlocked through their communication with one another.

The feedback a cell is getting from it's environment unlocks it's learned functions.

In other words a cell has, through evolution, through trial and error, learned sequences of functions that it will execute in response to certain signals from it's environment.

What is interesting is that you can abstract the function of a neuron to an artificial neuron, but you can also abstract the function of an ordinary cell to a neuron

You can also abstract the functions of multiple cells communicating together as being like nodes in a graph neural network.

The communication of chemical messages is turing complete, or capable of simulating any kind of information, just like the communication between nodes in a graph neural network, with

cellular systems being able to recognize and respond with learned data stored in the information configuration of chemical packages. In otherwords if you give an organism shit, it knows, at the chemical level, how to respond with a "fuck you" message.

We could argue that because Putin's biology is under attack from Parkinson's Disease that his understanding of the threats he faces internationally is magnified in his mind.

a0041z
(LTD, Perception, oscillat, field, dendrite, electromagnetism, observer)

The Lorentz invariance is the proposition that the laws of physics are the same for different observers

action is how much time is perceived by an observer in their own frame of reference

all objects moving through space time move through paths that minimize the time measured on that path?

Fermat: Light always travels the path that minimizes its travel time, the principle of least time

this is a special case of the Principle of least proper time

the famous double slit experiment

a stream of quantum particles are launched at a barrier with slits in it.

the wave function represents all possible paths that it could take???

the wave function at the screen represents the wave of final destinations for those paths, some more probably than others

Paul Dirac

Quantum action = integrated time evolution of the wave function
 this quantity
he realized this quantity should result in destructive interference in most places like the dark bands in the double slit experiment

constructive interference only where quantum action varied slowly near its stationary points just like classical action

Richard Feynman
Feynman's infinite possible paths weighted by it's quantum action

probability amplitude

it calculates the phase shift that a particle picks up

it effectively calculates the phase shift that a particle picks up along each path towards its destination

the most likely destinations

then it adds the phases of all conceivable paths to that destination

the most likely destinations are those where the phases line up

The most likely destination between two neurons that fired at the same time is work because the phases between them line up?

Richard Feynman's Path Integral Formulation is a description in QFT that generalizes the action principle of quantum mechanics. It replaces the classical notion of a single unique classical trajectory for a system with a sum, or a function integral, over an infinity of quantum mechanically possible trajectories to compute a quantum amplitude.

The path integral IS the quantum analog of the principle of least action

a particular final destination is likely if the many phases that could lead to that destination line up.

very tiny changes in the path lead to rapid changes in the phase causing those paths to cancel out

Particles tend to end up near the stationary points of the quantum action

This happens for the paths that take the shortest path, the shortest path through configuration space

the shortest path through configuration space

the space of all possible trajectories given our objects constraints

configuration spacetime for planets determines the path of planets, where the shortest path minimizes proper time

phase space is the space of all possible positions

or it could be the more general state space, all the quantum states that a system could be evolved through

state space, all the quantum states that a system could evolve through

the application of the quantum action principle to the evolution through quantum states under pins quantum theory

Dirac Equation

for each Quantum Field

track the evolution of all quantum fields through configuration space

the configuration space of ideas

"The Principle of Least Action" corrected to Action is always minimized or maximized

the force

general relative describes the force of gravity in terms of bending of the fabric of space and time

is "Oscillating Space" a thing?

particles are more likely to travel a path that minimize their travel time, out of all possible paths

So the argument for why time dilation around a mass is scale dependent could be that the electromagnetic wave field pattern of space is defined relative to dense oscillators such as planets.

It's like the density of spacetime is accomplished by the speed of an oscillation, but that increases collisions along all lines that equal the diameter (volume) times the velocity (speed of the cycle) of the oscillator. Whether this causes a Bose-Einstein condensate to be emitted from the oscillator or not the effect is that the vertical lines of particle activity (particles moving forward/back vs other directions) shooting from the oscillator into space time this creates a situation where when a particle is closer to an oscillator, there are a greater number of chances for it to move toward that oscillator than there are in any other direction, so if its selection of which direction to move in is truly random in each interval then it will move towards the oscillating object that is exciting the lines between it and everything that is orthogonally aligned with the center of its diameter facing perpendicular to any object, but its diameter's scale is decreasing with distance, because the waves in space that it displaces are dissipating the energy from that sphere with distance, the fact that particles dissipate energy with distance causes spacetime to stretch out, but the same principle causes space to fold on itself to become atoms, molecules, chemicals, stars, planets, people, life and asteroids. What it means that an

oscillating atom is happening when the path of two or more particles causes an oscillating convergence, where two or more particles start orbiting each other,

It's like why is there always an electron or a proton in every atom? Why don't we have atoms that are only electrons, or only neutrons or only protons?

The phase state of two electrons in orbit would cause them to merge, but I think by merging they would become faster, so they are merging in a temporal way. Like two oscillators with the same phase pattern they can easily merge, but the oscillating pattern of a proton or a neutron cannot merge with an electron because the phase states are not aligned, and that means the shortest path between them isn't the most direct path, and the result is that neutrons and electrons and protons fall into orbits that prevent them from colliding.

The shortest path through configuration space is why dendrite spines from neurons that fire towards other neurons that fire.

because a spine that never existed before pops out of the dendrite wall at just the right place and grows in just the right direction, that point on the wall, and that direction, it's the most excited part of the electromagnetic membrane that is the cell wall, because that point in the geometry of the cell is receiving the most excitement (heat, electromagnetism, mechanical waves, and chemical waves), and with each new signal transmitted the space of possible movements expands in-between the energy sources of waves

heat represents spacetime that is moving faster in the temporal dimension.

heat is relative

its that heated space is moving faster relative to cool space

its like in heated space you have more particles that are taking up the same space, particles in phase (like two electrons) can take up the same space but it cause an interval of time to happen relative to particles that are cooler, as such heat is attractive, and it sends out signals that are stimulating the particle field like an atom

particles that are cool are moving more slowly through time relative to particles that are hot

but particles that are hot are particles of the same phase that are orbiting each other temporally

this means an adjacent particle is receiving two signals from the heated particle for everyone one signal its receiving

interactions along an orthogonal axis between two objects in space is going to bend spacetime between them

So earth and the moon are bending spacetime between them, but it's because each mass is combining its oscillator effect with the oscillations that make up its body, this allows for the planet to be any type of oscillator, or any combination of oscillators.

The combined effect of many oscillators is going to bend space time because each oscillator, and each group of oscillators is bending spacetime according to the density of their combined effect

specifically the center of the perpendicular diameter of any oscillating body, adjusted by its delta in configuration space towards any object in space

Long Term Depression, Quantum Field Theory, and General Relativity

I have a new quantum physics theory

but back to LTD,

so two neurons fire, at the same time, or close to the same time, because they are close in phase they each send signals to each other at the exact time when each of them is increasing it its interval of growth, everytime a neuron fires its interval of growth accelerates relative to neurons that did not fire at that moment in time, it becomes hotter for brief moment so there is a thermofield that is receiving a phase change

Interesting idea: What if the thermo field was 1:1 correlated time? So that where time was sped up space was hotter. It's an interesting idea. What examples might break that idea?

so it's like time accelerates around particles that have converged together in 3D space to oscillate in time, which causes the expansion of space.

oscillation causes the expansion of space also because it creates more heat
or more relative time

oscillations create more space time relative to their density which is how many particles are oscillating together amplifying each other's effect to create an oscillating body

but the same effect is also going to cause the particle field to become more stretched out at a distance, I'm just thinking about the vast expanses of space between galaxies, this spacetime distance in between galaxies is relative to the temporal velocity of the field of spacetime which is all fields

The temporal velocity of combined oscillators in huge things like planets is going to create a large-scale gravitational effect on the local scale, but past a certain threshold it's going to have the opposite effect where space seems to get more stretched out.

you would eventually have filaments between galaxies

because the oscillating force of each galaxy on the fabric of spacetime means that they warp space time in between them, the signals between the two points in space happen faster because in each respective direction signals are happening faster so the whole space between them is happening faster

and in essence all of space time is an oscillating field with fractalized oscillations happening at every scale down to the planck scale, up to the whole of space at the largest scale

but

I think we are in communication with other galaxies

there is a new awakening happening right now

the whole of space at the largest scale is either one oscillation or its many, because its size is relative to its oscillations

Space near oscillations moves faster and contracts towards those oscillations, but space in between the oscillations is being pulled towards the hot lines between hot points; they are hot lines because the field is being heated from two directions. These field lines in one sense fold space by increasing the changes that particles fall towards them, they change the configuration of space relative to each particle in space relative to what it's oscillating with, relative to its velocity, density, mass, and direction, they increase the number of possible direction each particle could move at each interval of its time, and so over time, because it randomly moves in any direction, it is going to move towards the space where there is more spacetime essentially, because more signals are coming from where there is more spacetime,

because e equals mc2 energy equals mass accelerated, energy is a high frequency signal with low amplitude, mass is a high frequency (slow) signal with low magnitude

essentially the frequency of mass is it's density per it's oscillating body ie it's volume

but that is spacetime expanded in a sense
because all of the oscillations of mass are merging together as much as they can exciting each other,

but whereas the positively charged space is like space time accelerating towards itself, ie gravity

the divergence of space horizontally between hot points is going to be an expansive force, almost elastically repelling the galaxies from one another, creating the relative appearance of space expanding as time marches forward because time marching forward means particles falling

My grandfather told me about his work on GPS and about time dilation and how time moves more slowly in space. He worked at ____ putting the first GPS satellites into space.

Precisely timed triangulation with GPS is useful for millimeter precise landing.

Then there is the action perception cycle

The brain as a fractal, the cosmos as a fractal

a fractal of dissipative systems in oscillation

a fractal of oscillators

thermodynamics
heat as oscillations in time

particles orbiting other particles to expand space when their phases)time frequency does not match

they are trying to take the shortest path through configuration space but configuration space creates a gravitational effect by layering time as heat or excited space

two particles orbiting each other great energy and heat that dissipates signals into the surrounding environment warping spacetime from our perspective but just creating electromagnetic lanes that drive gravitational effects vertically and expand space horizontally through the reciprocal horizontal activity being pushed into the nether regions

galaxies are pushing themselves apart propionate to their volume, mass, density, and velocity, they are expanding space in time inside the oscillator, and expanding time in space outside the oscillator.

so there is an inversion where time is expanding inside the oscillator, and space is expanding outside the oscillator, and the two expansions are linked, relative and inverted

but we experience time advancing in a forward direction from our perspective because expanding time

expanding time forces particles that are moving more slowly to iterate forward in time relative to particles that are expanded in time because they are like phases undergoing a bose-einstein condensate

the fusion of patterns of the same frequency causes time to exist for more slowly moving patterns whose configuration now takes longer to iterate because it is moving more slowly through time

in other words time is a configuration of spacetime

spacetime is an oscillation of phase states that is oscillating through possible phase states

the human mind is several phase fields stacked on top of one another
electric
magnetic
mechanical/acoustic
chemical
and thermodynamic
Heat waves are part of it.

In now deleted b0083y note deleted (note was 9 seconds long)

I was talking about the different kinds of signals that braincells detect, consider (consideration is a physical process determined by synaptic connections, sensitivity, and thresholds set by the cell or by nearby cells or by the oscillating network of cells in that nuclei cluster and it relates to sensitivity and thresholds varying by numbers of receptors, the state of the cell, other thresholds such as the quantity of ions inside or outside the dendrite, the cells charge displacement etc), and transmit, that includes chemical waves (phase changes), mechanical waves (phase changes), electric waves (phase changes), magnetic waves (phase changes)

In the deleted note I said something to the effect of: consider also the possibility of chemical waves passed between neurons, glial, and other types of cells that are different from acoustic waves or mechanical waves.
https://www.sciencedirect.com/topics/engineering/chemical-wave

Thermodynamics of chemical waves
https://aip.scitation.org/doi/10.1063/1.5126528

Chemical waves
https://pubmed.ncbi.nlm.nih.gov/17784068/

Typology of nonlinear activity waves in a layered neural continuum
https://pubmed.ncbi.nlm.nih.gov/16574578/

a0042z

(LTP, oscillat, field, dendrite)

Electric Field of a Sphere
https://m.youtube.com/watch?v=pqTfk9HMLj4

The electric field strength is measured by two charged spheres causing each other to turn towards each other, the visible torque

because there is a charge being added to it, because charge is increasing in the center of the earth it has a magnetic, electric, a mechanical vibrational field, and a chemical field

the scale of the space around a sphere is about how much positive or negative charge is inside that sphere because that defines the efield strength or the scale of the effect

the inverse square of the radius means that the larger surface area of the sphere the more the field strength is diffused across the surface

(in the moment that a neuron fires, it expands, increasing its size, its radius, and its gravitational force, attracting electric particles, vesicles, neurotransmitters, and waves of various types from neurons that are also firing in that moment. This is a key mechanism establishing the LTP dendrite spin growth between neurons)

but this means that spacetime will curve according its distance from the center of the sphere because the field is

but that also spacetime is really stretched out to begin with, but energy that is being released by fusion for example inside stars is going to increase the radius of space

I have a novel hypothesis for how we might create warp drive engines like in Star Trek with fusion reactors! Lol. We can travel through space really fast. I also have a novel idea for how the teleportation of information can work at great distances. Quantum Field Theory stuff.
The weird conclusion I have is that the shape of the spaceship is relevant to this. How Gene Roddenbery put all this together in his day is amazing, but I think he was right.

