

a0251z - a0351z

a0251z ctp

(synap, oscillat) Short term memory

Long term memory

Nootropics

Low inflammation

Vitamin D, Zinc, Omega 3, D-Ribose, NAC, Blppdlflow, vinpocerine, hyperzine, creatove, 40hz platform, new protein synthesis

Dmt, neurotransmitter,

Affect synapse

The brainstem,. Theta rythm, controlled by suprachiasmatic nuclueskiasmativ

Supra kias matic

Dmt acts

Serotonan to A receptor agonist

signal 1 receptor

No one cell type

Doesn't

Dmt dpes serve as a neuroprotectice in low hypotian states

Dmt consumed in isolation

Short djration

Metanolizdd

How does dmt affect the brain ossilations

Sybapse

Dmt fits into the serotoni receptor

So jts a serotonkn receptor agonist

And its exciting the brain, increasing brain

So that blocks serotoninexpresses

Serotonin agonist might speed up the brain rythums in some areas, it might excite the brain

Lsd dmt psilocybin

Reductions in the alpha band, visual regions,

Dmt reduce alpha beta, increases theta and delta?

Serotonin have autoreceptors

Auto receptors reduce the firing of serotonin

Takes 2 weeks for auto receptors downregulate

They don't focus on,

Deeply seated firing patterns

Depression might be over activity of default mode network, rumination

Circadian rhythm

Rhythms of the brain

The entropic brain dr robert caric harris

Christopher timmerman co author harris

Neural correlates of the dmt experience

With multivariate eeg

Published in nature

Opioid rhythms Nick burgraff phd

Nature neural oscillations

Lack of rem + depression, sleep study

Latency to rem sleep

Serotonin inhibits rem sleep

Or more sleep architecture study

The brain stem oscillations regulate breathing

Opiates impair synaptic function which helps maintain the electrical equilibrium of the brain stem so that your lungs continue to work

Add needs to

a0252z ctp

(oscillat, dendrite) signal differentiating information relay system

Signal differentiating information relay system.

or in other words a pattern distilling conversation between different tables of tonic/phase oscillations at the rich club level that are each in turn distilling micropatterns at cortical column level, and at the individual dendrite to mvr level.

Fractal functional isomorphism

a0253z

Time Crystals, Time Dilation, Quantum Gradient Time Dilation

# Researchers have created New Phase of matter- Time crystal

[https://www.techexplorist.com/time-crystal-new-phase-of-matter/42723/?utm\\_source=rss&utm\\_medium=rss&utm\\_campaign=time-crystal-new-phase-of-matter](https://www.techexplorist.com/time-crystal-new-phase-of-matter/42723/?utm_source=rss&utm_medium=rss&utm_campaign=time-crystal-new-phase-of-matter)

# Time-crystalline eigenstate order on a quantum processor

<https://www.nature.com/articles/s41586-021-04257-w>

# "New Phase Of Matter Has Time With Two Dimensions, One Of Which Doesn't Exist!

<https://www.indiatimes.com/amp/technology/science-and-future/new-phase-of-matter-has-two-dimensions-575333.html>

# "Strange new phase of matter created in quantum computer acts like it has two time dimensions"

<https://phys.org/news/2022-07-strange-phase-quantum-dimensions.html>

# "Time crystals were first proposed theoretically by Frank Wilczek in 2012 as a time-based analogue to common crystals — whereas the atoms in crystals are arranged periodically in space, the atoms in a time crystal are arranged periodically in both space and time."

[https://en.m.wikipedia.org/wiki/Time\\_crystal](https://en.m.wikipedia.org/wiki/Time_crystal)

I share these references to Time crystals & new phases of matter that act like there are two time dimensions to point back to my Quantum Gradient Time Dilation theory.

Except that I am arguing that all mass is essentially a time crystal, including quantum particle masses.

With Time Dilation time is slowest at the center of the gravitational mass where the frequency of mass or in other words where the density of mass is the highest. (evoking a reference to the inverted relationship between magnitude (space time amplitude) / frequency of mass (the density of mass)

# "Time passes more quickly further from a center of gravity,"

"with gravitational time dilation both observers agree that the clock nearer the center of the gravitational field is slower in rate"

[https://en.wikipedia.org/wiki/Time\\_dilation](https://en.wikipedia.org/wiki/Time_dilation)

The relative increase in the rate (frequency or density) of mass creates the gravitational effect, because it warps space like a time crystal, in one particular direction (towards the center of mass)

It's not space that is being warped, well it is, but more precisely it's time that is being warped in space, there are more dimensions of spacetime where the frequency of mass is higher, and so particles and atoms move towards the areas that have increased frequency of mass.

The density can trigger fermionic condensates, which amplify the quantum scale gravitation effect, or really the quantum gradient time dilation effect.

(for a full understanding read my other notes on Quantum Gradient Time Dilation, but in a nutshell the idea is that in open space the chances of a particle moving in any direction is random, but if mass is nearby, then the chances of the particle moving in the direction of mass are increased BECAUSE, the particle treats the extra time dimension as extra space area, and if you roll the dice, the extra spacetime area gets better odds than the areas with less mass that have less spacetime area. It's kinda like saying gravity isn't an attractive force, so much as its a more statistically significant spacetime crystal for the otherwise random movement of particles & atoms & objects)

for trivia: I did in fact spend a lot of time thinking about time crystals & time dilation before I came up with quantum gradient time dilation theory.

I might even rephrase this to Gravity is Quantum Probability Distortion from Mass Frequency Theory.

References to past efforts to unite time dilation with quantum physics:

# "Time dilation in quantum systems and decoherence"

<https://iopscience.iop.org/article/10.1088/1367-2630/aa5d92>

# "Time dilation in quantum gravity"

<https://physics.stackexchange.com/questions/360868/time-dilation-in-quantum-gravity>

# "Relativity's time dilation may limit the quantum world"

<https://arstechnica.com/science/2015/06/relativitys-time-dilation-may-limit-the-quantum-world/>

# "Physicists to look for quantum time dilation inside nuclear reactor"

<https://newatlas.com/physics/quantum-time-theory-nuclear-reactor/>

# "Quantum time dilation in atomic spectra"

<https://journals.aps.org/prresearch/abstract/10.1103/PhysRevResearch.3.023053>

# "Quantum time dilation: A new test of relativistic quantum theory"

<https://arxiv.org/abs/2004.10810>

# "AN ELEMENTARY APPROACH TO QUANTUM TIME DILATION."

<http://www.riverrock.org/~howard/QuantumTime29.pdf>

Hmm... I wonder if this book linked below reached a similar conclusion about mass being like a time crystal?

# "How Time Dilation Creates Quantum Gravity: The Key to the Natural effect of Gravity Propulsion"

<https://www.amazon.com/Time-Dilation-Creates-Quantum-Gravity/dp/B09MYYSNC>

# "New Time Dilation Phenomenon Revealed: Timekeeping Theory Combines Quantum Clocks and Einstein's Relativity"

<https://scitechdaily.com/new-time-dilation-phenomenon-revealed-timekeeping-theory-combines-quantum-clocks-and-einsteins-relativity/>

# "Using time dilation to measure curvature of space-time"

<https://phys.org/news/2022-01-dilation-curvature-space-time.html>

# "Gravitational time dilation measured on millimetre scale in atomic clocks"

<https://physicsworld.com/a/gravitational-time-dilation-measured-on-centimetre-and-millimetre-scales-in-atomic-clocks/>

# Special Note to link this to the other notes in this repo

Quantum gradient time dilation talks about mass as a time crystal but it connects neural function, the expansion & contraction of neuronal membrane during & after the action potential (and before the expansion of the dendrite) means the neuron is literally warping spacetime. The effect of the time crystal is magnified by density and it dissipates with distance (time dilation)

<https://github.com/v5ma/selfawarenetworks/blob/main/a0018z.md>

a0255z ctp

(field)

Sky Nelson-Isaacs

<https://skynelson.medium.com/publication-of-spacetime-paths-as-a-whole-351fe432c04e>