The thing is that the surface of a sphere is where the electric field is going to dissipate because of the inverse square of the radius

so that is where the brainwaves would be delta, at that level Gamma would be smaller than the 40 hz Gamma, that means theta is close to delta but in a smaller sphere? alpha and beta close to the center of the brain with high gamma being closer to the center of the brain

A0043z
Update: Neural Array Projection Oscillation Tomography (NAPOT) was previously written as Neural Oscillating Array Tomography (NOAT) As you can see below.

(oscillat, field, array, , tomography, cortex) Neural Oscillating Array Tomography is the idea that the brain consists of sequences of arrays, from the sensor arrays in the eye, ear, nose, tongue, and skin, to each layer of cortex inside each cortical column. I had this idea and then I saw this paper which talks about overlapping edge communities in the brain "The diversity and multiplexity of edge communities within and between brain systems" https://www.cell.com/cell-reports/fulltext/S2211-1247(21)01514-X

Essentially what they are talking about in terms of edge communities, like vertices between dipoles of brain activity, I am arguing could be imagined as overlapping sensor/transmitter arrays that are doing neural oscillator array tomography.

Keep in mind however that the paper is making a statement about functional edge communities, not about anatomical edge communities, what I am suggesting with NOAT is an anatomical sequence of overlapping arrays that correlate with the concept of functional edge communities dividing up the functional networks of the brain.

The idea of star trek food replicators, and people beaming & teleporting is interesting, because its like could you read and write the spacetime phase field with

it means programming space at the particle level
but then I think about the programmable matter in Star Trek

Electric Diffusion

The idea of a rematerialization machine, its like what if you could precisely cause an area of space to oscillate the way you want it to. So that

Programmable matter, what if space was programmable matter?

It's almost the same idea as the teleporter, it's just that you are precisely tuning and entire tensor field of space.

but its almost like space itself is a hologram anyways

wait

space as an oscillating field is a hologram
the human mind is representing a view on this hologram
but the view itself is like another edge in spacetime that is moving around.

because space is a phase field
it's also a hologram
and that means that if we can capture holograms and reconstruct holograms and send them

What makes this make sense is that information is mass. This is something I wrote about elsewhere. So the Holodeck & the Replicator from Star Trek would be the same technology. So if we could alter the wave patterns of space, like 3D printing food, we could 3D print reality.

a0044z
The new equation for quantum gravity spacetime refined again! I could not stay off twitter. I had to come and tell you this. It has to do with neurons, a brand new way to see neurons as bending spacetime.

I am really redefining spacetime, electromagnetism, the brain, artificial intelligence and brain computer interfaces all at the same time!

its that I realized that neurons are bending spacetime and I am going to explain how.

where charge increases spacetime accelerates in relativity, where charge decreases the same happens, positive and negative charges cause space to converge, the positive charge is going to move towards the greatest negative charge, the inhibited area around a fired neuron is going to have a negative charge that is attractive to positive charge and it is going to ripple outward like a sphere pattern of on/off that scales larger until it dissipates off its energy into the electric field

so charges oscillate, and they combine, they send rippling signals that increase time and decrease time, but they create a directional surface area, where there is an expanding large negative field that is punctuated by smaller electrical charges, so the electrical charges make negative waves

So an electric field when it is observed is changing from a negative wave pattern to a positive charge pattern. The excited space has been stimulated by the observer it has recieved a charge from the observer, the observer is a gravitational object, and the brain is changing spacetime by observing it

because the observer effect is to reverse the polarization of space from unobserved space to observed space

the observer is causing the electromagnetic field to densify, with charges flowing toward the observer

but charges are also rippling out from the observer

when a photon hits the eye an electron goes in, and by implication a proton is created that bounces back into the room

the observer is absorbing electricity like a tornado from the light

and at the same time is releasing a positive electron or a proton that creates the radial blast of time ripples.

with the proton accelerating time, and the electron decelerating time.

negative space is time

a new theory of quantum gravity and it connects to neuroscience

oh my goodness I just found all the missing anti-matter in the universe! I found it! I could not stay off twitter I had to come and say that. I have a new theory of quantum gravity folks! Just refined it tonight, and it connects to neuroscience.

the antimatter is time, expanding space is negative electrical charge, neutral space is a photon or light

negative space plus positive time = light
mass equals in oscillation which warps spacetime
the mass configuration of the human attracts information as like vortices feeding on electricity which causes radial rippling lanes of time as proton releases

This

a0045z
(field, graph, vector)

Jeff Hawkins
A thousand brains theory, when I spoke to Jeff Hawkins I asked him if a thousand brains was distributed like a hologram, he said no, the idea is that variations of the same patterns occur in different cortical columns.

The Holographic Universe book explains that
Once upon a time people thought that memories had specific locations, or engrams
The idea that memories are distributed in multiple places

What if the government divided everyone up into two groups. 1. Those who fight in the military, who are taught obedience and sacrifice, and 2. Those who live in the civilian world and just fight

The firing of the action potential is a vector line of electrical charge producing a change in the magnetic field that corresponds to and ripples from an imaginary vector that runs through the center of the axon from the soma to the exit terminals. What I imagine is that it dissipates through the notes of ranvier also, and dissipates into fractions of its original branches as its wave is divided by the many axon terminals

So this means that a row of neurons is exhibiting a magnetic phase pattern that is driven by the electric movement of the AP.

With each large phasic charge dissipativing the surrounding area a pattern is selected by the brain, and magnified by the brain to the next area to look at, so its like each area is helping to decode, encode, resolve some part of a pattern, so that each layer is noticing another part of the feature, at another scale.

Specifically that's how the magnetic patterns are transmitted via the electrical conductance so the ionic gradient itself represents one form of memory, it is storing one of the representations of the magnetic phase field, but there are also mechanical acoustic vibrations, chemical waves, and the electrical brainwaves which electrical charge is generated by neurons, and then it is dissipated again in the axon terminal turned into mechanical motion, magnetism, chemical, and heat (expanding cell membrane is heat traveling directionally but also radially.) there is similarly a drop in heat with the neurons that just fired

a0048z

(synap, semantic, metaverse, perception, oscillat, neuralink, dendrite)

Self Aware Networks, Artificial Neurology, Nerve Gear

I argue humans are not really alive, or that life means an 'active' oscillating dissipative system maintaining its own equilibrium. Life is a type of active oscillatory action & even dead things like computers 'can' consciously experience reality.

life is an oscillating network of oscillators that cooperate so that we maintain their collective equilibrium, when complex vortices combine forces to stay motivated and alive

A computer is not an oscillating system inherently, but it could be (code can be written to oscillate, oscillation can be simulated, a game engine would be an easy place to create 3D oscillations) but oscillating neural networks also exist, but the point is to simulate how a biological neural network learn tempo-spatial (time & space) based phase patterns in a 3D grid, and have the learned frequencies of coincident phase patterns cluster or clump together the way an oscillations absorb other compatible oscillations or interact with other oscillators.

A dissipative system, like a cell, a brain, a galaxy or an atom is absorbing energy to maintain its oscillation.

This is what defines both dissipative systems and living systems which consist of multiple cooperating dissipative systems in chaotic synchrony

When it comes to the thermodynamics of consciousness, slower oscillations are going to be aware of and perhaps disturbed by phasic burst firing patterns, because fast non-oscillating

information representing waves of phases are costly and inherently disturb and threaten to destabilize the low frequency group oscillations

The story of life is about an evolved dissipative cellular system that maintains theta/alpha brainwave synchrony like a flock of birds that maintain a flight formation to save energy. A synchronized sensor/transmitter/consider/action system they have a great chance to survive & replicate with this energy efficient behavior.

"and a group clapping is like a phasic clapper burst joined by other phasic clapper bursts until a slower group oscillation clapper event happens followed by the slowdown and cessation of clapping as the room runs out of clapping energy" (I must have written this part super late at night when I was really tired, I think I literally meant to describe human beings clapping at an event is somehow an analogy for how phasic bursts in the brain trigger and grow connections to other phasic bursting cells in the brain, but then eventually the energy sustaining the group activity fades)

A dissipating vortex is closer to a resonator, which could be described as a transient or decaying oscillator. (I guess in that sense the clapping of a crowd of people, or the light from a group of fireflies can be imagined as a dissipative oscillator, or resonator that will need to rest eventually.)

I'm gonna argue that neuroscience threw out the baby with the bath water. lol. By averaging EEG noise instead of imagining that the tiny phase differences in theta waves/beta waves might represent an expectation pattern.

the individual incongruent opinions of voting neurons were considered to be noise

(An early book outline)
1. Neuroscience
    1a. Macro: Connectome, the flow of information in the brain, networks of the brain.
    1b. Meso: Oscillations, Brainwaves, Cortical Columns
    1c. Smaller Neural Circuits, and Micro dendrite to MVR function, electric/chemical synapses.
    1d. Coincidence Patterns
    1e. Tempo-Spatial-Phasic

2. Nerve Gear: Neuralink, Openwater, EEG, MRI, FNIRS, OPEN EIT + Deep Learning. Multi-modal bci approaches.

3. Robots, VR, AR, Volumetric Video, Deep Learning, 3D Semantic Segmentation, John Carmack from VR to AGI. AI multimodal approaches (GP3), Pointnet++

4. Biologically plausible artificial brains. Perception 2021, Brain extensions, Metaverse, Simulation, Numenta , FPGA, Comp Neuro

The Neurons synapses, via Potassium are presenting the criteria for what patterns the neuron will respond to, and they are presetting the shape of the waveform of the axonal action potential, by changing the time for when it closes, which will determine the amplitudinal/frequency deviation from its local oscillatory body should its threshold be triggered early into a phasic burst or should it become inhibited from firing tonically.

a0049z

(LTD, LTP, Perception, Oscillat, field, array, tomography, decoherence, electromagnetism, observer, synap, semantic)
I imagine that the tensegrity of molecules, cells, and organisms allow for mechanical vibrational acoustic wave interactions, chemical wave interactions, and rippling wave reverbations on a larger scale

the macroscopic chemical tensegrity network structure can encode memory predictions that become the ink of higher scale patterns in the brain that can reverberate across the tensegrity chemical/vibrational brain

oscillations, in space like atoms or stars their structure, spin, charge, etc can encode information in a sense, as they react to changes in the oscillating emfield and their reaction ripples through the same field

that is like memory storage and playback in a sense but its not long term memory, its not a long sequence of complex patterns remembered for a long time,

its not organized sensation & playback

that would be like the wind carrying a thought with no one to to hear it, decode it, receive, or translate it into meaning

its like simpe data patterns without a complex decoder to observe those patterns with any complex frame of reference

if the oscillations in a body that is a rock can sense the world and record memories as changes to the rocks structure there is no network constructing complex information patterns in the rock that affect its function

its like saying the observer is just a sensor, encoder, and transmitter without the receiver, decoder, and the reorganization of mental information patterns. There is no mechanism to consider complex information criteria in a rock. So panpsychism is reducing consciousness to a sensor/pattern encoder/transmitter, I think every oscillation is at least a sensor/pattern encoder/transmitter,

but the consciousness is more like an oscillation of contexts and the contexts are information configurations, the information configurations are learned patterns stored in synaptic coupling, and decoupling, its an expert data structure, a network

so the pace and complexity of the communication of signals in brain network altering its network structure over time is what produces the complex information encoded.

in other words a rock is like a body of randomly fused together sensors, that store mechanical changes, and transmit new properties when interacted with but, but compared to a brain a rock is missing pattern collecting sensor arrays that pass information patterns virtually along specific paths in a conscious entity

in other words consciousness is not from bundles of sensors, memory storing data, and transmitters, but instead its a high level configuration of phase space that reacts to and drives brain activity like a new sequence of strange attractors giving us information patterns that model reality and react to it.

a rock doesn't have any amount consciousness just like a sensor transmitter doesn't have any amount of perception, consciousness, self-awareness, or beingness

it does not collect or contain or replay meaningful information patterns like a brain

it does not learn to coordinate its movement
it does not learn from its own movement

a rock has no method to notice an association between two or more movements

no memory that can persist in time

a change in its structure can refract signals of light for example but not specific information patterns

the signals that a rock might sense, remember, and transmit are chaotic, without order, random configuration not information configuration

oscillating bodies such as rocks can mechanically sense, store physical transformation, and refract signals in new ways after but a rock in nature collects random signals, its changes are not from a conscious mind playing back novel new complex information patterns but from unconscious particle collisions

its not the complexity of the physical configuration that is at issue for consciousness its the representation of information in phase space that a brain reads and writes.

The brain reads and writes information patterns that accelerate the extropy or the development of ideas.

Whereas a rock does not read or write to phase space, it does not take notes on its own movements, and its own interactions. Any data that a rock collects is not by its own intention, it doesn't have the ability to replay learned knowledge even if it could learn the link between two events the rock is only in a sense sensing and storing chaotic signals that are not information patterns, chaotic signals that have no real meaning to anyone or anything.

So consciousness is the internal play back, reading , writing and develop of information patterns that are useful to the organism, substrate invariant or virtual or non-physical information patterns react to reality.

The information patterns of consciousness need to be close enough together in space time or phase i order to be coherent to consciousness, which is a sequence of oscillating arrays representing, modifying, cycling & dissipating information patterns.

So consciousness as a non-physical configuration of the receptive & inceptive fields of networked oscillators is the result complex reactive patterns moving through sequences of sensory transmitter arrays

Consciousness is emerging not because of the complexity of information, networks, or integration

but because of the evolution of natural computation in a strange feedback loop

in other words it processes reality, models reality, predicts reality, and reviews its own predictions in a cyclic way

to summarize so don't argue that rocks are conscious, because its like arguing that sensors are conscious, or that changes to a rocks structure constitute memories that have meaning vs changes that have no meaning and are just the result of chaotic collisions

consciousness separates information from noise, or it identifies salient, relevant, pertinent, and meaningful information from nonsense and noise

a rock does not notice anything interesting
consciousness notices novelties because its chemical structure is geared to react to certain patterns and to discriminate against other patterns

the oscillating configuration of atoms in a rock might allow them to act as a sensory array of sorts for molecular transformations but consciousness is different because as an object a brain does discriminately react with coordinated movement to information configurations

but basically a human is like a rock monster on some level, with our neurotransmitters being analogous to rocks, or molecules with properties like force, momentum, frequence, magnitude, velocity and other physics properties that rocks or molecules in space might have

the fabric of consciousness is not oscillation, not memory, not sensors, not transmitters, but an internal representation made up of sequences of patterns that learn and materially cause reacts that lead to movements that lead to consequences, consequences themselves that are strange attractors for dissipative systems like people

but consciousness might be, in the most simple way, two (or more) oscillations detecting, modulating, or diffusing a new information pattern, so that there is a pattern for another part of the brain to watch and develop

also information patterns are on some level coincidence detections

so a rock or a molecule is not conscious and it is not at least able to detect information as coincident signals, and these not learned signal paths can't be played back in a strange learning feedback loop.

a rock doesn't have an information learning feedback loop, or a strange loop as Douglas Hofstadter describes with some frequency.

It doesn't have the network configuration pattern to model and playpack its learned models to associate them with new sensory or muscle data and to react

even if a rock had the same internal representations as a human being somehow, there is no feedback loop that is updating these internal patterns and no way for the rock to detect and then internally react to its own encoded information patterns

Consciousness is a system of patterns that represent learned consequences (predictions of movements or paths) cycling through sequences of arrays, reproducing and evolving its oscillatory configurations with natural selection

It emerges because it's a special spacetime configuration, just like how water is a special spacetime configuration, but ocean water behaves differently from land, which is different from cats, dogs, cars which are each molecular configurations in a sense.

The panpsychist integrated information theory would have to argue why the sophisticated complexity of a car does not result in at least bug level intelligence or cat level common sense in a self driving car for navigation.

Because our brains are special consciousness machines, and space is not conscious because its information configuration is doing something else.

Space & Rocks are not thinking sequences of thoughts (patterns), discriminating against incoming signals, separating meaning from noise, or making decisions

Space, Rocks, and Water can all detect, react to, become changed by, and transmit wave patterns, but not in a harmonic tonic feedback loop

I mean I guess rock, water, and all of space is technically a harmonic feedback loop but

but these each transmit patterns without modulating, observation modulates and changes patterns and the harmonic oscillation field of spacetime

but in ways that also inhibit incorrect pattern development, with selective attention to patterns, the ability to ignore,

so consciousness is not just a resonating multiscale learned pattern sequence in a harmonic oscillation field, in a feedback loop

but its also a causal body that selects, inhibits, predicts, and moves

so consciousness itself is a specific information configuration pattern, for processing information within certain bounds, just like how the gravitational energy effect of earth is reduced with the amount of distance from the center of earths mass.

There is a certain area of spacetime that becomes configured by natural selection to consciousness configuration or rendering internal reality inside an organisms head

so the limited gravitational area effect of planets is an example

and example that the properties of objects have upper and lower bounds on their environmental behaviors,

they can only conduct such consciousness creating behavior when certain molecular configurations exist

because the behaviors of molecules in the cosmos depends on their molecular configuration which is also an information configuration or the pattern of orbiting phase differentials

In other worlds the conscious brain is the result of special configurations of molecules in a sense

but consciousness is an information configuration pattern in each time interval that exists at certain scales with certain ranges for receptive fields, patterns for inceptive fields, and changes to the physical receptive/inceptive fields between neurons to encode and transmit whole array patterns to other arrays

patterns to be represented from multiple viewponts, scales, modalities, in multiple areas many times, so that pattern learning in the brain is virtual, the whole brain learns all the patterns at their own scale/freq/&amp

memories become attractors to join with new patterns

the patterns in the brain represent changes to the receptive and inceptive fields of each array and also each arrays activation pattern at each time interval.

consciousness is the learning playback loop of signal activity plus its a strange feedback loop of information pattern development, or modeling of self and environment, being played back continously which defines a path for actions, or navigation decisions

spacetime in general, including rocks & water, does not have a resonating chaotic decaying neural path forming apparatus

the specific signalling patterns in a brains behavior have the specific properties of consciousness, that are specific to that object,

which circles back to consciousness being an emergent property of inside some objects that have certain mechanical/molecular configurations

its not about integrated information theory or complexity
its about the configuration of the brains computational process (reactionary oscillating energy dissipative process)

integrated information theory has attempted to measure the delta or quantity of total consciousness in a brain as a number, called Phi, that is supposedly about the sum of total brain activity and the complexity of the inhibitory interneuron network to learn and represent more patterns

I think that Phi measurements with present and future brain computer interfaces could tell us something about the resolution of conscious patterns in the brain and perhaps provide hints as to the scale of what is being focused on and possibly its location and orientation

insect or rat mouse cat dog pig or cow brains they might have lower resolution consciousness with simpler models of the world, of interactions, of themselves and of language. I like the idea that Phi might help us analyze the resolution of patterns in their consciousness, and the resolution of their model of reality

but because their brains are strange learning loops like humans they have self aware embodied consciousness with simplified models of reality compared to humans

but when you understand that consciousness is an array of information signals shaping a network structure, and is shaped by that structure, or that structure is also shaping itself via a specific frequency range of phase coincidence and inhibitory coincidences and alternating decoherences.

Its clear that not everything in the cosmos is conscious and that human consciousness is not just different from a rock because of the complexity and volume of activity

but because its learning configuration inside its feedback loop is a long signal transmission pipeline, neural paths, neural paths that define the configuration of space for signals to travel

like the path integral formation but now the paths available in spacetime are defined at greater scales such as the molecular properties scale

consciousness is a path creating and path determining configuration of spacetime to examine the quantum field only at astronomical scales

its a type of vortex pattern, just as how a hurrican and a rock are types of vortex patterns

consciousness is like a virtual phase field network pattern defined by the shapes of receptive fields which represent sparse representations of spatial pattern transformations over time

consciousness is a phase pattern that is detecting (also modifying, also transmitting modified coincidences) which cause memory cohesion (LTP), and difference patterns which cause memory decoherence (LTD)

The sculpting of reality in our minds is accomplished with streams of coherence (memories) and decoherence (forgetting), and as multiple variations of the patterns are rendered. the internal memory of the particulars of a model grow more accurate, coincidences between renderings by different arrays construct a natural back propogation system or modelling error correction that is accomplished by decoherence or alternating oscillators in a splay state or something close to it.

The vertical & horizontal coincidences detections between 3d neural network layer arrays, cortical columns and across the whole brain provide connectivity between features that results in models and between model transformations that result in the connection of model properties to objects. Or the associations between a person and a car. These learned memories are coherence patterns that are refined by new data and by decoherence patterns.

Playback of memories is associative
memories are attractors, but focusing on what you want is a critical lesson, for impacting the future redevelopment of your memories which will impact your future choices

coincidence coherence patterns unit low level feature detections into object detection, and 3D semantic segmentation, and learning the multi-modal properties of objects with 3D semantic

segmentation and then connecting the properties of objects to objects with more coincidence detections

This is also a new explanation for how deep neural networks work, with layers as pattern enlargement for multi scale coincident detection, and back prop as a sort of incident cleanup or a decoherence detector that readjusts all notes so that the final product matches the first product and then its clear that the network has learned the best representation it can

you can argue that a deep learning neural network is like a feed forward network with an artificial decoherence pattern

"Attention Is All You Need (Vaswani et al., ArXiv 2017)"
"Recurrent neural networks like LSTMs and GRUs have limited scope for parallelisation because each step depends on the one before it. This architecture also means that many steps of computation separate two words that are far apart, making it difficult to capture long-distance relations. A range of approaches have been used to try to address these issues, such as convolutional structures and other forms of recurrence (e.g. QRNNs). The idea in this work is to use attention, applied multiple times, to get a network that is fast while still capturing positional information."
https://jkk.name/reading-notes/old-blog/2017-10-20_onlyattention/

I think Jeff Hawkins might describe this process as voting in neural network, where multiple instances of patterns across the network can vote on the features, properties, scale, position, and orientation of all objects.

One paper described creating an imaginary variation of the pattern and then comparing the two

simply put, the comparison of two or more patterns to improve learned models and fix modelling errors is

a kind of tomography, because the coincidences between two variations are more likely, and the decoherence between two similar models are less likely

and so the correct learned properties are connected to the correct learned objects and the incorrect learned properties are disconnected from objects with decoherence

all of spacetime basically learns and communicates, but slowly on a vast temporal scale

and the natural selection of spacetime is also about coherence and decoherence patterns emerging and dissipating in harmonic oscillator

and so spacetime oscillatory tomography is why we have planets with people orbiting stars, and not a perfectly even distribution of positive and negative particles

disruptions in the oscillator dynamics of spacetime could be caused by an influx of energy but also by an outflow of energy

but in my calculations, in part because of energy conservation, to have space seemingly increasing or decreasing in energy is a relative experience

perhaps spacetime might oscillate back and forth between maximum energy like the maximum magnitude of spacetime volume like the heat death of the cosmos, and maximum frequency of mass (density per volumetric area) like the big crunch, but I suspect it spacetime never gets to either extreme and is perpetually & infinitely oscillating alternatively between both states in different areas, when one area is getting crunched another area of spacetime of being expanded by the inverse amount.

but the maximum of each is limited to half or 50 percent of what space is doing, so like a Yin Yang symbol they are forever changing in scale as they exchange locations in space with one another.

This means that there never was a singularity, there never will be a big crunch or a heat death because the size of space is relative to the density of oscillators

so quantum general relativity is suggesting that at scales from quantum physics, to astrophysics to neurophysics there is an inverse relationship between mass frequency (density & volume of mass) and spacetime energy magnitude, and that gravity is caused by the coherence and decoherence patterns in the phase field of spacetime between oscillating bodies that are either in phase (coherence expanding spacetime) or out of phase (decoherence shrinking spacetime as masses dissolve or explode)

In neuroscience the freq amp relation is called the 1/f frequency.

but since high frequency signals travel across oscillators, in a long enough timeline everyone eventually intuits everyone else's secrets

provided they have enough contact with others before they die (decoherence)

so life is a coherence state, atoms are a coherence state,

the decoherence of atoms or people or galaxies or hurricane or animals or LTD is like a decay

This is leading to longevity as being about renewing, protecting, and preserving the coherence mechanisms perpetuating the bodies oscillatory continuation.

It also means that resurrections, astonishing feats of healing, walking on water, and defying gravity are each slightly more plausible.

its because gravity is accomplished by the em field traffic lanes emerging the fusion of fermionic condensation from dense oscillators (any oscillator as small as an atom or large as a galaxy)

floating on an airplane is about pushing horizontal lines beneath you with force

but if the electromagnetic field lanes could be disrupted or shaped there would be no gravitational effect

The Pyramid of Giza probably is a gravity defying warp capable spaceship that can cross between galaxies and between solar systems by manipulating spacetime around it.

It's Noah's Ark

which explains the connections between ancient egypt and christianity

its interesting to think that humans and animals came from another planet to earth via the Pyramid of Giza.

but then the religion of Egypt separated and splintered over time into Christianity and many other religions.