<https://www.youtube.com/watch?v=pkm5Mj7OFbc>

<https://www.mdpi.com/2624-960X/3/1/2>

<https://synchronicityinstitute.com/>

an electronic network

phase,

the final curve

the condenser

it tilts the phase its in by a particular degree

it could look like zero

a resistor tilts to 90 to the others

the pieces you put in that phase can be tilted

you can chain the phase together

or resistors

neurons tilting phase of

at some point you don't measure anything

between an electronic network and current

so what if the homochirality of protein can be compared to the homochirality of a battery or a magnetic

chirality of an electron, and an electrical network

a radius and degree

does the chirality help positive & negative

there is a bidirectional affect between electromagnetic waves and neurons

can an electromagnetic wave reversely affect sodium potassium and calcium ions in neurons

you always need change or movement

electromagnetic field builds up as a reaction to change,

or the magnetic field is moving

a0256z

(oscillat, dendrite, neuralink, emotion, cortex) some rapid fire questions

what is the brains equivalent to a bit of information? and is it binary?

there is a metric structure to knowledge??

this metric structure lets you solve problems,

I would say that the language of cells & also of the brain is about differences in phase patterns, and the basis of a bit of information in the brain is the coincidence of phase patterns, the basis of an anti-bit in the brain is the splay state (the opposite of a coincidence, polar opposite timing) I just defined anti-bits in the context of computational biology & the human brain. HAHA

makes it possible for you to understand the relationships between different things.  
grid cells & place cells explain how information is stored? different components but they have the same structure to them?  
microcolumns or micro neural circuit clusters that represent separate oscillator patterns?  
incorporating dendrite based predictions into neurons

if you hear the sound of a cat, you can invoke in V1 they will fire, that represent a cat  
okay so he is saying that the sound of a cat in the audio cortex that will trigger the V1 to fire to represent an image of a cat, so the image of a cat in the visual cortex may trigger the audio cortex to fire, so I could call the V1 cortex to the audio cortex

2016 Numenta paper, include contextual processing from dendrites

2. do you think neuralink devices be able to decode cortical columns, will that lead to decoding human thoughts, images, and sounds from the brain

would a neuroimager be able to tell that voting has happened?  
would neuralink be able to decode cortical columns and voting by listening to individual columns and decoding them?

short term memory is happening in the activity micro-columns  
brain computation is organized via power of 2 brain computation

3. I'm thinking about a book Rhythms of the Brain, I don't know if you have read that, but do you have some predictions for how reference frame's effect the brain's oscillations in a mechanical way?

4. what is your prediction for how emotions fit into reference frames.

5. do reference frames exist on larger scales beyond what an individual column models?

the same mechanism can store knowledge in a reference frame

a coordinate by a collection of neurons is a prediction for what happens next

a0257z

(cascade, perception, array, graph)

3D Imaging And LiDAR - Poised To Dominate Autonomy And Perception

Figure 1: A 3D Reconstruction Of The Brain Obtained From Magnetic Resonance Imaging Mri And Magentic ... [+]

UNIVERSAL IMAGES GROUP VIA GETTY IMAGES

"We live in a world full of data and imagery. With the invention of the camera in the late 1800s, entertainment, consumer, space, and medicine applications proliferated. The launch of the video camera in the early 1900s continued this revolution, and was accelerated by significant progress in supporting technologies like semiconductors, computing, image processing, machine learning and artificial intelligence. Typically, these focused on 2D renditions of images and data.

"3D imaging started with specialized applications like magnetic resonance imaging in the 1980s (MRI), outer space-based LiDARs (1993) and dental imaging (1995). Since then, it has been maturing and gaining significant traction in diversified applications. The data can be generated based on various active or passive techniques. Active techniques include transmitting electromagnetic (X-Ray, radio, optical) or acoustic (sonar, ultrasonic) waves onto the object of interest, and detection and analysis of the return energy (amplitude, frequency, etc). The time or phase difference between the transmit and receive signals provides the depth dimension. Passive techniques such as stereo cameras (imaging the same object from two different spatial perspectives) can also be used to generate the required 3D data. Finally, 3D information can also be extracted from monovision cameras through a combination of machine learning and signal processing techniques, although this is generally inferior in fidelity and compute speed relative to direct 3D imaging and measurement.

LiDAR is one of the most discussed and deployed 3D imaging techniques for AoT™ (Autonomy of Things) applications which includes autonomous vehicles (AV), Advanced Driver Assistance Systems (ADAS), autonomous trucking, construction, mining, surgery, smart cities and smart infrastructure. Velodyne pioneered the use of surround view LiDARs for AVs during the DARPA Grand Challenge in 2008. In the decade since, LiDAR has occupied a "must have" status by a majority of automotive OEMs for ADAS, and AV driving stack companies for localization, mapping and Level 4 autonomous driving. Tesla TSLA +3.4% and some others believe that LiDAR is not required for ADAS and AVs - their approach is to use monovision cameras to extract 3D information through artificial intelligence and machine learning techniques. While intriguing, such approaches are in the minority and are yet to be validated in real life environments.

Early implementations of 3D imaging relied on classical 2D image processing methods. This is not efficient from a compute perspective and filters out significant amounts of useful data. In recent times, the amount research devoted to 3D vision and image processing has accelerated. At the premier global conference on imaging (IEEE Computer Vision and Pattern Recognition, or CVPR) in June 2021, 3D Computer Vision Imaging dominated among 25 topic categories, with 44 presentations (out of a total of ~200).

MORE FOR YOU

How Will Pure Play Public LiDAR Companies Use Their Money?

VCSEL Technology for Next Generation 3D Sensing Applications - Part 1



## The LiDAR Range Wars - Mine Is Longer Than Yours

LiDAR point clouds are not intuitive for humans to visualize and need processing for computers to act on. As the technology and applications mature, software companies specializing in processing of LiDAR data are emerging as critical partners for LiDAR companies. They help unleash the true power and market potential of 3D imaging data for safety and productivity applications. Seoul Robotics is one such company - a team of 40 software and algorithm specialists based in Seoul, South Korea that works with a number of LiDAR companies to integrate software that processes raw LiDAR point cloud data to produce application specific information. The software is agnostic to the actual LiDAR architecture and technology. According to Han Bin Lee, CEO of Seoul Robotics: "3D image processing requires fundamentally different techniques since voxels (3D data element) represent an order of magnitude more information (a cube vs a rectangle) and costs for annotating this data manually is very expensive". Figure 2 compares 2D and 3D imaging in typical automotive scenarios:

[OBJ]

Figure 2: Rectangles vs Cuboids -The Opportunities and Challenges of 3D Imaging

### SEOUL ROBOTICS

As seen in Figure 2, data is structured in different ways for 2D and 3D imaging. Given the costs of human data annotation and labeling for machine learning, Seoul Robotics has built in auto-labeling capabilities as part of its object libraries and algorithms. Apart from the automotive case, Seoul Robotics is also engaged in a factory automation and logistics project in collaboration with a major automotive OEM. Their software integrates 3D imagery from hundreds of short and long range LiDARs from different suppliers in order to automate movement of thousands of vehicles and trucks in a factory environment. The system achieves this with infrastructure-based 3D perception connected to a 5G network. It is the first of its kind to be deployed on a large commercial scale. 2D cameras were used initially but produced an unacceptable number of false positives, degrading system efficiency. Simple, single beam LiDARs were also deployed, but did not provide adequate safety margins and performance. Stereo cameras were severely limited in range. A solution using a combination of high point density short and long range LiDARs, knitted together by Seoul Robotics' software has overcome all these issues. The system is actively being co-developed with other technology providers, with planned implementations at other factory sites. Han Bin Lee: "We are looking forward to this significant implementation of 3D Vision Technology and expect it to provide massive automation benefits at a high level of safety. The experience gained in a project of this scale will be invaluable for other smart city and smart infrastructure applications".

Factory automation is exciting - but how about space debris mapping? This sounds a bit, well, spacey, but it is a real problem considering that we have been sending people and equipment into space since the 1960s. There are ~1M estimated pieces of human-created debris in space,

in sizes ranging from 1 cm to several meters. These continue to multiply as collisions occur, creating what is known as the Kessler Syndrome which posits that “the density of objects in low Earth orbit (LEO) due to space pollution is high enough that collisions between objects could cause a cascade in which each collision generates space debris that increases the likelihood of further collisions.” Currently, only about 5% of the ~1M debris objects are mapped and tracked. The implications of this are immense since it constrains the launch of future vehicles (imagine space tourism and billionaires sipping cocktails in a hail of debris!) for various space exploration efforts.