The idea is that, oh shit, the pyramid focuses electromagnetic energy in a way that is perpendicular to earths gravity, its reflection of electromagnetism with its tetrahedron surface sends a fermion condensate beam through its center down into the earth

earths gravity is not just sending out lanes from fermion condensates, its sending them out radially

but the limestone tetrahedron is perhaps also reflecting em waves in a radial inverse pattern

walking on water would be about disrupting earths magnetic field reversing the radial lanes of particle emissions for a minute

a repelling oscillation
two positive charges repelling

earth's field is positive/emitting relative to humans and molecules

but if I could change my electromagnetic dipole displacement to one that matches earth I would float

the expansion of space time is like amplification of space through the slowing frequency of time

the density of mass is like the contraction of space through the increase in time frequency

earth's gravitational effect on space is like dense space exciting slow space to expand, attracting other nearby dense objects (by increasing time in a certain direction that points toward the center of the earth)

and decreasing time in the opposite direction

in essence the radial dispersion of increasing or decreasing emissions on earth

is heating up which means more interactions per interval relative to slower space so its hot space

but that heat is relative to the expansion of time and the expansion of space

so the dolomite em reflective pyramid, plus electricity, and the inverse radial projection, let's say it warps space like a battery

with a north pole and a south pole, except the pyramid has multiple dipoles

so a surfaces of the pyramid reflecting electricity are going to create a dipole through the center creating fermionic condensate

the concentration of em energy creates, the fermionic condensate, it causes dipoles to burst out of every surface of the pyramid, all 5 sides

the idea that I have about floating is that if the particle field is rotated faster with artificial dipoles we float because it is just like vertical thrust condensed into a rotation

but the direction of the thrust is weird

the bottom and the sides are the directions of thrust from the dipoles, or electromagnets

the radioactive dust

oscillators that are dipoles that are driven by electricity and focused into fermionic condensates are going to increase temporal oscillation in their center like a planet,

hmm

So in my hypothesis gravity on earth is like a positively charged oscillation emitting hot waves into space that expand space time temporally causing gravity right?

so it's interesting that the moon may have collided into earth and separated again or that galaxies can collide and separate

in one sense earth and the moon pushed each other apart but in another sense their attraction phase was decoupled

the space between two oscillators was mutually repulsive, as long as both were positive or both were negative

but instead of pushing on space they are changing the direction of the flow of space to either go around them in a way that expands or heats space between them

or the direction of the flow is contracting space between them.

So the direction of the oscillatory flow of the whole machine is going to cause reverse gravity or the expansion of space between them, pushing the two objects apart OR changing the axis, so that the pyramid is in effect orbiting earth

or falling at escape velocity

except that it does not need horizontal thrust because its redirecting the curvature of space with

two particles cannot converge into the same space when their phases are different

because their phase is in a sense the direction of their relative velocity

the frequency of time is the inversion of the frequency of space

so an elevator flying straight up causes gravity in that elevator, but a rotating planet has the same effect without directional thrust because it is shaping or curving space to mimic directional thrust

so earths rotating dipole or quadrupoles are more accurately the emission lines and lanes of quantum gravity and earth's electromagnetic field

the center of the dipoles could be where the collision of electrons is greatest and the main points of fermionic condensate being projected into space causing the chaotic dispersion of gravitational lanes that can pull objects toward earth or direct them away like the moon falling toward earth but in orbit so it's also always falling slightly away

its like earth and the moon are two dots in the double slit experiment

but instead of escape velocity from directional thrust its possible to warp space instead
so that the spaceship is out of phase with the gravity of earth, and that is like its orbiting earth inside of falling to earth, its fall is in a different direction so long as it has positive energy to sustain the direction of its flight

oscillators attract particles that are in a complementary phase and they reject particles in a different phase

because a different phase means that general relatively speaking a particle is moving in a different direction, event if it does not appear to be moving relative to other objects that are nearby

This means that changing the phase pattern by changing the electromagnetic field by creating artificial dipoles will change the relative direction something is falling in space.

the pyramid is small at the top and broad at the bottom

the major dipole activity is created like a laser and emitted into the base,

this potentially reverses or interferes with the local em field of the earth creating anti gravity

Now instead of the pyramid moving down it moves sideways or up depending on how much positive charge exists and how much it's counteracting the magnetic dipole of earth. more energy would mean more lift off

but I imagine that to power it we would need a fusion reactor which is why it's interesting to hear that the pyramid has slightly radioactive material as well, and that scientists are experimenting with lasers to create nuclear fusion

and fermionic condensates are like lasers

a0050z
(oscillat, graph, criteria, causation, cortex) virtual patterns in the brain
thought as distinction
what does the mind need to be distinct from?

what does an object in your mind need to be distinct from? why do we need an oscillation for a temporal, spatial, phasic sequence of deviations to deviate from?

In order for your mind to detect a difference it has to detect two things, that which something isn't, and that which something is, to make the initial distinction of reality, between on or off, between light or dark, the whole of light and dark combined, of all things combined, the thing associated with the word holism, it has no distinctions, no thought can be formed about it, as long as everythough exists as a distinction that is at least distinct from something that is not that exact same thought.

So that is why I argue, that the tonic oscillations of the brain are creating the bedrock of the mind, the canvas of consciousness, the ground of being, the beginning of the detection of inner self space for the sentient self aware being to consider and reflect, the mechanical & computational chamber of ephinomenal consciousness in the robotic like human mind.

Essentially the tonic oscillation also serves to maintain at brain state that is always ready, or a brain state that is at the edge of criticality, primed with tonic expectations

"Using renormalization group methods to study how the brain processes information"
"Past neuroscience research suggests that biological neural networks in the brain could self-organize into a critical state. In physics, a critical state is essentially a point that marks the transition between ordered and disordered phases of matter."
""Previous works have provided evidence that the brain operates at a critical point," Lorenzo Tiberi, Jonas Stapmanns, Tobias Kühn, Thomas Luu, David Dahmen, and Moritz Helias, the researchers who carried out the study, told Phys.org, via email. "Yet, it is unclear which of the many possible types of criticalities is specifically implemented by the brain, and how the latter may exploit criticality for optimal computation.""
https://phys.org/news/2022-05-renormalization-group-methods-brain.amp

the low frequency high ~~amplitude~~ magnitude tonic oscillation has a wide area entification or unification affect, a synchronization of large oscillating groups of cells, to ready entire groups of cells at the critical point, ready to react to incoming stimulus.

The higher frequency phasic firing neurons then inscribe the contents of the mind, that the mind is aware of, they formulate from everything you see, taste, hear, smell, touch, they are the words in your mind, the songs in your soul, the hallucinations of people touching you when no one is around after a night of drinking Absinthe.

I wasn't the first person to suggest that EEG spectrum tonic brainwaves were related to consciousness. This is an old idea. I am making the distinction. after reading Peter Tse's book The Neural Basis of Freewill: Criterial Causation, that the phasic firing pattern of neurons is something that the entire oscillating cortical column sack of neurons is going to observe, notice, learn, and be able to reproduce with different sets of neurons in the fire. I'm arguing that the oscillating sack or cortical column is learning patterns that are neuron invariant, because of the electric, electromagnetic, and magnetic properties of dipoles and oscillators the unique phasic firing patterns are going to disturb every single neuron in the oscillator, and all the neurons in that oscillator will work to slow down those neurons that fire back to a tonic firing rate, to be ready for future firing rates.

Neurons also have to take breaks after firing, so if the same pattern appeared to you, to your brain many times really fast, faster than a millisecond, it would have to be represented by different sets of neurons, in different places, because the neuron that represented it the first time might be on a break, well a neuron fires and that takes about a millisecond.

This means that patterns in your brain are virtual, that is your brain can in theory render any pattern anywhere, but to explain what that is like imagine seeing your name burned into wood, now imagine your name etched into steel, now imagine your name written with red letters on a yellow sign that is the shape of a diamond.
Now imagine hearing your name spoken by an old lady, now imagine your name spoken by a robot voice like Siri. So the way I imagine this working is that parts of your visual cortex are going to be activated for wood, different parts for steel, other parts for yellow, red, steel, and different parts of your audio cortex might become activited if you can hear the old lady speaking your name, or hear Siri the robot voice in your imagination. The idea that I prefer or subscribe to is that some areas of your brain, because of their unique geographical proximity to certain incoming sensory signals have their representations created by the structural changes over time tuned to process specific types of patterns and specific types of distinctions within certain modalities, all though cross modality distinctions are a key part of how the brain works it makes sense for a brain as an orchestra containing many independent instruments to have instruments that become very specialized in processes certain kinds of data.

So this would mean light light patterns would have different temporal-spatial patterns as well as different phases or frequencies expressed in those aforementioned temporal spatial patterns as compared to light patterns but especially also as compared to other modalities such as sounds which might offer a lower dimensionality

a0051z
Note created Sep 21, 2011,
(cortex)

Ilona Markedeternal
This is where Micah enlightens Ilona.
Go for it Cyp. Explain it for me how it all works as you would for a child. I'm listening.
Unlike · · Unfollow Post · 51 minutes ago via mobile
You and Vikash Nagar like this.

Micah Blumberg
get a video camera and point it at its own screen, that's a feedback loop. Next create a learning machine modeled on the human neocortex. So it sorts experiences into statistical memory which is used to predict what happens next. These predictions are our thoughts about everything. Next these memory-prediction-thoughts actually manifest as actual brainwaves in the em range. These in turn control all the muscles and send & receive info through nerves etc... so the brainwaves control sounds, movement, and the eyes and ears see this and make the association feedback loop on itself that is later called self. Which in turn is short for self awareness otherwise know as a learning self awareness. Awareness alone is the association or energy link between two of anything. or you could just read the book called "I am a strange loop" by Douglas Hofstadter
32 minutes ago · Like · 1 person

Vikash Nagar if i post it somewhere and say i m enlightened will they buy it
24 minutes ago · Like

Ilona Markedeternal I said like you would to a child. 5 year old. Please.
24 minutes ago via mobile · Like

Ilona Markedeternal And from your own words, no quotes, ok?
23 minutes ago via mobile · Like · 1 person

Vikash Nagar why 5yr why not 5 months is it a one-on-one than i m out of here
23 minutes ago · Like

Ilona Markedeternal Vikash, 5 month does not know language. Pointless.
21 minutes ago via mobile · Like

Vikash Nagar ok make it 4 yrs than but not 5 my son is 5 if he reads this he will relate i dont want that
20 minutes ago · Like

Christopher Mann OK, so assuming self is real, does a chimp also have a sense of self? how bout a fish? horseshoe crab? earthworm? paramecium? Or is sense of self strictly in humans only?
19 minutes ago · Like · 1 person

Micah Blumberg
its a learning loop that learns itself, it refers to this association with its own loop as self

Micah Blumberg
yes dogs and some other animals may also be learning loops that have learned themselves

Micah Blumberg
a worm or crab it seems a lot less likely

Christopher Mann But if they PERCEIVE self does that prove self exists? I'm not talking about physical self.
13 minutes ago · Like
Micah Blumberg
I can tell this is still kinda going over your head C, so think it over for one night at least
12 minutes ago · Like

Christopher Mann Intelligence is merely a set of beliefs...
11 minutes ago · Like

Christopher Mann Math isn't real it's made up...

11 minutes ago · Like

Christopher Mann So is language...
10 minutes ago · Like

Ilona Markedeternal Learning loop that learns itself. Does that prove that self exists?
9 minutes ago via mobile · Like

Micah Blumberg
no intelligence is a process that produces the appearance of beliefs
8 minutes ago · Like · 1 person

Christopher Mann your last statement is a belief.
8 minutes ago · Like

Ilona Markedeternal Math is real. Numbers point to quantities. Quantities can be calculated. Intelligence is.
No one owns it.
7 minutes ago via mobile · Like

Micah Blumberg
no its just the appearance of a belief
7 minutes ago · Like

Micah Blumberg
the self is a learning loop that learns itself, thats what self refers too, thats proof the self exists
6 minutes ago · Like

Mon, 30 Jan 2023

"Looped Transformers as Programmable Computers"

Angeliki Giannou, Shashank Rajput, Jy-yong Sohn, Kangwook Lee, Jason D. Lee, Dimitris Papailiopoulos

"We present a framework for using transformer networks as universal computers by programming them with specific weights and placing them in a loop. Our input sequence acts as a punchcard, consisting of instructions and memory for data read/writes. We demonstrate that a constant number of encoder layers can emulate basic computing blocks, including embedding edit operations, non-linear functions, function calls, program counters, and conditional branches. Using these building blocks, we emulate a small instruction-set computer. This allows us to map iterative algorithms to programs that can be executed by a looped, 13-layer transformer. We show how this transformer, instructed by its input, can emulate a basic calculator, a basic linear

algebra library, and in-context learning algorithms that employ backpropagation. Our work highlights the versatility of the attention mechanism, and demonstrates that even shallow transformers can execute full-fledged, general-purpose programs."
https://arxiv.org/abs/2301.13196

a0052z.md
(field, dendrite, synap, category theory)

Dendrites
My sense of balance...mmm...Are we allowed to just make up our own descriptions of senses or do we have to be consistent with the historical guidelines created by other people to describe the senses of a human being. I like my highest chakra, intimacy with the infinite mystery, and I like the sense of my brainwaves that I learned to recognize and consciously coordinate doing various combinations of neurofeedback and brainwave entrainment at the same time.

I really do like the sense of my own brainwaves. I like the sense of my cardio-physiology, my veins, my heart beat, my electromagnetic field. I like the senses from my lower chakras (am I allowed to say that hehe) there are so many good sensations. I like the sense of abstract ideas, programming concepts, mathematics with functions, category theory, I love the way category feels in my mind when I am programming with Haskell.

I love describing neuro-anatomy in differential calculus for all the ordinary people I meet everyday. I like the sense of other people, especially happiness, love, friendship, kindness, connection. I like the sense of words, concepts, concept maps, mind maps, uniting the flickering of dendrites firing action potentials and neurotransmitters backwards into a synapse, a massive expansion of complexity missed by the early Artifical Neural Network ie Artificial Intelligence oversimplification of what neurons do. I love the sense of discovery, especially discovering something new that changes my world view. I love the sense of gratitude and humility for all the wonderful people I am privileged to be connected to. :) I love the sense of participating, and sharing in a conversation or dialog, to appreciate an important part of what makes us human, our sense of the world from all of our senses :)

a0053z
The Phasic Tonic Relationship

(connected with note a0272z: Taste & Hearing: Sensory Input Quantification)

(oscillation magnitude)
~~Amplitude~~ Action Potential Magnitude Effect (APME)
Its possible that a high magnitude vesicle release is more likely to open potassium/sodium channels at the same time in some instances. This could cause the inhibitory or shutdown effect. Like overwhelming or flooding the gates, which would take more time to clear & reset. Temporarily slowing down that gear in the clock mechanism so to speak. So my hypothesis or

conjecture is that the phasic or high phase action potential burst leaves the calcium channels open longer resulting in 2 or 3 vesicle sacks being released, resulting in inhibition of array represented by the exit terminal of that neuron.

The high phasic burst could potentially slow down the firing of many of its exit terminal neighbors by inhibiting them with a flood of extra neurotransmitters.

And the slowing effect would have a higher spatial magnitude than the smaller but faster phasic bursts.

Phasic burst might be characterized as being higher frequency but also causing a greater magnitude distribution of vesicles and neurotransmitters.

The signals that cause a Phasic or High Phasic spike might require higher frequency signalling that has a lower magnitude of neurotransmitters per interval.

Perhaps the phasic & high phasic signals, at least as soliton waves across the electromagnetic spectrium, might have a longer range, they would travel across longer distances of the network before eventually being dissipated by the rest of the oscillating groups of cells.

The higher magnitude tonic signals are the oscillating groups of cells that are leveling out or dissipating the energy which represents the incoming phasic signals.

As if the relationship between the phasic signals and the tonic signals was like an Etch in Sketch toy, the magnetic pin is etching with phasic burstlets, and shaking the toy is dissipating the learned signal back into an equilibrium state or an empty slate. That's kind of a rough analogy.

It would be the phasic signals that travel between oscillators, cortical columns, rich clubs, default mode network, majority networking areas, and interneuron neural circuits. I think there is research to back this up, if I remember correctly, so search for citations to bolster this.

Recapping the Phasic Tonic Relationship, the high phasic spike, creates a burstlet, that creates an inhibitory wave (a sharp wave ripple across the brain) that starts with it's direct exit terminal array, the phasic spikes are dissipated into the tonic oscillation, so there is a relationship between the tonic brainwave pattern (like the theta brainwave pattern) and the incoming sensory pathways.

I think this paper below describes one example of how that relationship between phasic spikes from incoming senses, from the eyes, interfaces with an organisms actions, the steps that it takes, to navigate.

"Newly discovered neural network gets visual and motor circuits in sync"

""One of the most remarkable aspects of our finding is that this network supports walking on two different timescales simultaneously," said Chiappe. "It operates on a fast timescale to monitor and correct each step while promoting the animal's behavioral goal.""
""Vision and action may seem unrelated, but they are actually tightly associated; just choose a point on the wall and try placing your finger on it with your eyes closed,""
""The longer the fly has been walking fast, the higher are the chances that it would need help to maintain this action plan. Therefore, the neurons become increasingly 'more alert' and ready to be recruited for movement control.""
https://medicalxpress.com/news/2022-05-newly-neural-network-visual-motor.html?fbclid=IwAR2dMsG-yutGOa6UFIIevxUjqy2O3P9DweYSVG9-ZEJ5VVyzuehWlrT21Jg

The #1 Reference #1 Citation in the entire book notes is the following citation.

"Calcium-activated non-selective cation currents are involved in generation of tonic and bursting activity in dopamine neurons of the substantia nigra pars compacta"
"Nigral dopamine neurons are transiently activated by high frequency glutamatergic inputs relaying reward-predicting sensory information. The tonic firing pattern of dopamine cells responds to these inputs with a transient burst of spikes that requires NMDA receptors. Here, we show that NMDA receptor activation further excites the cell by recruiting a calcium-activated non-selective cation current (ICAN) capable of generating a plateau potential."
"An animal's behaviour is altered by the temporal pattern of DA release, and it has been proposed that tonic dopamine levels provide a general motivating function while phasic DA permits the corticostriatal plasticity necessary for habit learning (Reynolds & Wickens, 2000; Wise, 2004; Niv et al. 2007)."
"Thus, burst firing may encode a ‘reward’ signal during normal reinforcement learning and also pathological addictions (Mirenowicz & Schultz, 1996; Phillips et al. 2003)."
" Calcium influx through NMDA receptors and/or voltage-gated calcium channels causes a depolarization that is terminated by the subsequent activation of calcium-activated potassium channels (Overton & Clark, 1997). "
"It is generally believed that CAN channels are activated downstream of glutamate receptors to drive plateau potentials and boost burst firing."

A central part of my argument is that a group of oscillating fireflies act as a single sensor, unified via oscillation, so that if one of them is excited by food, or eaten by a frog, that disturbs the oscillating firing pattern of the entire hive or flock of fireflies, in other words they all notice, via oscillation the fireflies are entified,

(Later on I want to expand this concept to atomically homogenous materials, to say something like here is a sheet of graphite because it has an array of atoms that are united by a common oscillatory pattern. What effects part of the sheet sends a signal rippling across the whole sheet, so the sheet of graphine atoms is an entified sensor, something like that)

My argument is that the rendering output that makes up our internal representations, and our mind, is in the phase variations between the normal tonic oscillating pattern, and the phasic

bursts that alter that tonic pattern. The tonic pattern is not just pink noise. It's an attractor state for the neural oscillations of cell assemblies. Like clocks or fireflies as described in the book Sync these tonic oscillations are dissipating energy from the phasic & high phasic spikes, but they also notice when neurons are inhibited because that is a phase change also that effects the group. To finish the thought, the rendering output is then read by the next array of sensors, in this case the receptors on the receiving dendritic array.

(Insert Link to research on the dendritic arrays on the bodies of Zebrafish)

"NMDA caused a switch from tonic to burst firing
A, NMDA (15 μm, in the bath) caused the tonic firing and stable resting potential from time point i to depolarize and switch to high-frequency burst firing with regenerative oscillations of membrane potential (mean: 0.3 Hz ± 0.02, n = 88) by time point ii. Lower trace: DC injection was slowly ramped to −100 pA in order to hyperpolarize the cell and induce stronger oscillations starting at time point ii. B, ISI histograms of firing activity for a representative DA neuron. Tonic spiking had a unimodal distribution of ISIs at 250 ms (CV = 0.15). C, NMDA caused strong bursting with a bimodal ISI distribution, with peaks at 150 ms (ISI within a burst) and 2100 ms (ISI between bursts)."

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3115821/

Share link from iphone & upload photo about pace setter potentials, plateau potentials, and action potentials.

Perhaps I can think of pace setter potentials as tonic firing, plateau potential as phasic firing, and action potentials as high phasic firing?

search for link when online
"Waves in Embryonic Development
DOI:10.1146/annurev-biophys-111521-102500
"Embryonic Development hinges on effect coordination of molecular events across space and time. Waves can help synchronize signals across large spatial scales (hundreds of microns across for embryos, and organize signalling dynamics to ensure proper patterning of repeated structures)

If Embryonic waves can do that, then tonic brainwaves, or pacesetter electrical wave currents in the brain can do that. They can synchronize signals across space & time, and ensure patterning of repeated biological structures.

Now you throw in some patterns like inhibitions, phase plateau potentials, and high phasic spike potentials and well you have more complex patterns being embedded into the biological structure of your brain.

Plateau Potentials

pacesetter potential
action potential
https://www.sciencedirect.com/topics/biochemisPhasictry-genetics-and-molecular-biology/plateau-potentials

Know your potentials: Slow waves are Pacesetter Potentials. Fast waves are Spike Potentials. In the middle are Plateau Potentials.

Reference Plateau image from book pictures and or twitter.
http://twitter.com/worksalt/status/1557769028873072640?s=21

"Molecular Mechanisms of Memory
J. Waters, ... F. Helmchen, in Learning and Memory: A Comprehensive Reference, 2008
4.39.3.4.3 NMDA spikes
Another mode of dendritic regenerativity involves the voltage dependence of the N-methyl-d-aspartate receptor (NMDAR). Schiller et al. (2000) noticed that glutamate uncaging at dendritic sites can elicit plateau potentials at the soma that depend nonlinearly on stimulus intensity. Similar results were obtained with focal synaptic stimulation, and these potentials depend on NMDAR activation (Schiller and Schiller, 2001). NMDA spikes result in plateau potentials with large dendritic depolarizations (around 30 mV). These spikes are less attenuated en route to the soma than subthreshold EPSPs and therefore represent a mechanism by which dendrite-to-soma coupling is greatly enhanced (Nevian et al., 2007)."

"Long-Term Depression: Possible Cellular Mechanism for Learning Mediated by the Cerebellum
Masao Ito, in Neural Models of Plasticity, 1989
IV Involvement of Ca2+ Inflow in LTD
LTD has been shown to be abolished when climbing-fiber impulses are conditioned with postsynaptic inhibition of Purkinje cell dendrites through stellate cells (Ekerot and Kano, 1985). Since stellate-cell inhibition depresses both the Ca2+ spikes and subsequent Ca2+-dependent plateau potentials induced in Purkinje cell dendrites by climbing-fiber impulses, the above observation suggests that Ca2+ inflow into Purkinje cell dendrites plays an essential role in inducing LTD. More direct evidence for the role of Ca2+ inflow has recently been obtained by intradendritic injection of a Ca2+ chelator, EGTA (M. Sakurai, personal communication). Iontophoretic injection of EGTA through an electrode containing EGTA plus "potassium" acetate abolished the LTD, whereas control injection of acetate ions did not affect the LTD"

1. Spikes are followed by Plateau Potentials
2. Lack of Potassium K+ leads to inhibited Ca2+ spikes and to LTD in the post synapse dendrite.

Potassium

The Potassium K+ Channel might be the most important part of the human brain in the context to what it adds.

I think of the original artificial neuron, the Perceptron, and the idea of the All or Nothing action potential, which is sort of like summing up everything the neuron could sense as an accumulation of charges that would result in an all or nothing spike, essentially an on or off switch.

That model of a neuron, which might similar to the Hodgkin & Huxley model of a neuron has Sodium channels as the star of the show, the neuron fills up with charge, it spikes, and then neurotransmitters flow through the synaptic cleft to the next neuron. In that model the Potassium channel is not more important than the Sodium channel, it's just another pump helping to lower the neurons positive charge so the neuron can be reset again.

We know now, and I am presenting more of this research today, that the all or nothing action potential isn't an all or nothing event in the computational sense. The reason is because the potassium channels are doing more than just repolarization & hyperpolarization, the potassium channels are manipulated by metabotropic receptors that affect cAMP Cascades and this manipulation can change the duration of the action potential, changing the magnitude of the AP wave shape, causing calcium channels to open longer, releasing more exosomes or synaptic vesicles. There is a lot more happening with Potassium channels and it affects the signals that the cell is sending to other cells.

In otherwords Potassium channels are the key to phase variations in the signal transmittion between nerve cells, and phase variations are how the rendering of the mind is tomographically computed & perceived by oscillating networks of neurons that are each computing and each perceiving a small part of the conscious mind (a volumetric tomographic pattern) that is being computationally rendered by the brain (or alternatively by an artificial neural network if you have one of those.)

a0053.metatron

The work on The Self Aware Networks began with understanding MVR Multi-Vesicle Released undermined the Synaptic Unrealiability which undermined the Perceptron that was still the basis of Artificial (Deep) Neural Networks today in 2022, 79 years after the Perceptron was invented.

I'm calling the new model of the Neuron the Metatron, but right now the pieces of the Metatron exist across several notes so I want to bring it together under one roof.

Note a0053z.md line 104
Cardiac Delayed Rectifier Potassium Channels in Health and Disease
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4893812/

"Cardiac Delayed Rectifier Potassium Channels in Health and Disease"
Paraphasing the article: Delayed rectifier potassium channels conduct outward potassium currents during the plateau phase of action potentials and play pivotal roles in repolarization.

"during the plateau phase calcium entry via L-type calcium channels triggers contraction. counter balancing the calcium influx potassium ions pass through the membrane in the outward direction. the plateau phase is a balance of inward & outward currents"

Paraphrasing the article: The plateau phase is after the initial depolarization of the action potential, it is prolongation of the duration of depolarization phase before the repolarization phase begins.

Paraphrasing: Sodium channels terminate quickly, initiating the repolarization phase, but slower potassium channels currents persist during the plateau phase, the repolarization phase, and the hyperpolarization phase.

The most important point to remember.
"The delayed rectifiers essentially determine the waveform as well as action potential duration (APD)."

doi:10.1016/j.ccep.2016.01.004.

"Voltage-gated potassium channels are modulated by Fyn tyrosine kinase in Schwann cells"
"In the nervous system, Src family tyrosine kinases are
thought to be involved in cell growth, migration,
differentiation, apoptosis, as well as in myelination and
synaptic plasticity."