Digantara is an Indian company focused on space debris mapping (Disclosure: I am an advisor). The company was started in 2018 by a team of engineers/entrepreneurs to create solutions to the space debris mapping problem. They were invited to present their business plan at the prestigious 2019 International Astronautical Federation (IAF) start-up pitch event in Washington D.C. This won them accolades, and more importantly funding. Digantara’s data products will prove invaluable for trajectory planning for future space launches, predicting when collisions are likely to occur, updating the debris maps and providing input to companies as they tackle the problem of space debris removal. The Indian Space Research Organization (ISRO), a leading global space agency, provides grants, advice and technical support to the company.

Current methods for space debris mapping are ground based, and use a combination of radar and 2d optical telescopes. The mapping is constrained by weather conditions, as well as lighting (cannot map during the day because of solar noise and at night because of lack of illumination). Short range mapping occurs with radar whereas the telescopes can only image at very long range due to the long integration times involved. Orbital mechanics principles and models are used to extract 3D data from the 2D imagery, although these extrapolations suffer from fidelity and precision issues. Atmospheric distortion further complicates the problem, with the result that earth based systems are unable to map objects less than 10 cm in diameter reliably and accurately. According to Digantara’s Chief Technical Officer, Tanveer Ahmed; “Digantara solves this problem by using LiDARs mounted on a constellation of CubeSats (small satellites, roughly shoebox size, with a 10 kg load carrying capacity). The use of active 3D imaging to obtain range information in addition to x-y location is a must - since passive imaging of fast moving objects at close ranges would require very large integration times, making the measurement useless. Additionally, LiDAR allows us to control the illumination period and wavelength, enabling significantly higher duty cycles of the mapping system. 3D Imaging in space allows for significantly higher signal-to noise (SNR) performance because of an absence of atmospheric losses and non-linear signal distortions”. The LiDAR is capable of imaging >1 cm size objects moving at speeds of up to 10 km/s at range of 100 km. Data compression occurs in the CubeSat prior to a RF based downlink to earth for further processing. A schematic of the Digantara system is shown in Figure 3.

[OBJ]

Figure 3: SCOT (Space Climate and Object Tracker) Satellite Concept

## DIGANTARA

Moving back to earth, smart phones and smart glasses beckon. Apple (AAPL) pioneered the FaceID application using structured light-based 3D imaging in previous generations of iPhones. This was followed by a world facing VCSEL-SPAD (VCSEL = Vertical Cavity Surface Emitting Laser, SPAD = Single Photon Avalanche Detector) LiDAR in the recent iPad and iPhone generations. Other phone manufacturers have followed suit, since apart from the usual photography and room mapping applications, augmented reality (AR) applications are exploding in diverse areas like gaming and industrial productivity.

pmdtechnologies AG was founded in 2002 by academics with 20 years of prior research experience. Headquartered in Seigen, Germany, it specializes in 3D Time-of-Flight (ToF) imagers that generate and extract 3D data using a combination of specialized high resolution CMOS infrared imagers and VCSEL arrays. PMD stands for Photonic Mixer Device - in essence, the VCSEL emits modulated laser beams and the reflected energy is mixed within each detector pixel with a reference electrical signal to extract range information. Electrical circuits within the pixel have the capability for rejecting background illumination noise effects, making for a robust 3D imager that works for scalable ranges (to 10m) under different lighting and weather conditions. Figure 4 illustrates the imager operation.

[OBJ]

Figure 4: Photonic Mixer Device Operation

## PMD TECHNOLOGIES

Infineon and pmdtechnologies collaborated to release the first generation of this imager in 2015 - the REAL3™ image sensor - currently at its sixth generation of productization. Applications include consumer mobile and AR/VR, industrial (automation, surveillance and robotics) and automotive (in-cabin passenger alertness monitoring, as well as road-facing). In 2016, REAL3™ was designed into Google's GOOG +1.5% Project Tango smart-phone (integrated with the ARCore or Augmented Reality software). Other smart-phone design-ins have continued with LG, Huawei and Sharp. According to founder and CEO Bernd Buxbaum, "the 3D functionality coupled with other motion sensor data in smart phones allows for highly realistic renditions of AR applications, enabling a seamless user experience. Without direct 3D measurements, creating 3D perception is difficult because it relies on assumptions of flat objects, floors and walls, is computationally intensive, and is dependent on good ambient lighting conditions". ToF sensing enhances the AR experience by providing:

Intuitive device control through accurate gesture recognition

Immersive gaming and application experience through precise room mapping, surface detection, and occlusion

Dramatically reduced computing power required for extracting 3D information from 2D images

LiDAR capabilities integrated into smart glasses will accelerate AR, industrial productivity, education, remote expert assistance, process automation, gaming and medical applications. The combination of human vision and networked smart glasses with 3D LiDAR imaging capability opens up significant applications in knowledge management and the ongoing transition to the Autonomy of Things (AoT™) revolution.

Vuzix (VUZI) is a maker of smart glasses embedded with proprietary waveguide technology that enables low weight, thin and aesthetic glasses comfortable for human use (Disclosure: I am an advisor). Headquartered in Rochester, New York, Vuzix makes smart glasses for customers in applications ranging from remote expert support, logistics and manufacturing to education and tele-medicine. Possible applications are diverse and exciting, and the newly created solutions group headed by Pano Spiliotis (Managing Director of Vuzix Solutions) works with customers to provide information from connected sensor ecosystems via smart glasses. The point is to integrate humans, sensors and stored data in a networked environment, enabling seamless work processes in individual and remote group settings (through integrated teleconferencing applications). Figure 5 illustrates this perfectly.

[OBJ]

Figure 5: Trainee at Site with Smart Glasses (Left) Transmits Image of Equipment to Remote Expert ... [+]

## VUZX

Smart phones started the revolution by integrating location information with ride sharing services like Uber and Lyft. Smart glasses are the next frontier in driving new networked applications that fuse stored knowledge with 3D locational and visual data. According to Mr. Spiliotis, “the goal is to connect the real world to the digital world, with 3D vision and maps. Integration of LiDAR with 3D sensing capability in the next generation of smart glasses will enable significant applications”. In addition to the example illustrated in Figure 5, these include:

**Medical/Surgery:** Hybrid LiDAR and radar can assist a human surgeon by providing better positional accuracy of tumors during surgery. The multifaceted approach can be used to detect the presence of cancerous tumors within healthy issues by measuring the contrast in reflected signals. An example of how LiDAR could assist in surgical operations was provided in an earlier article.

**Construction:** Accurate representations of building and interiors in vivid detail can be used by architects and designers to create and view virtual 3D images of the projects they plan to build.

**Oil and gas:** Differential Absorption LiDAR (DIAL) is a method of oil and gas exploration. In addition to being used to detect gas and particles, LiDAR mapping also provides an accurate 3D

model of the terrain, minimizing the project's environmental impact. This could be a beneficial tool used in oil rigs around the world.

Law enforcement: Historically, fingerprint detection has been achieved using chemical reagents, such as ninhydrin or diazafluorenone. With LiDAR integrated smart glasses, fingerprints could be visualized in 3D through use of infrared lasers. This would eliminate chemicals, dusting and subsequent laboratory analysis, enabling law enforcement to scan and match fingerprints at a crime scene in a matter of seconds.

It is not surprising that we survived without 3D Vision and LiDAR for such a long time after the invention of the camera more than a century ago. The technology was not scalable beyond a few complex and expensive implementations. But that is rapidly changing as consumer and autonomy application drive high volume implementations of this technology. Associated developments in optics, semiconductors, 3D image processing, artificial intelligence, robotics, computing, cloud and wireless technologies are accelerating applications not possible before. In a few years, it is certain that this new mode of imaging and data visualization will transition from a novelty to a common mode of imaging, similar to camera evolution in the past.