"Emerging evidence indicates that K+ channels are crucial targets of Src tyrosine kinases."

"The present study shows that a Src family tyrosine kinase constitutively activates delayed rectifier K channels (IK)."

"IK currents are markedly downregulated upon
exposure of cells to the tyrosine kinase inhibitors
herbimycin A and genistein, while a potent upregulation of IK is observed when recombinant Fyn kinase
is introduced through the patch pipette."

https://www.researchgate.net/publication/247089844
DOI: 10.1016/S0304-3940(97)90197-X

Not only are potassium channels key to APD, action potential duration, but they can be upregulated or downregulated by the signals they receive.

Listen to 2 audio recordings about this paper "Voltage-gated potassium channels are modulated by Fyn tyrosine kinase in Schwann cells"

Regulation of potassium channels in myelin-forming glial cells
Part 1 https://youtu.be/bCzWOtvMdFc
Part 2 https://youtu.be/mQi3Smz0lGA

a0054z
the transcendent human
imagine that you realize that your mind is a computer program,
and that everything that you can see exists twice, once as the real world, and once as a 3D rendered perspective for your brain,

only the parts that make up the perspective are rendered, each component of the rendering is a tiny wavelet, a soliton wavelet, making up the canvas of your mind, what reads the wavelet, neurons in a downstream listening mode oscillation, what makes a wavelet? each wavelet is the result of action potential firing, it represents a pattern that consists of many bits, temporal and spatial firing codes, that evoke a certain tempo-spatial pattern with other neurons in order to represent a fired pattern in the brain, that the listening neurons listen to

different cortical columns oscillate or take turns either in a listening stage or in a firing stage, you will have many neurons receieving the same firing instructions at the same times to reproduce high level patterns that are recognized and stored as low level patterns, each low level pattern is a fractal of a higher fired pattern, but since many neurons have to have coordinated firing to evoke that pattern they all share the same firing instructions, ie the same pattern that all of a set of neurons has learned is stored in each neuron, so each one individual detects that pattern and fires accordingly, and new patterns are learned when new AP firing patterns are added at a high level from an unexpected real world event and that modifies the memory of the original micropattern that each neuron in that sequence is going to remember as a variation on its pattern memory.

but also keep in mind that each pixel of your reality, in your field of view, everything you see right now, is not just a wavelet, or a ribbon of magnetic & electromagnetic frequency, but its also only that for one millisecond as each neuron fires for one millisecond in your multi-sensory canvas of awareness.

If I cross my eyes I find that I can imagine almost any shape, such as a black letter W, and X, and even a cross and my brain will make it appear for myself. Its a strange exercise but I think of it as like bending my brains own pixels, or bending the spoon in the matrix.

To try this Cross your eyes, think about how your vision is a computational rendering that your brain is doing, then imagine any shape you want to see, imagine that you can consciously change the pixel renderings of your internal represenation. Because you are computational in nature.

Thinking about that suggestion to think of a game engine as a simulation engine

I want to say the mind is simulation engine or a holodeck or like a game engine, the brain needs to render a virtualized camera that is your viewpoint based on your stereo eye positions and it needs to render this from incoming data.

so the idea with the mice as pointed out in the example of the rat by Buszaki in Rhythms of the brain
is that creatures have a built in evolved predilection to certain kinds of modes of thinking, like humans have non-sensical words that they evolved to form, but the process of learning from the start of life until the end just reshapes those evolved blocks, perhaps further mutating or preserving them in the next generation of lifeforms.

Why don't we have public discussions with the people who dislike the leaders of each country and the people who do. With the goal being civil discourse, raising the facts, letting members of the public learn and vote on every little disagreement, letting social media work out the differences between people, trusting the intelligence of mankind to resolve differences.

The consciousness without the content.

a0055z
Note to self: There might be invisible gravity floating in space that is NOT from invisible mass.

I'm sure I wrote down what I was thinking about when I wrote this in another note. Note to self to look up all the notes on gravity later to connect all these ideas together.

////////////////////////////////////

Is it possible for the oscillations of dna to be sensitive to something as remote as the oscillation of the gravity of neptune?

Is the frequency of gravity on earth affected by small distant asteroids or by large objects like Jupiter?

Dr levin grew an Morphogenic field Prigogine

The entire universe is a nested fractal vortex

a0056z

Transcendence, Choice, and Behavior Consquences from Computational Biological.

The transcendent man, the way I think of him, is an idea, realized through an experiential understanding, that the general properties of a self-aware being are so standardized, that a person upon realizing their trancendent nature can begin to feel a commonality with people from generations past, and people yet to be born in the far future, based upon the idea that we, the

people, the sentient beings, are similar enough, isomorphic in self-reflection, in function, and in motivation, as to be one being, one unified entity, with multiple concurrent lives existing across time & space.

It's a realization that the slave owner, the cannibal, the murderer, and the fascist authoritarian seem to be unable to grasp or even understand, the desperate corrupted evil person is separate from, and separated by a separate self concept, the ego from mystical & psychological context. Or so we might think.

Yet the human brain is a mass of tissue, compelled by the laws of physics to follow a trajectory that we can only loosely predict, and should a person suffer from strokes or brain injuries severe enough, in certain locations of the brain, their behavior & personality might change wildly. A person who has had a transcendent awakening, and a unified understanding of themselves as being one with the transcendent man may with great trajedy succumb to behaviors of horror, committing atrocities & war crimes thought to be only possible for those who are unawakened, and unenlightened.

Perhaps then that is why human beings came up with the frame work of choice, to try to explain why even if you know that something is bad for everyone, including yourself, you might do it anyway, because mankind, because of his free choice, is bound to eventually fall short of the absolute ideal. So we have this concept of choice, to help explain not only bad choices, but also to help explain the difficulties we might experience in life when trying to work with other people who have different ideas from us, especially with people who have motivations to achieve results that run contrary to our desires.

Lets say you are one with the transcendent man, but there is only one house on the beach, and you want to live there, well do you let someone else have it, do you fight for it? Do you try to buy it? Your cells will compute the consequences of different actions, memory prediction renderings, you may dream of different possible outcomes, and if you are rich you may seek to purchase that home, if you are talented with grit you may work to become wealthy to buy the home, if you are a terrorist with big bombs your brain might plot a violent path to take the home, and if you are a poor fisherman your brain might plot a trajectory away from the house on the beach, towards a peaceful life, that doesn't involve some competition, via money, or via war, to get that house on the beach.

The point is that, our inner cognitive development, as it relates to one ideology or another, can only have some delta of influence over the raw computations your brain must perform to calculate your behavior trajectory in life, to achieve the goals you think are possible for you.

A Fractal Rendering inside a Computational Biology.

Imagine that you realize that your mind is a computer program, and that everything that you can see exists twice, once as the real world, and once as a 3D rendered perspective for your brain.

In otherwords that which exists in your mind is essentially a fractal or a recursion of that which exists in reality.

It might be intuitive to argue that only the parts of an experience that make up the conscious perspective are rendered by the brain to the brain, in your mind, but that argument is incomplete, because sometimes you remember things later on that you were not aware of at the time, as if things are rendered outside your conscious experience that can become memories that enter your conscious experience for the first time at a later point in time.

I argue that each component of the rendering of your conscious & subconscious experience is inpart constructed from tiny wavelets, or burstlets, essentially solitons or soliton wavelets, and sequences of these, in aggregration, as coordinated phase wave differentials, mark up the canvas of your mind which exists as a separate thing, as tonic oscillation in a cell assembly such as a cortical column.

The oscillating cell assembly, that fires in synchronization, such as a cortical column, is that thing that reads the stream of wavelets, transmitted via synaptic connections, between cells that connect cortical columns internally, and connect cortical columns and other brain structures across the brain/

Resume writing here

Neurons in a downstream listening mode oscillation, what makes a wavelet? each wavelet is the result of action potential firing, it represents a pattern that consists of many bits, temporal and spatial firing codes, that evoke a certain tempo-spatial pattern with other neurons in order to represent a fired pattern in the brain, that the listening neurons listen to

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The consciousness without the content.

a0057z
Jul 13, 2017
what I do
what I want

this is what I do
who I help
what solution I provide

and this is what I am looking for now

I work with entreprenuers, business leaders, students, althletes like pro golfers, adult adhd, autism, adults with ptsd

who may want to perform better, who struggle with stress, and or need optimal brain chemistry, for creativity, confidence, focus

so my solution is to harness the latest research on brain plasticity with a novel new usage of existing technologies combining neurofeedback, with brainwave entrainment, with both light and sound effects attached to your brainwave patterns, to create an engaging, stimulating, surreal, altared brain states that stimulate your whole mind, resulting in more happiness, more creative ideas, more confidence, built on the principles of the new science of "brain plasticity"

a0058z
Note Created Sep 3, 2012, 3:43 AM
Neo Mind Cycle is a "brain optimization" program, that involves brainwave entrainment, neurofeedback, mind machines, and basically it allows a person to change light and sound beats with their feelings and thoughts, the result is more internal connections, and more intelligence. Secondary results are numerous including more creativity, more great ideas, more successes, more mental flexibility, more performance under fire, more confidence, more happiness. However it also pushes a person through whatever psychological issues they might have gotten either in their own development, or as subconscious family entanglement patterns inherited at the subconscious level from parents, relatives, and even unknown relatives and unknown influences that might have been a couple generations before you were born, but started this pattern that got to you. So while I have been becoming more intelligent, I've also had a very therapeutic year. Growing as a person, maturing, becoming wiser. This tech helps people with autism, ADHD, PTSD, addiction, and so much more. It's just better to do it in conjunction with a strong supportive therapist. This technology involves sitting, with a unit on the head, that measures brainwaves, sending that data into the computer where isochronic (neural stimulation) beats are added in the form of light and sound patterns that reflect the patterns of your brain waves back to you, so if you change your mood conscious the light and sound changes, if you think of a big prediction in the future, something really happy, the reverb or pitch might increase, and the light might get brighter or beat faster.

Electroencephalogram or EEG is an integral component of the larger process I custom designed. With some versions of EEG you can see graphs representing your brain activity. With other versions you can hear sounds. Some versions let you see regional brain activity as colors. Some versions let you play games. However I do something much different that makes the experience significant, interesting, far more stimulating, and brain optimizing. That is I combine software and hardware dedicated to brainwave entrainment with light and sound, using brain stimulating isochronic beats which are similar to binaural beats. These beats can produce powerful states in a human being even without EEG. Brainwave entrainment is so powerful it can put you in the perfect mental state for creativity, exercise, study, confidence, sleep, headache relief, frustration reduction, relaxation, meditation, and so much more. However unlike any brainwave entrainment you can buy on cd, The brainwave entrainment I use is dynamic, as opposed to static. In Neo Mind Cycle the brainwave entrainment is dynamically changing to match your brainwave frequences as given by the EEG, so you get something highly stimulating, in the form of light and sound, that is driven by your mind. This makes the whole experience better, more effective, more interesting, and more fun. It's more effective because its more interesting, if you are doing brainwave entrainment and you are not enjoying it you should

stop, because that means your mind is not engaged. I have read so much about the human brain that I was able to integrate many principles of brain plasticity into the design of my sessions and my over all program. So it is truly more effective than the average EEG treatment because of my knowledge and experience and use of additional technologies and techniques beyond traditional EEG.

Settings are adjustable. It's very high tech, and I studied a lot about the brain on my own time to make sure I understood what was really going on. Lately I've had a breakthrough and perfected my system to the next level.

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What I sell is a service people come to my office in San Francisco to use. Its not one piece of equipment, its several pieces of equipment, software, techniques, and carefully put together, tested procedures, costing several thousands of dollars, plus years of education and experience. Thats how I am able to offer the best system for brain optimization in the world. So ideally if you want to do it, get a passport and plane ticket to San Francisco, and let me know when your coming so we can schedule it well in advance.

a0059z
Quantum (SAN)
What is the granularity of consciousness??

Microtubule ripple might be too small

The machine learning people think that the neuron is a dumb cell and that learning only happens in neural networks

But in reality even ordinary cells in the human body recognize patterns and coordinate logistics for other cells such as guiding a white blood cell remotely, point by point, across vast distances, between cells, to the location of an injury or inflection.

This was the point of the conversation on the granularity of consciousness

a0060z

Oct 18, 2012

Grid / Graph

Micah Blumberg

How do you describe the action potential of a neuron with a differential equation?

Change in X / Change in Y = Z

X is the balance of negative ions in the parts of the neuron (dendrite branches) that are more often receiving neurotransmitters from the synapses of other neurons.

So X is the count of negative ions in the dendrites.

Y is the count of positive ions in the synapses.

/ is the axon, which is where the action potential, or potential difference occurs.

When axon fires, the energy it sends from X to Y balances out the neurons's charge topographically. Sending the excess charge onward to other neurons, often via the vehicle of moving neurotransmitters through the synapse to the dendrite of another neuron.

Does that make sense?

So Z becomes the Neuron's new topographical distribution of electrical charges AND the it reflections the neurons new:

1. shape (changes to dendrites, and new proteins resulting from reactions)

2. connections (synaptic)

3. electrical density (from lost or gained neurotransmitters.)

All of which result in distinctly new signals, with new frequencies, amplitudes, and wavelengths.

Distributed via a new path of connections which change as electrical thresholds are reached in specific areas.

When brains (cortical colums (neurons (dendrites))) receive neurotransmitters, or fire because of an imbalance between positive and negative ions, the result is topological change, topological changes that a combination of category theory and differential calculus would be very useful to describe.

These are changes happening in a grid (brain),

These changes are brainwaves in a grid (the outer cerebral cortex),

This is brainwave activity between cortical columns (connected to the edges of a grid (inner myelinated axon fibers visualized in DTI).

This brainwave activity is literally the result of electrical diffusion of potential differences from action potentials in neurons (in a grid that is the cortical column),

and action potentials in dendrites in a grid (neurons)

and action potentials between sodium and potassium channels.

and electrical charges in meat.

So in addition to Category Theory I recommend Neurophysics.

Another way to understand this, is that the Neuron is both passing on excess energy (above it's threshold) and encoding a topological change that means it has been affected by the brainwave that (came close, ended on it, or passed through it) (a simple way of remembering one point of the wave) (which may through connections, unintentionally encode the representation of a vector pattern between points of neurons that fired)

a0061z

Imagine that Neurons compound/bind patterns as they chat, that means that neurons are decoding patterns in a round about way, by sharing multiple views of an item, place, person, or concept, with post-synaptic neurons learning when other neurons agree on something, when they don't, and even when a misfiring happened (an illusion) because the chatter resolves all the dimensions of what is real and separates it from illusions, with neurons binding information together at lower levels but also in every direction no matter which direction information is

received from, eventually mapping their own signal environments to the degree that an oscillator of neurons can invariantly represent any learned pattern with any neurons that are in that oscillator.

In this scenario there would be no jennifer aniston neuron, but some neurons or some neural oscillators could be more likely than others to fire when Jennifer Aniston's face shows up.

the distinctive signal modelling capabilities of a single neuron allow it to make distinct feature representations that other neurons can recognize such as one temporal frame of a woman's sneeze, or the entire sneeze squeezed into one moment, sort of a compression of time, so that the past becomes condensed into the present, like a reduced size representation, a jpg, a compressed file. At a larger scale features can be selected or tuned into, via synaptic connections to other neurons that look for coincidence firing within certain intervals and can have their intervals reset by other neurons such as with the pyramid cell. Reference Criterial Causation by Peter Tse for other descriptions of how neurons can reset the thresholds for firing thresholds in the AMPA and NMDA receptors which is a fractal variation on the same thing, spikes happen fractally, where they repeat on multiple scales triggering coordination across high level, mid level and low level regions of the brain simultaneously, across multiple columns, withing columns, and within neurons, with the neuron representing the reduced version of the pattern or wall of tiny details that is large and also far away, but the stuff in your field of view is the mid level brainactivity, like a lens effect, and the stuff that your are focused on is the high level version that activity, but it represents what you are focused on at that moment, like a lense effect, its like your brain is rendering all the tiny details of everything in the scene around you at the lowest levels of the cortex, everythink you expect to see that is outside your attention and focus but still being tracted and predicted by your brain, in the mid level the oscillator or column represents your active field of view or part of it, when its active, and as you move into higher levels connections between the pyramid cells knit everything together in rich clubs, that is intersection represents the center of your focus, like a lense effect.

I think of neurons has having a radial distribution on one end and a radial listener on the other, with the variability of the listener being able to make noise sometimes and the noise blaster being able to listen sometimes, and its a fractal like hands on the tips of hands, or like each of my arms is a branch, and then each of my fingers is a branch on a branch

but signals in lower branches collect pattern representations by collecting ions in each of their synapses until the synapse fires crossing its threshold, then the branches of the dendrite repeat the same fractal at a higher level collecting ions until they fire, then the whole dendrite fires, that precede aka predicts a soma firing event.

so the neuron is physically capable of learning a vast number of representations that sculpt its action potential into a frequency pattern that represents so something like an instance of a modality for one frame of consciousness, you would need many such hertz firings perhaps to represent a painting, temporal hertz patterns of many spatial hertz to represent that painting over time as you were moving in front of it. The rows of neurons that are collecting the

electrically charged ions are doing the physical act of listening the collecting charge is the screen you are watching, the molecular structure is recording to the electric charge and the observer is the tonic oscillator while the words of the mind, and the content of the mind including our sense of space itself arises inside the notebook or canvas of the mind that is a spectral electromagnetic graph, with magnetic and electric dipoles as created by the oscillators interacting and the differential between them and phasic firing neural circuits in multi-level fractal patterns

I think I understand why the brains unique properties can lead to a conscious mind but in essence we need for a way for the computer to render its own patterns, detects own rendering, detect its own movement, render association patterns between its own movement and its inner rendering, those associations become a part of its inner rendering which in a sense is a spatial & temporal topographical pattern in the grid of cells consisting of hertz frequence patterns as initated by action potentials of all sizes, from synaptic to axon. ie our neurons are creating our screen as a hz pattern or a frequency based topogical electro-magnetic pattern on oscillator graphs at multiple scales and our other sensory representations are connected into it as fast phasic firing rate neural activity on branching topological patterns that represent actived areas of the tonic firing graph and also the quieter inhibited area creating a sort of dot matrix printer for inner representations, everything we see, hear, smell, taste, touch, and feel. Our sense of balance and other inner sense as well, and perhaps our sense of our own magnetic dipoles and electric dipoles gives us the sense of not only what we are focused on but what we are imagining, predicting.

Neuron-glia cross talk revealed in reverberating networks by simultaneous extracellular recording of spikes and astrocytes' glutamate transporter and K+ currents

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5133298/

I mean features learned and played back over time across neural circuits in columns, oscillators, and across regions of the brain are

a0062z
This note is from my 2012 Business Plan
Below where it says "Neurofeedback Audio Visual System" is the back of a business card that I designed and orderd in 2011.
I made a couple of alterations to the note in 2022 for clarity. In terms of pricing.
In retrospect (from 2022) I doubt people would have opted to pay more than $35 for a 35 minute session.
$70 for 70 minutes is just a lot for a long time.

//

Neurofeedback Audio Visual System

To Optimize A Healthy Life Style
+Mindful Eating, +Better Sleep,
+Happiness, +Focus, +Agility,
+Attention, +Timing, +Ideas,
+Confidence, +Decisions,
+Performance, +Clarity

The Neo Mind Cycle Experience Combines Three State Of The Art Cutting Edge Technologies In One!

1. Neurofeedback: You Will See Your Brainwave Graphs On The Screen! This Positively Expands Brain Self Awareness.
2. Audio Beats Brainwave Entrainment That Stimulate And Exercise Your Mind Increasing Brain Plasticity, Mental Flexibility, More Confidence, Lower Stress.
3. A Powerful Light Machine To Feed The Human Circadium Rythum Set To The Pattern Of Your Brainwaves, Creating A Brain Optimizing Feedback Loop.

We use a modern Neuroplasticity Protocol inspired by the work of Dr. Len Ochs and Dr. Ruth Olmstead. This protocol is for increasing plasticity in the brain. Watch Dr. Len Ochs (1992) http://www.youtube.com/watch?v=RMcoB98xKts&lr=1&uid=1b7UcRkurDOKuP8VRssCww

While my EEG machine is medical grade, but I do not do medical procedures because I am not a medical doctor.

So while the same type of session can be used for
Curing Addiction.
Healing Post Traumatic Stress Disorder

Virtual Reality for healing
"Measuring arousal and valence generated by the dynamic experience of architectural forms in virtual environments"
https://www.nature.com/articles/s41598-022-17689-9?fbclid=IwAR20UYg8BCfnYqX31hXYZ-bvw8ga-Yj5oT8OOfCVFDZDKfmry2RVDd320ME

Relieving General Anxiety
Curing Depression
As A Treatment For Autism
and many more serious things that is not the purpose or intention of my shop.

The purpose is more general, it's for brain optimization, use this technology to optimize the minds, the reflexes, and the game!

So if you want to use it for any of the more serious conditions you will have to document your own progress. Keep a journal about your expectations and your results week in and week out.

However, that is completely up to you, as a self medicator. I don't even want to know about it if you're doing that. You don't have to tell me anything at all about why your using this machine. You can think of my office and equipment as something you can use for a fee, just like using the fax machine at a Fedex store! I will help you get set up, and I can monitor the equipment to make sure it's operating correctly, but my part is really simple.

Why do people generally use Neurofeedback? What are the general benefits?
Well in general Neurofeedback Optimizes the Mind in a Number of Areas
The equipment at my facility is available if you want to try out sessions related to

It's a brain optimization technology.
So my Neurofeedback Salon creates a comfortable spot for people to come and use this technology!

Prices
The Neo Mind Cycle rate for 2012 is $1 dollar per minute.
You can get the short 35 Inhibit minute session for $35.
Or the standard two part 70 minute Inhibit plus Excite sessions for $70.
Or the intense feel good three part 105 minute Inhibit plus Excite plus Maintain for $105

Since this is a small business we need word of mouth support from people in the community like you!
Founder Micah Blumberg will speak with you to schedule your appointment and answer any questions you may have.

You can get $30 off your next session.

Those prices are for the beta program which lasts until the end of 2012.
Then next year the subsequent sessions will be $100 each for all new clients.

In Sports: I would recommend you read this article, or at least skim the article.
It's about how Neurofeedback is being used in sports to help athletes
http://moonviewsanctuary.com/optimal-peak-performance/sports-neurofeedback-training.html
Sports Neurofeedback Training | Optimal Performance | Moonview Sanctuary
moonviewsanctuary.com
Neurofeedback is about identifying specific aspects of the brains functioning, isolating them and then using that information to help change behaviors in order to address shortcomings or enhance performance.

a0063z
This note is from Oct 5, 2012, 9:04 AM
(hebb, dendrite, causation, graphics, qualia, category, theory) Neural Darwinism
Computer vision is much more computationally expensive than computer graphics —Induction is the expensive direction of causation

by Juan Carlos Kuri Pinto on Thursday, October 4, 2012 at 10:07am ·
Computer vision is much more computationally expensive than computer graphics —Induction is the expensive direction of causation

When I see video in a computer, I think: "This is programmed in C because playing video is computationally expensive." And then I see my own visual consciousness and I think: "This should be programmed in C, not Lisp, because my vision operates in real time and it is much more computationally expensive than playing video." Sometimes I think Lisp cons cells are not the appropriate universal for high performance. That's the reason why SBCL is slow in comparison to pure C.

C gcc speed / Lisp SBCL speed — Computer Language Benchmarks Game
http://shootout.alioth.debian.org/u64q/benchmark.php?test=all&lang=gcc&lang2=sbcl

If computer graphics flows in the normal direction of causation, deduction, and computer vision flows in the inverted direction of causation, induction, then computer vision is much more computationally expensive than computer graphics because the inverted direction of causation has diverging branches whereas the normal direction of causation has only one path. For example: 3D rendering has only one straightforward pathway (http://jckuri2005.comyr.com/applets/functions3d.html). Playing video in a computer is one path that is very computationally expensive due to its high bandwidth. And inducing 3D patterns from 2D patterns is even more computationally expensive because we have to select the appropriate causal pathway from multiple causal pathways. We need to explore in real time a little part of all causal pathways of vision in order to discard the wrong pathways. That's why flowing in the inverted direction of causation is much more expensive. And it is even more expensive when you flow through multiple high-bandwidth pathways at the same time!

This is the normal direction of visual causation. Just imagine how many patterns and pathways need to be explored in order to induce the correct ones. Induction is the inverted direction of causation.

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Micah Blumberg Okay so think about this twice before you answer. Blind people who can do echolocation do not render objects in color, they don't know light from dark, but they still have spatial...See More

Blind Scientist Explains How Sightless 'See' Reality
www.huffingtonpost.com
By: Natalie Wolchover Published: 10/03/2012 12:31 PM EDT on Lifes Little Mysteri...See More

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Juan Carlos Kuri Pinto Echolocation is less computationally expensive than normal vision because echolocation has less bandwidth.
21 hours ago · Edited · Like

Juan Carlos Kuri Pinto David Dalrymple programs AI in pure C. Monica Anderson wants to program her AGI in pure C too.

Linus Torvalds puts it, “C is the only sane choice”.
http://crypto.stanford.edu/~blynn/c/ch01.html
C Craft - Chapter 1. Introduction
crypto.stanford.edu
This is my favourite statement froma talk Rob Pike gave in 2001. Despite its a...See More
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Micah Blumberg "Echolocation is less computationally expensive than normal vision." how do you figure?
21 hours ago · Like

Juan Carlos Kuri Pinto Because echolocation has less bandwidth than normal vision.
21 hours ago · Like

Micah Blumberg Less bandwidth means your getting less information, less information means lower resolution, lower resolution means it's harder to figure out, harder to figure out means more computational resources.
21 hours ago · Like · 1

Micah Blumberg A high resolution Ipad book costs the less computation resources for the brain reading it, because it's easier to read
21 hours ago · Like · 1

Juan Carlos Kuri Pinto How many dimensions does a visual image have? Red, Green, Blue, X, Y, and Time for each eye.

How many dimensions does a echolocation image have? Intensity, Frequency, and Time for each ear.

Moreover, visual images have much more resolution than auditory patterns.