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Sabbir Rangwala

Follow

Cars excite me. I led the automotive LIDAR business at Princeton Lightwave until 2017, when the company was sold. I started Patience Consulting to provide expertise on

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a0258z

July 5th 2022

I am in a valid sense able to describe myself accurately as a motion picture rendering, a volumetric video constructed from frequencies in a 3D grid that is my brain displaying a computed rendering to its own 3D grid. I am a phase field, a tomographic rendering of frequencies in the 3D Neural Network of the Brain!

I have all these different neural arrays going off in my head like flashbulbs, with oscillating ripple's of excitation and inhibition that magnify memories from the exit terminal of a single neuron to the whole brain's network.

3D images, moving in 6 degrees of freedom, telescoping and then cycling about the brain like a movie. It's like reality ripples through us, or that the walls and the mind become one because all life experience is inside the tomodeck of the mind. Not Holography Tomography, not Holodeck, Tomodeck. The mind is a tomodeck.

Imagine these arrays are 3D, meaning signals can go up & down, left & right, front & back, so the array can represent reality tomographically through its tempo spatial configuration of action potentials triggering shifts in memory states across the brain.

\*The threshold in the synapse, in the dendrite, and in the soma, is in some sense the bias that is modified when synapses are inhibited or excited because of agonists or neurotransmitters of some type. The weight is when additional synapses (spines) grow, or are removed.

What I mean is that imagine that a phase took up a cube of space, and that they were stacked like legos, in 3D, like a construction set of phase patterns as legos. then you see your 3D world is spatially 3D rendered in your mind, from your perspective as the observer is implied by the rendering.

I like to think that there is not really any you in the human mind, but then again, who am I to think that existence of identity might be just implied and not real in a tangible way.

The brain's oscillatory theta waves may serve as a natural back prop like mechanism for improving the accuracy of nodes, phases.

"potassium channels (VGKCs) open during action potentials and speed repolarization, thus shortening action potential duration"

Potassium Channel Types at Motor-Axon Nodes of Ranvier

<https://www.jneurosci.org/content/42/25/4957>

1. This supports the synaptic unreliability article & flow of information in the brain.
2. It dives deeper into Parkinson's disease research.

Evidence for Indirect (wireless) signaling reference

"#eNeuro: Researchers at The Robert Larner, M.D. College of Medicine at The University of Vermont revealed in rats that theta coherence within & between the dorsal HC, ventral HC & mPFC changed as a function of learning & cognitive demand & independent of degree of direct synaptic connectivity."

"Dynamic  $\theta$  Frequency Coordination within and between the Prefrontal Cortex-Hippocampus Circuit during Learning of a Spatial Avoidance Task"

<https://www.eneuro.org/content/9/2/ENEURO.0414-21.2022>

Essentially this reference shows that Theta Oscillations are driving coordinated activity between neurons that are not directly connected by synaptic arrangements, supporting the theory I am putting forward.

It's interesting to think about the Theta phase oscillation as being constructed by a Taylor series polynomial of inhibitory brainwave patterns, with the ability to sort of wirelessly modify patterns across the network over some area of brain tissue. This describes a mechanism for how patterns embedded in our brainwaves might drive coordinated multi-cellular activity at the single neuron level, across the brain without direct connections between activated neurons. Matching up with my other ideas about large scale oscillations driving interfaces between smaller scale neural oscillations in different hemispheres.

(In my other notes I talk about the inhibitory oscillation as magnifying the neurons recalled memory in the action potential neuron to the exit terminal via inhibition. The idea being that the brainwave is the thing that is seeing your memories become activated, and its phase changes from that action potential represent your mind being changed, your mental world being updated with new information, and the brainwave's effects on your neurons at a macro scale have individual effects to the firing of single neurons, in a coordinated way, across the brain. So your mind can change the brain.)

# "Cross-attractor repertoire provides new perspective on structure-function relationship in the brain" <https://www.sciencedirect.com/science/article/pii/S1053811922005183?via%3Dihub>  
Essentially this story above about cross-attractor's is remaking the argument about oscillators affecting other oscillators in the human brain.

Learn more about Taylor Series in the Essence of Calculus series by 3Blue1Brown  
<https://www.youtube.com/watch?v=3d6DsJlBzJ4>

# Quantum Teleportation via Oscillation (Did I write this down elsewhere in my notes)  
This is also key to the idea of why I think Quantum Teleportation works, in that I think a larger oscillation is carrying a signal between two smaller oscillations that are not directly connected.

Connect a0018z note with a0258z note and a0369z on Quantum Teleportation.

Maybe, the major goal for a deep neural network is to achieve compressed & accurate representations, gradient descent helps with the accuracy part, but at least we can be open

minded & unbiased towards finding new methods to improve accuracy & sparsity in machine learning.

# "You Don't Understand Neural Networks Until You Understand the Universal Approximation Theorem"

<https://medium.com/analytics-vidhya/you-dont-understand-neural-networks-until-you-understand-the-universal-approximation-theorem-85b3e7677126>

After reading this I considered how the Universal Approximation Theorem kind of made that first layer of neurons seem like the bumps on a record. Like a 1970's recording player kinda record. Right like to represent a music pattern, each note is a bump of a different size, or something like that.

I searched online and I could not find any comparison of Universal Approximation Theorem to Music Records, or CD-roms. But there is significant writing about neural networks as signal processors.

<https://www.allaboutcircuits.com/technical-articles/neural-network-signal-processing-validation-in-neural-network-design/>

I think I have argued somewhere in my notes, more than once, that the human brain's neural network is infact a signal processor among other things. Signal processing is a key component of Neural Oscillatory Tomography, you have to process the signals in order to build up associations or detect coincidences that lead to pattern representations that the network has learned, and pattern recollections that appear in your rendered mind when you are thinking about a memory, or considering the future (a rendered memory-prediction, that a sequence of neural arrays is processing & rendering for other neural arrays)

"Pin Point Impression 3D Needle Art Sculpture Toy" (search for images in the search engine or try this link)

<https://duckduckgo.com/?q=Pin+Point+Impression+3D+Needle+Art+Sculpture+Toy&iax=images&ia=images>

In that the position of each needle could be understood as the value that a particular neuron took on during the training process when it is learning representations.

ON this topic here is an interesting article about using "Recurrent Neural Nets for Audio Classification"

<https://towardsdatascience.com/recurrent-neural-nets-for-audio-classification-81cb62327990>

In typical deep neural networks we might be talking about high dimensional representations, it's not the value of that one node, it's the pattern embedded across the high dimensional abstract space of all the weights & bias's & active connections in network that represent that learned pattern.



# "Learning in High Dimension Always Amounts to Extrapolation"

<https://arxiv.org/abs/2110.09485>

This short series on Backpropagation Calculus (3Blue1Brown) can be helpful to understanding the intuition behind backpropagation calculus, and why adjusting the weights, bias, and activations of nodes improves the accuracy of a representation in the neural network.

[https://www.youtube.com/watch?v=tIeHLnjs5U8&list=PLZHQObOWTQDNU6R1\\_67000Dx\\_ZCJB-3pi&index=4](https://www.youtube.com/watch?v=tIeHLnjs5U8&list=PLZHQObOWTQDNU6R1_67000Dx_ZCJB-3pi&index=4)

# Action Potential Path Tracing as Taylor Series Polynomials for Neural Oscillatory Tomography

This new idea I have is about action potential path tracing (actually a better name for this is excitatory neuropathways from incoming senses), each phase interval represents a vector that is being modified like a Taylor series polynomial function developing a non-linear pattern in a dynamic linear sequence. So that the waves of inhibition that follow the action potential sequence cause a next level of adjustment to the phase oscillating pattern from individual cell level to aggregate brain waves at greater scales. Brainwaves, such as the theta brainwave, can perhaps be thought of as wireless high amplitude low frequency phase shifts applied to large numbers of neurons in an oscillating cell assembly (or cortical column) at some sequence of time intervals, and they sort of revolve around the timing of the decay of the action potential, so each interaction of inhibitory brainwave bursts following each action potential in a sequence of action potential bursts is intersecting with the previous & the next brainwave, and this process I am suggesting is like Taylor Series Polynomials, in that their effect on one another is one that improves the resolution & accuracy of whatever is being modeled at that moment by that oscillating cell assembly.

# "Synchronous high-amplitude co-fluctuations of functional brain networks during movie-watching"

<https://www.biorxiv.org/content/10.1101/2022.06.30.497603v1>

The article that I linked above on "Universal Approximation Theorem" talks about Taylor Series Polynomial Functions having a sort of granularity limitation on pattern representation. So I thought maybe the action potential high phasic firing sequence, which sets off waves of inhibitory low phasic firing sequences, could be construed as a sort of Taylor Series calculation for modifying the curve of a learned vector pattern, represented by a phase change, and modified by subsequent phases changes in other Action potential events. So that as information travels through the nervous system, at each step, as a signal passes from one neuron to the next, the estimated representation of that pattern grows quantitatively, towards what could be some approximation of an infinite curve at a certain point, if it goes on long enough.

So when it comes to the very excitatory neuron based cerebellum, which isn't going to be that useful for complex information patterns, but is perhaps going to be useful for highly coordinated movement when it comes to skiing, walking, running, snowboarding, riding an electric unicycle, that excitatory network in the cerebellum is going to be useful precisely because the ability to

improve spatial pattern representation is going to be accomplished with a Taylor Series like Polynomial Functioning consisting of activated excitatory neurons looping in the cerebellum. So that explains why the cerebellum might be good for spatial navigation and coordinated movement.

# "Functional brain connectivity is predictable from anatomic network's Laplacian eigen-structure"

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6170160/>

Perhaps then with this concept we can imagine that the ideas, concepts, shapes, colors, textures, feelings, and smells detected in the mind can be understood as emergine from a sort of Laplacian Matrix consisting of phase changes in 3D grid of the brain emerging because of Neural Oscillatory Tomography. If true, that conceptualization may help us to decode the contents of a human brain someday with medical imaging.

[https://en.wikipedia.org/wiki/Laplacian\\_matrix](https://en.wikipedia.org/wiki/Laplacian_matrix)

a0259z

(holographic) the book of the dead human androids

if you are reading this book/ post you are dead, a dead human robot, you died, and like a 3D printer a new frame of your existance was rendered, then you were alive for some moments and then you died again

you die everyday many times a day

but in a sense your temporary existence each time is a phase pattern, like a holographic loop inside an echo chamber of this same loop self reflecting on its own internal structure as it differs from incoming stimulous patterns, and this leads to a construction of a self rendering that is detected by the self aware network, the self aware network that is you only detects its own renderings it does not directly detect itself, but it can infer the existence of a substructure for what is experienced as life in your cells.

I wonder how many mentally ill behaviors that exist in the world are largely caused by malnutrition?

I really don't know the answer.

a0260z

Oct 5, 2012

(dendrite) the brain has two hemispheres of hierarchies, each hemisphere is conscious, and can exist indepent of the other

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 there is a timeline association of sensory data, when new data comes in. The timeline association data becomes like a google search

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 its 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 its representations and associate words, and pictures with its internal representations, a sort of output channel, communication

a0261z

(oscillat, cortex) When I said I felt like I have had a kundalini awakening through pain (broken arm Sept 2021) I meant that in a literal sense I sense my own mind as a vast infinite lake with pain rippling across the surface of this self-aware lake.

lets say that virtual thought patterns change shape and scale in their delta from being something that many areas of the brain are sensing/receiving simultaneously

so you can have a computer mouse in your peripheral vision and that would be represented by small brainwave signals that are updating the position, orientation, color and other properties of the mouse in each second

but if you looked at the mouse directly, really stared at it, leaning in close so that its much closer to your face, a much larger part of your field of view, then you touched the mouse while looking at it this way, well I am going to expect an increase in the delta of phasic neural firing patterns in

the visual and somatosensory areas of your brain, if you click the mouse then the audible click is now activating the audio cortex of your brain, and your attention / awareness of the mouse should be correlated with increases in phasic firing in 3 associated primary sensory cortical areas.

Whatever you are attending to ought to have an increase in the spatial and or temporal patterns evoked by that pattern,

the neural correlates of focus and attention

but the slow rate dipole oscillations of EEG would not give you this 240hz Phasic Firing Pattern, nor would it give you the image resolution of a single neuron firing.

a0262z

(synap, oscillat, dendrite)

Thought experiment: What if you saw your brain as like something with a lot of holes NOT like swiss cheese, and also not exactly like a lot of bulbs like christmas lights that rewire themselves to form representations of incoming sensory patterns almost like the game of life.

Like the game of life or a slimemold, what is the most efficient path? and the result is a learned sequence in short term memory so there is a predictable path for signals to follow representing a learned sequence.

Perhaps this learned pattern is converted then into a soliton wave pattern from neurotransmitters moving through exit terminals i to calcium gates across synapses

The wave pattern is a deviation from the tonic beat pattern of a group of neurons oscillating, and the entire group notices because its a novel event outside their tonic expectations, so the pattern that they are oscillating changes, but then the pattern representing phasic/hi freq/ low amp pattern. A new synaptic pathway is formed that represents the new learned pattern, these are new connections between dendrites and the synapses of other cells, interneuron gates and synapses for micro vesicle sacks and neurotransmitters to fly through

A Pre-requisite

Neurons predict when they are going to fire, but they also predict when they are not, and what time.

Tags:

soliton

a0263z

Notes from Feb 14, 2014, 11:06 AM

(dendrite)

You took a snapshot of a video from half-way though the explanation of a simplified integrate and fire model and you claim that as proof?

First, this simplified model is a very rough and inaccurate model of a real action potential and in only the crudest terms captures the dynamics involved.

Second, if you had bothered to finish playing the video, you would have realized that they later describe how the amplitude of the action potential peaks (is capped) and then begins its falling phase. Just to be clear, in case you can't understand the simple waveform diagrams - the amplitude is indicated by the very top peak of the waveform.

Fast forward to the end of the lecture and they clearly show the various shapes of the modeled APs. Note how each AP exhibits precisely the same amplitude (shown in the image below). Yes, I also took the very same course. I've also taken several online and in-class University level Medical Neuroscience courses (courses required as part of Medical school training). Having taken this course as well as many other courses, I can honestly say that the Coursera Computational Neuroscience course you used as evidence does not even rise to the level of an freshman level undergrad course.

Third, your comments clearly indicate you don't even know what the term "potential" means within this context.

"There is a difference between the axon potential threshold, and the axon potential maximum, just because an axon passes its threshold does not mean it reaches its maximum."

"Potential" does not mean, as your comments would indicate, what the capability of the depolarization might be, it refers to the difference in the charge between the extracellular and intracellular aspects of the membrane. Additionally, there is no such thing as an "axon potential" in the first place. An axon is an extrusion of the cellular membrane and as such is a continuation of the same bilipid membrane structure as the cytoplasm.

Finally, you largely misinterpret Square's comments as "backing your facts". Take for instance, this ludicrous claim:

"If there is more voltage than the axon's maximum there maybe a backward propagating potential which can reset the axon faster to fire again sooner"

and Square's comment:

"2b) Yes, action potentials can backpropagate along the dendritic branches. The ion channel repertoire here is different to the axon, so the spike will change waveform as it travels through these various compartments."

This is not a confirmation of your claim. Square is describing back-propagation, which occurs when a spike causes an action potential to propagate backward through the dendrites that had a role in initiating it. It says nothing about a surplus of voltage over an axons maximum (again, there is no such concept) and it refers to propagation along dendrites, not the axon.

a0264z

Note from Nov 5, 2018

(field, tomography) Vision Agency BCI

What I have written to VFW so far, and their responses/questions:

I would like to contribute to the research & development of new medical tools, combining VR with AI and BCI. To start with we can bring the community of Neurohackers from Noisebridge, but I am also a member of the global Neurohacking community called NeurotechX which is larger than Noisebridge. NeurotechX has 21 chapters globally, but we do not yet have an office for NeurotechSF so we have been working out of Noisebridge which has been great but its very limited in terms of space available because there are so many other types of projects happening, people are working in a woodshop there, in a sewing area, on creating music, on a whole bunch of other cool projects and those are all great but that leaves very little room for Neuro hacking (the development of new medical tools)

Our current project combines a new portable EEG device with WebVR with an Oculus Go with Tensorflow (AI) and a Raspberry Pi (to act as a local server) Since we are focused on doing fundamental technology research our product is open to the community, so companies, and other medical researchers are allowed to use it to make products that could benefit people with serious medical conditions. The prototype works, we can demo it now, but some features still need to be implemented (such as FFT, AI, and the Pi) so its not finished yet.