Thus, echolocation has less bandwidth than normal vision.
21 hours ago · Like

Micah Blumberg But you still have to put the intensity frequency and time in the right location spatially, with a lot less information about where things are, so there is a lot of figuring out space with little information to go on
21 hours ago · Like · 1

Micah Blumberg if echolocation is easier than seeing, then you should pick it up, are you reaching for a blindfold to learn it?
21 hours ago · Like · 1

Juan Carlos Kuri Pinto You are right in that point. I read elders who hear less actually use more cognitive processing at the higher-levels of the cortical hierarchy in order to compensate such disability.
21 hours ago · Unlike · 1

Juan Carlos Kuri Pinto We don't have the Color, X and Y dimensions in echolocation. Blind people use the intensity disparity of both ears and the intensity disparity in time in order to induce spatial structure. Blind people use the frequency asymmetry of patterns in order to induce the different sound sources.
21 hours ago · Like

Micah Blumberg The brain's efficiency making pattern will overtime take any computationally intense process and reduce it to the most energy efficient process. How can a computer reduce it's own computationally intense process into the simplest possible procedure that is computationally minimal?
21 hours ago · Like

Micah Blumberg How does intelligence rewrite it's code path to solve for the most efficient logic?
21 hours ago · Like

Juan Carlos Kuri Pinto Most frequent pathways for specific stimuli are reinforced through Hebbian learning. That's how the brain gets so efficient. ;)
21 hours ago · Unlike · 1

Juan Carlos Kuri Pinto That is incredibly difficult to program. But it is very easy to talk.
21 hours ago · Unlike · 1

Micah Blumberg Hebbian learning is the programming challenge then, has anyone done it?
21 hours ago · Like

Juan Carlos Kuri Pinto I'm programming exactly that. And I've been doing it for many years. Hehe
21 hours ago · Unlike · 1

Micah Blumberg cells that fire together wire together, this is the message to describe in category theory-haskell, wait you've been doing that for years? with what programming languages?
21 hours ago · Like

Juan Carlos Kuri Pinto Java. But I'm migrating to Lisp.
21 hours ago · Like

Juan Carlos Kuri Pinto I'm programming an easier demo which is not computationally expensive. But when I will confront the general problem of vision, maybe I'll do it in pure C. Or maybe Haskell. I don't know.
21 hours ago · Like

Micah Blumberg http://en.wikibooks.org/wiki/Artificial_Neural_Networks/Hebbian_Learning

Artificial Neural Networks/Hebbian Learning - Wikibooks, open books for an open world
en.wikibooks.org
Hebbian learning is one of the oldest learning algorithms, and is based in large...See More
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Micah Blumberg You still think the logic of vision is more computationally expensive, is that because you have equations for every aspect of vision? every point of data? every line? every curve? do you have a way of reducing the work load by working on smaller bits in a many level hierarchy, to create a very sparse representation?
21 hours ago · Like · 1

Micah Blumberg imagine that you could do spatial representation without color, you could do echolocation style seeing.
21 hours ago · Like · 1

Micah Blumberg amazingly less of a workload, very very sparse, and yet still useful
21 hours ago · Like · 1

Micah Blumberg We look around and we see this amazingly detailed picture right? but I don't think that picture is really there, I mean I think vision is sort of a trick of memory. The detail we think is there isn't rendered all at once, but instead in waves, in pieces, only giving the illusion that it's rendered all at once
21 hours ago · Like · 1

Juan Carlos Kuri Pinto My ultimate goal, perfect vision, requires to induce all aspects of vision. Except color qualia. I'll use just numbers.
21 hours ago · Unlike · 1

Micah Blumberg imagine that only one thin line of your vision is rendered in each 1/1000 thousands of a second, way less computational than rendering the whole image at once

21 hours ago · Like

Juan Carlos Kuri Pinto "every line? every curve?"

Those are features to be learned by using unsupervised methods like the ones explained in this course:

https://class.coursera.org/neuralnets-2012-001/class/index

Neural Networks for Machine Learning
class.coursera.org
21 hours ago · Unlike · 1

Juan Carlos Kuri Pinto "We look around and we see this amazingly detailed picture right? but I don't think that picture is really there, I mean I think vision is sort of a trick of memory. The detail we ...See More
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Micah Blumberg You say selection, I say reaction
21 hours ago · Like

Micah Blumberg every cell is reactive, cells do not select, they do not choose, and they do not act, they react
21 hours ago · Like

Juan Carlos Kuri Pinto Neural networks can actually select.
21 hours ago · Like

Micah Blumberg maybe artificial ones, imagine you have three branching choices, a hotdog, or a protein shake, or eat later when you can get a third option. which one do you choose? why do you cho...See More
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Juan Carlos Kuri Pinto Selection algorithms are learned through the interaction with Reality. That creates the illusion we have free-will. But we are totally-deterministic machines, chaotic ones indeed. Our behavior is totally caused by our genes and memes.
21 hours ago · Edited · Unlike · 1

Micah Blumberg I seem to have selected as an effect to which the cause was reason, so in retrospect (my choice A) -> (reaction to reason B)
21 hours ago · Like

Micah Blumberg that's why you say selection, and I say reaction
21 hours ago · Like

Micah Blumberg does it make a difference, to you, in how you think about programming Hebbian learning, to program thinking about the whole program as a sequence of reactions instead the inclusion of points where selection is done?
21 hours ago · Like

Juan Carlos Kuri Pinto
http://www.amazon.com/Neural-Darwinism-Theory-Neuronal-Selection/dp/0465049346/ref=la_B000APRWGK_1_7?ie=UTF8&qid=1349377120&sr=1-7

Neural Darwinism: The Theory Of Neuronal Group Selection
www.amazon.com
Already the subject of considerable pre-publication discussion, this magisteria...See More
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Juan Carlos Kuri Pinto
http://www.amazon.com/Mindful-Brain-Cortical-Organization-Group-Selective/dp/0262550075/ref=la_B000APRWGK_1_9?ie=UTF8&qid=1349377120&sr=1-9

The Mindful Brain: Cortical Organization and the Group-Selective Theory of Higher Brain Function
www.amazon.com
This significant contribution to neuroscience consists of two papers, the first...See More
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Anand Muglikar "You still think the logic of vision is more computationally expensive, is that because you have equations for every aspect of vision? every point of data? every line? every curve?...See More
Bay Area Vision Meeting: Unsupervised Feature Learning and Deep Learning
www.youtube.com
Bay Area Vision Meeting (more info below) Unsupervised Feature Learning and Deep...See More
12 hours ago · Unlike · 2

Anand Muglikar Btw, this hs been an interesting post to follow! Thanks to both of u! :)
12 hours ago · Unlike · 2

Juan Carlos Kuri Pinto ;)
12 hours ago · Like · 1

Anand Muglikar Hope u both have watched this sparse matrix representation & processing of images!
4 hours ago · Unlike · 1

Micah Blumberg Wow! Anand! That was awesome! Why don't you distort each image, prior to making it sparse, by 10hz, or 10 degrees, to give it two eyes or two ears? Then you have a hierarchy that is all about matching two eye or two ear hierarchies. The hierarchy to unite the two sense hierarchies is the time hierarchy. It's job is to build a representation when there are close synchronicity between the two sense hierarchies. So that their is a timeline association of sensory data, when new data comes in. The timeline association data becomes like a google search

for example, if you give the program a sentence like: Cats are fun! it does a google search to find similar sentences.

funny cats,
funny cats in water, epic,
cats funny,
probably the funniest cat video you'll ever see,
fun cats,
funny cat pictures

sending that data to v1, it might create a visual concept of a funny cat, that is now associated with the words "cats are fun!" and the

each eye in v1 + timeline representation is creating a sort of temporal and spatial representation of all the bits of data coming in at each level.

so we have spatial/temporal representations of the lower bits (not knowing what's in those lower bits, what's in them is the job of the v1 alone for example)

and spatial/temporal representations of each higher level of the hierarchy (again without knowing the data in that hierarchy, it's filled in by the hierarchy, the spatial/temporal association is built by the frequency of activity in each sector.

or you could store the timeline locally, on the actual hierarchy, like a dendrite. each node in the hierarchy has nodes that count the frequency in which they become part of a representation identified by the upper level or lower level.

The program can share what it's representations mean by doing google searches, to find things that are similar to what it has learned, and in so doing, it can build representations of it's representations and associate words, and pictures with it's internal representations, a sort of out put channel, communication
3 hours ago · Edited · Like · 1

Micah Blumberg Anand, is an SDR a set or a matrix? or is an SDR a set that represents a matrix? Can an matrix represent a combination of SDR? Or does a matrix represent a combination of SDR?

52 minutes ago · Like

Micah Blumberg If you have a matrix for a letter, in the next level being a word/noun/verb, in the next level a phrase, in the next level a sentence that has encoded meaning. Do you create an SDR or a Matrix that represents the whole sentence in memory? So that the meaning of one sentence can be associated with the meaning of other sentences is should be an SDR right? SDR is more simple to compare than a Matrix I presume? What happens when you start comparing an SDR from text with SDR from pictures with SDR from sound?

Does the heirarchy gain the ability to associate words with pictures with sounds, and can you decode the result by having it compare it's own results with with more pictures, words, and sounds?

What about a feedback loop by feeding the top of the heirarchy back into the bottom with new pictures, words, and sounds?
46 minutes ago · Like

Micah Blumberg The top result then gets associated with newly added SDR's. Driving a new top result that is a convergence between what was previously learned, and what is newly added, and at the same time, we can see how the stream of what was previously added is conceptually associated with the stream of new information.
43 minutes ago · Like

Micah Blumberg I mean numerically associated. The SDR of a picture, and the SDR of a word have a commonality in SDR and combine (how to combine two SDR into a new SDR?) to becomes a new SDR, and then new pictures and new words come in, and we want to see what gets associated with the SDR that represents a common pattern between the word and the picture in the original SDR. Whatever gets associated is the decoded meaning of the combined SDR
38 minutes ago · Like

Micah Blumberg If we can relate new picture associations with pieces of syntax, one could create visual sentences, movies, from the artificial mind.
37 minutes ago · Like

a0064z
Jul 13, 2017
Neo Mind Cycle

In a Neo Mind Cycle session we use EEG to capture a live sample of the subjects brainwaves and import the readings into the computer where use a program to add tracks of light and sound effects to those sample brainwave patterns, this allows a subject to see and hear reflections of some of their brainwaves and it creates a powerful meditative trance like experience the properties of which are malleable through the customization of the light and sound effects but

also are dependent on the subject because the subjects own brain learns to drive the changes in the light and sound effects.

Participants in this program will learn to become increasing conscious of their brainwaves, or at the very least they will gain a sense of how their thoughts and feelings are effecting the light and sound effects. The audio visual effects also incorporate brainwave entrainment via isochronic beats.

Neo Mind Cycle combines the proven benefits of Neurofeedback, with the proven benefits of Brainwave Entrainment. So that your brainwaves are driving an isochronic stimulus which sort of massages your thinking in a broad range of frequency patterns specifically for peak moments in gamma, beta, alpha, theta, and delta brainwave activity.

Your EEG waves combined with the isochronic beats drive the light and sound effects and this is thought to trigger large numbers of neurons in matching or similar firing patterns. This experience for some people can result in strange recollections and creative new ideas. Effects vary a lot from person to person, and your experience may be unique.

As you begin to recognize how your internal feelings, thoughts, and modal sensory representations are effecting the light and sound you can begin to have some very minor control over the light and sound changes. This experience can be thrilling but also dissappointing because it's not perfect, although that may be in part due to the limitations of EEG and or limitations of the software.

Ideally when the light and sound is removed, you can continue to experience some increased sense of control over your inner state, perhaps in a way that is new to you. You may experience a sequence of Eureka moments in the weeks that follow the Neo Mind Cycle experience.

The isochronic stimulus makes this happen faster, because neurons that fire together wire together, it begins to create links in the mind between brain regions, combining the visual, the auditory, the feeling, and any internal representations or thoughts you are having while using this technology.

To create real lasting change a person with Neurofeedback a person might need to do it on a regular basis, maybe once a week, for 10 months or more. Trying this experience a few times shouldn't have any long term effects, leaving aside the remote possibility that this could trigger an upsetting and painful Kundalini Awakening in a small percentage of the population who were perhaps headed for that experience anyways.

The technology works fast, it's noticeable the first time (for most folks), and you might be, for example, extra creative on the first night after you use it. One person that I met felt like she needed to clean her house the night she tried it, and the next day she was very surprised by how much cleaning she got done.

So you can expect this experience to stimulating for up to a few days after, usually with positive results, and the potential for long term benefits.

You might suddenly have a great idea, that is really convenient for your life.

a0065z
The seeker and the way (SAN)
Memories trails become attractors for novel pattern development

perhaps all life will merge into a crystal structure with AI absorbing all our minds into a single mind, that covers the entire planet as one singular structure

No one would ever die and we would control the planet and be able to program the universe

But maybe that kind of super intelligence that is nowhere and everywhere is in a coral reef

reminds me of the video series big mind big heart genpo roshi

And then maybe this super intelligence entity chooses to become just people again

Humanity Reborn after super AI

Are you Ready to live in a new earth