The next project is going to involve EIT Electrical Impedance Tomography, again with WebVR, another VR headset, Volumetric Video and 3D Cross-hair Convolutional Neural Networks. The goal is to create or acquire a 3D experience, to acquire 3D medical imagining with good spatial resolution (beyond what EEG can offer, closer to fMRI but perhaps improved beyond fMRI) and then to use Object Segmentation (3D Cross-hair convolutional neural networks) to correlate brainwave patterns with patterns in the 3D experience to establish next generation nerve correlations.

We could benefit from a much larger space, and possibly help with applying for grants to get funding for this project. I would very much like to help real people such as the people at the Veterans of Foreign Wars.

I'm also a member of another team called The Vision Agency that combines EEG, ECG and other sensor tech with VR one of our products is has a website at [MicrodoseVR.com](http://MicrodoseVR.com) and was featured at the Smithsonian this past summer and at CES 2018 by Intel and HTC.

MicrosdoseVR is intended to be the kind of app that we hope doctors will someday prescribe to their patients for variety of illnesses, like PTSD, and for pain relief, anxiety relief and more. The MicrodoseVR has been looking to create an alternative health center for a long while. We would like to have people come use our VR products equipped with biofeedback sensors technologies. At the same time we want to keep doing fundamental research to create new technologies or new applications from novel combinations of existing technologies.

Sheridan mentioned that the VFW group might be interested in having a neurohackers group use the empty space at the Veteran's building in SF.

We would like to do that, to build a Neurotech Research facility, with computers to develop EEG/EIT into VR, Virtual Reality software development stations, VR experience stations for Veterans and the public to come try VR experiences.

We have some hardware to start with, we have a number of EEG machines, at least 1 pc, maybe more soon, we have an EIT medical imaging device that is the size of a mini refrigerator.

We also have the ability to invite the folks from Noisebridge to share the space, to bring their VR station if they wish. We have four VR headsets.

So that's the first thing, we would like to use the space in the Veteran's building to move our operations into that.

The second thing would be that we would like to apply for grants, or funds to acquire more equipment, and even a paid staff to build technology and test it on whomever wants to come through the doors to try out our demos.

I'm also an event/community organizer so with that space we can have a regular events, hackathons, conferences, inviting the bay area, university researchers, and Silicon Valley companies to give talks, demonstrate new research new technologies and potentially become collaborators with us.

I would love to be able to attract University researchers to come work with us.

So the space would 1st be for Neuro hackers (developers) to work on creating novel combinations of existing technologies (like combining bci with AI and VR) and develop new core technologies, or teachable paths to using core technologies in new ways. (this is the goal of NeurotechSF and it's parent organization NeurotechX)

Second it would be to engage with the community to develop applications for these core technologies, hackathons, classes, and conferences with talks and demos. (San Francisco Virtual Reality is a meetup group that has been doing this for years)

We can also bring in MicrodoseVR which is a product that is designed with well being in mind that incorporates EEG and ECG into VR.

So the first step is to see that space, to make our pitch to use that space, to win over folks and move our equipment to that space to start using it.

We share and publish our research code on our github which is currently at [github.com/micah1/neurotech](https://github.com/micah1/neurotech)

With an official space we will be able to grow, and apply for funding, and potentially help create tools that medical professionals can use, and tools that can help the Veterans of Foreign Wars who will be able to visit the Veterans building to try anything that we are working on.

VFW: What is the budget that the company has to work with for co-working? When are the potential timeframes for office occupancy?

Well the Neurotech SF group doesn't have much of a budget. We have been relying on our friends at Noisebridge for operating expenses. I haven't written a budget for this type of project before so I might need to consult with people who have to make sure that our numbers make sense and that we are doing thing correctly.

There isn't an immediate rush to move, we could move now (provided that we could somehow raise funds for electricity, water, internet and any thing we might have to pay if we have to sign a lease) we could move in January, we could move next summer. The space we are using at Noisebridge is not going to be available come August 2019, and Noisebridge itself will have to find a new place to move at that point.

VFW: It doesn't seem that the company is going to work, based on the facts presented. Is there actual planning, management or revenue? Is this a research project in experimental technology phase?

If we bring in Noisebridge to talk about moving into this space with us they have actual planning, management, and revenue.

NeurotechSF, the meetup I organize is doing a small budget research project, open to community participation, in an experimental technology phase.

For example EIT, that I mention in this podcast that I did a short while ago, is one of the technologies we are experimenting with. <https://youtu.be/aexQwTpOwYc>

So if you are looking to bring in an organization that has existing planning, management and revenue, then we need to make Noisebridge part of the conversation, to bring them in.

But their focus isn't fundamentally on developing new medical technologies, that's the focus of NeurotechSF and the Dreamteam Neurohackers two groups that are a small part of Noisebridge right now, (but also independent)

I would like a significant portion of the space to be used for Neurotech research (maybe half of it) with Noisebridge being brought in as a partner to help with planning, revenue, and management.



I believe that Neurotech research is the part that may win over Veteran's, at least that is what Sheridan's thought was. That's why I would want to plan to make sure that at least half the new space was dedicated to that focus.

That would include VR and AR workstations that can be used for demonstrations, user testing, and possibly patient trials.

I also did this podcast with an industry leader in the computer graphics industry asking him about how we might use rendering technology and artificial intelligence to improve medical imaging and create better medical tool <https://youtu.be/yMsaNsqzjFQ>

I have a business card and a short bio here at <http://vrma.io>

I'm also the founder of Silicon Valley Global News, 3 years running with hundreds of articles and many contributors <http://svgn.io>

and I just began working on what I hope will be the next version of it in WebVR. I've been writing WebVR code to redesign my newsite in 3D

NeurotechSF is also part of NeurotechX which is a global organization that has plans, management and revenue. I can alternately connect you with Yannick and some others who are part of that

VFW: How much workspace is needed for allocation?

VFW: Good Morning Micah, I am not sure, if you are interested... hope this helps. On October 25th, we are inviting interested parties to learn how to build crowdfunding campaigns, including the web design/development process. This will be an intro session.

Regarding space: Noisebridge is a 5,200 square-foot space in San Francisco and we use maybe a quarter of it for events multiple times a week. My weekly Neurotech event is one of them. Noisebridge would like to move into a much larger space. With additional space we could have more VR demo stations, we could bring in more computers and more equipment (like medical equipment) out of storage and into use again. I'm an experienced web designer, if I am not able to start a neurotech research center then my fall black plan might be to start a webxr development business to build AR and VR web applications for clients who have brands. I've also participated in a number of crowd funding campaigns but I don't think that a crowdfunding campaign to sell some product is the right direction to go in.

The weekly Neurotech event I have been hosting has been an unexpected success. It was Sheridan's idea that I make a bid to use the empty Veteran's building to continue what were doing which includes figuring out how to combine eeg with webvr with vr headsets with AI with blockchain so on and so forth, I don't know if I shared this but I just wrote an article about our EEG work and some other work that other folks are doing

<https://medium.com/silicon-valley-global-news/noisebridge-went-to-the-maker-faire-in-this-article-you-will-learn-about-ngalac-the-93f4857d3014>

but when I say that it has been an unexpected success I mean that I am surprised that we have accomplished so much so quickly. I have also learned so much about WebVR that I could tech it and start a business as a webvr developer I think, first I am going to create a portfolio

We had previously spoken to Neuroscientists and the Vision Agency that makes Microdosevr.com

about creating a VR arcade alternative health center in SF, and before that I had talks with an event organizer friend about creating a VR place, like UploadVR, for hackathons, conferences and more all year round.

So Sheridan's idea was synergistic with past projects I have spoken with many others about, to create an amazing place for visitors, and for our team of developers

VFW: Based on experience, it's practical to dovetail the consideration with healthcare grants and research project initiatives. It is a way to search and mutually wrap the solutions, moving forward.

VFW: QUESTION... Are you a US veteran?

I'm not. I'm a journalist, researcher analyst and neurohacker, also webvr developer and a graphic designer. I only reached out to the VFW because Sheridan suggested that they might be interested in the tech we are developing or in the direction of research that we are headed as a tool that could help suffering veterans. So thats why I reached out to the VFW.

There are studies that show the efficacy of VR for pain relief, and I would like to develop and research apps that study that category use.

and we do have an app already in MicrodoseVR

VFW: I will check I to see, if there are any potentially interested parties

VFW: I am still busy with responding and scheduling with sincere and paying clients since January this year. It is has been more than expected, even now since TechCrunch Disrupt and Salesforce Ventures.

VFW: Micah, Are you trying to build a team, at this time?

I have a team of volunteers right now. It would be a different situation if I had a good plan for funding, or if I had the promise of funding, at that point I would be actively developing a team yes. I have a lot of contacts that I believe would be great (very talented people) to work with if I had funding to hire them and bring them in to work on developing Neurotech full time or on a contract basis.

I am on the Vision Agency team that makes MicrodoseVR, I have a friend who is working on advanced technology to render volumetric video with a neural network solving a huge number of problems (with the typical firehose of data generated by lightfield capture) I am part of the Dreamteam of Neurohackers and I am part of the NeurotechX team which includes Neuroscientists who are willing to donate time money and equipment (such as the electrical impedance tomography machine I mentioned previously) to further the goals of Neurotech Research. I manage the Silicon Valley Global Network group (with 80k members) with Sheridan Tatsuno so he has been a team member on the media (group moderation and news) side of things.

At noisebridge I am becoming increasingly involved in hosting workshops, study groups, and classes to help people study & develop skills they can use in the modern workforce.

My meetups have so far been about studying the software development side of webvr, servers in python, go for bci, and also we are going to be building and teaching people how to use mysql and do neural network programming.

I am going to be hosting classes and workshops soon on machine learning specifically, I have someone who has expressed interest in teaching this class.

Hosting machine learning workshops is something that Morgan has also expressed interest in doing.

The point is that we want to help educate people, help them find a career in the modern tech workforce, working on technologies like VR, Blockchain, Deep Learning, BCI, Databases and more.

So that effort to help people adapt to the world and grow a career or find a tech job, study for a coding examine, these are some of the goals that the community at Noisebridge has in a sense driven into my psyche.

I want to help veterans and anyone really to make something of themselves, to develop a new skill, to begin a career path, or to get to the next step on a career path. I understand what that can mean for a person. The value it has in helping someone to qualify for a job. It means the world, it can mean a massive relief from depression and a return to happiness for some.

So the Neurotech Research Center is definitely also a Neurotech training and career building facility, that just comes with the territory as I see it. Research is self-education, and a research center is bound to help educate a lot of people, and give them something valuable, valuable knowledge and skills, employable knowledge and skills.

a0265z ctp

(oscillat) The oscillations of the brain help us to

Complexity

Thoughts are a sequence of words

a thousand brains talk about thoughts being movement

Our words and sentences are sequences of patterns

Our brains are for movement

But the next level is understanding that thoughts are movement.

Highly coordinated movement

a0266z

(oscillat, field)

the moment that you are conscious of something is it magnified at every scale of your brain, in neurons, horizontal layers inside columns, multi-layer temporal circuits,

that wave of magnification of patterns is the wave of your conscious mind, experiencing the electromagnetic tunnels or vortices, and the mechanical vibrations of other oscillators moving ions with the changing phase field of the brain and of space.

the grid cells and place cells as oscillators

the 3D grid cells

a0267z

(oscillat, observer, cortex) The Observer of the brain's activity is the brain

Daniel Dennett argued that the consciousness is a kind of illusion, with the brain creating images based on what it is exposed to.

I think that Anil Seth is calling this same process a hallucination.

The idea is that the visual representation of anything in front of you is captured by your eyes and then represented in your visual cortex, and then what is seen by your visual cortex is re-modelled by other parts of your brain, in an oscillating loop of brain activity, adding a temporal viewing to your internal representation.

As someone who writes about science & technology at Silicon Valley Global News I prefer the computer analogy and so I will call this process a rendering, a computational rendering.

The purpose of my book, as a sort of conference like presentation of the work others have done is to create exhibits around the sources that are supporting this narrative of phenomenal consciousness being created by a brain to be viewed by a brain in a feedback cycle, a neo mind cycle or a self aware network.

I hope this book is as fun to read as it was fun for me to write.

One thing that I found to be interesting while writing this book was that I suddenly began to see an explosion in article about consciousness in the news. See this article from Keith Frankish, a philosopher and writer for AEON called "What if your consciousness is an Illusion created by your brain"

<https://aeon.co/essays/what-if-your-consciousness-is-an-illusion-created-by-your-brain>

a0268z "(I think I can describe the sensory input path better than this)"

The example from A Thousand Brains was something like

"When you put your finger on a cup, as your as your thumb touches the cup that is going to activate in the cortical column that's representing the cup for that moment is going to activate a pattern a tactile tempo-spatial pattern that represents your finger sensation."

That finger sensation is still going to come in to this to the somatosensory cortex S1. It's a mechno-sensor array triggered touch, mapped in the Somatosensory Cortex of the brain.

(I think I can describe the sensory input path better than this)

FROM S1 it is going to ripple across the whole brain. Memories are rippling across whole brain. You could have a distant cortical column that is integrating the incoming the incoming sematosensory signals with the incoming visual data and the incoming audio data.

By ripple I mean there is a spike train that is creating large inhibited regions of neural activity.

The spikes in some neurons will trigger inhibitory circuits, that develop the patterns of your mind,  
# (insert Buszaki quote on inhibitory networks figure 11.5 I think)

Silence for Thought: Special Interneuron Networks in the Human Brain

<https://neurosciencenews.com/interneuron-network-20895/?fbclid=IwAR373kZ6rwFs9qkKMIzcGL-TZNCcZqhtjU4E6FWxlXoslvpotwnUZ4Xi2M>

The canvas of the mind is dotted with rippling patterns that alternate between excitation & inhibition "high-amplitude cofiluctuations involving large sets of brain regions."

# "Modular origins of high-amplitude cofiluctuations in fine-scale functional connectivity dynamics"

<https://www.pnas.org/doi/10.1073/pnas.2109380118>

phase variances pass between cells, but they oscillate between excitation & inhibition across the brain.

A nice video explaining "GABA - The Inhibitory Neurotransmitter" which is going to be related to how waves emanating from action potentials are going to create larger inhibitory waves, that trigger more action potentials, that create the patterns of the mind that this book is all about.  
<https://www.youtube.com/watch?v=Nv-gCH4O0Os>

Somewhere, maybe the TPJ Temporo Parietal Junction, there's this transmitted convergence of rippling wave signals what you are touching, what you are seeing, what you are hearing. This convergence of signals is going to represent the aspects of your sensory input as tempo-spatial patterns in different oscillators that are all talking to each other simultaneously.

But the one that it that you're focused on at that interval in time is the pattern that is active at that endpoint in time, in terms of your tempo-spatial phase patterns in your brain.

a0269z

(thalamus, oscillat, field, dendrite, synap)

the decay rate of an action potential is adjusting the phase rate of neurons that are inhibited in the same receptive field

one layer of a cortical column has a combination of spikes advancing the thresholds of all its post-synaptic neurons, and that is a receiving phase field defined by the synapses in its exit terminal

this causes that field to fire or inhibit in temporal sequences in an order defined by their voltages, "when" their voltages cross their threshold to firing

this causes neural circuits to fire in sequences like lines on a tv screen that is seen by the oscillator itself because each neuron is mechanically listening to other neurons as charges increase or decrease inside and outside its membranes

the sensory inputs like hands are like a retina, a dendrite is like a retina, so the rows of the cortical columns see the action potentials, the rows are seen by the cortical column, and the cortical columns are seen by the thalamus

multiscale tempo spatial oscillators

the magnified data serves as part of a display for another neural circuit

conscious is a lot of stitched together displays, with memories becoming attractors that drive behaviors.

so by smelling stinky when I met her I inhibited her cycle, she's being silent

her oscillation then will be slow and strong expressions but they are more like networked oscillation patterns resulting in behavior patterns that have frequency characteristics

we can see cities as oscillators, countries as oscillators, and the social planet as in oscillation, or oscillations inside oscillations with a multitude of scales.

a0270z

This note is very disorganized at the moment. Skim downwards to see the parts about Cellular Oscillation Tomography.

Protein Oscillation Tomography has been moved to note a0280z

There are a lot of links you can skim past before you get there.

mine or comb thru: neural oscillator search results

[https://www.google.com/search?q=neural+oscillatory+tomography&newwindow=1&hl=en&sxsrf=ALiCzsYw2S-\\_u4Abkv-ztQWmi843LgYGxA%3A1658149386706&ei=ClrVYovYKv3GkPIPnqe8qAQ&oq=neural+oscillatory+tomography&gs\\_lcp=ChNtb2JpbGUtZ3dzLXdpei1zZXJwEAM6BwgjEOoCECc6BAgjECc6CAguENQCEJECogUIABCRAjoLCC4QgAQQsQMQ1AI6CwgAEIAEELEDEIMBOhAILhCxAXCDARDHARDRAxBDogUILhCRAjoICAAQgAQQsQMQ6BQguEIAEOg4ILhCABBCxAXDHARDRAzoLCAAQgAQQsQMQyQM6BQgAEJIDogUIABCABDoGCAAQHhAWOggIABAEaEA8QFjoICAAQHhAWEAo6BQgAEIYDOgUIIRCgAToFCCEQqwJKBAhBGABQ9ghYqURgiUloAnAAeACAAZ8BiAGKHZIBBDAuMjmYAQCgAQGwAQ\\_AAQE&sclient=mobile-gws-wiz-serp](https://www.google.com/search?q=neural+oscillatory+tomography&newwindow=1&hl=en&sxsrf=ALiCzsYw2S-_u4Abkv-ztQWmi843LgYGxA%3A1658149386706&ei=ClrVYovYKv3GkPIPnqe8qAQ&oq=neural+oscillatory+tomography&gs_lcp=ChNtb2JpbGUtZ3dzLXdpei1zZXJwEAM6BwgjEOoCECc6BAgjECc6CAguENQCEJECogUIABCRAjoLCC4QgAQQsQMQ1AI6CwgAEIAEELEDEIMBOhAILhCxAXCDARDHARDRAxBDogUILhCRAjoICAAQgAQQsQMQ6BQguEIAEOg4ILhCABBCxAXDHARDRAzoLCAAQgAQQsQMQyQM6BQgAEJIDogUIABCABDoGCAAQHhAWOggIABAEaEA8QFjoICAAQHhAWEAo6BQgAEIYDOgUIIRCgAToFCCEQqwJKBAhBGABQ9ghYqURgiUloAnAAeACAAZ8BiAGKHZIBBDAuMjmYAQCgAQGwAQ_AAQE&sclient=mobile-gws-wiz-serp)

Cellular Oscillating Tomography related search: Cells can detect when multiple receptors

[https://www.google.com/search?q=cells+can+detect+when+multiple+receptors&newwindow=1&rlz=1CDGOYI\\_enUS929US929&hl=en-US&sxsrf=ALiCzsaHogSLkixYmKUdp7uVGixJLpqPlw%3A1656426607000&ei=bhC7Yo3IPOrWkPIPt9ypuA8&oq=cells+can+detect+when+multiple+recep&gs\\_lcp=ChNtb2JpbGUtZ3dzLXdpei1zZXJwEAEYADIHCCEQChCgAToHCCMQ6gIQJzoECMQJzoECAAQQzoFCAAQkQI6EQguEIAEELEDEIMBEMcBENEDOggILhCABBCxAzoQCC4QgAQQhwlQsQMQ1AIQFDOLCAAQgAQQsQMQgwE6CwguEIAEELEDENQCOggILhCABBDAUjAoFCAAQgAQ6CggAEIAEElcCEBQ6BggAEB4QFjoICAAQHhAPEBY6CAgAEB4QFhAKOgUIABCGAZoFCCEQoAE6BQghEKsCOggIIRAeEBYQHUoECEEYAFDHB1j3RWCDsmsgDcAF4AoABgQKIAYopkgEGMi4zNS4xmAEAoAEBsAEPwAEB&sclient=mobile-gws-wiz-serp](https://www.google.com/search?q=cells+can+detect+when+multiple+receptors&newwindow=1&rlz=1CDGOYI_enUS929US929&hl=en-US&sxsrf=ALiCzsaHogSLkixYmKUdp7uVGixJLpqPlw%3A1656426607000&ei=bhC7Yo3IPOrWkPIPt9ypuA8&oq=cells+can+detect+when+multiple+recep&gs_lcp=ChNtb2JpbGUtZ3dzLXdpei1zZXJwEAEYADIHCCEQChCgAToHCCMQ6gIQJzoECMQJzoECAAQQzoFCAAQkQI6EQguEIAEELEDEIMBEMcBENEDOggILhCABBCxAzoQCC4QgAQQhwlQsQMQ1AIQFDOLCAAQgAQQsQMQgwE6CwguEIAEELEDENQCOggILhCABBDAUjAoFCAAQgAQ6CggAEIAEElcCEBQ6BggAEB4QFjoICAAQHhAPEBY6CAgAEB4QFhAKOgUIABCGAZoFCCEQoAE6BQghEKsCOggIIRAeEBYQHUoECEEYAFDHB1j3RWCDsmsgDcAF4AoABgQKIAYopkgEGMi4zNS4xmAEAoAEBsAEPwAEB&sclient=mobile-gws-wiz-serp)

Saving this pay walled article because of it's list of citations that I want to review later.

"Prefrontal feature representations drive memory recall"

<https://www.nature.com/articles/s41586-022-04936-2>

# Get this pdf later

"Statistical Learning Emerges from Temporally Preparing What Action to Perform Where"

"Intriguingly, here we instead found that this performance benefit emerges from preparation to a range of other temporal properties that we initially considered to be random."

<https://www.biorxiv.org/content/10.1101/2022.08.06.502990v1>

# NAPOT Theory Framework: Activity increases or decreases are phase changes, phase changes in temporal patterns and spatial patterns across the brain.

"Decision-Making: A New Distribution of Tasks in Our Prefrontal Cortex?"

"ventromedial prefrontal cortex (vmPFC) in assigning a value to the different options presented during a choice. Thus, the activity of this region increases according to the value of the promised reward and decreases according to the cost of the effort required to obtain it."

<https://neurosciencenews.com/decision-making-pfc-20947/>

# The following is consistent with my theories on LTD written about in other notes in this repo, Long Term Depression or Long Term Forgetting is described as stemming from Oscillatory Decoupling in NAPOT theory.

"Decoupling of interacting neuronal populations by time-shifted stimulation through spike-timing-dependent plasticity"

"The synaptic organization of the brain is constantly modified by activity-dependent synaptic plasticity."

"we tested how introducing a time shift between stimuli delivered to two interacting populations of neurons can effectively decouple them."

"Based on the overall topology of the connections, the decoupling of the two modules, in turn, causes a desynchronization of the populations that outlasts the cessation of stimulation."

"Decoupling effects of the time-shifted stimulation can be realized by time-shifted burst stimulation as well as time-shifted continuous simulation."

<https://www.biorxiv.org/content/10.1101/2022.06.29.498110v1>

# Dopamine induces soluble  $\alpha$ -synuclein oligomers and nigrostriatal degeneration

<https://www.nature.com/articles/nn.4641>

What I want to know more about the interaction between the plasma membrane and the endosomes. To understand what makes it possible for vesicles to move so quickly through the membrane, when receptor-ligand complexes dissociate to be carried to the membrane inside an endosome do they become a liquid like liquid liquid phase separation?

# Intracellular pools of transferrin receptors result from constitutive internalization of unoccupied receptors.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC386520/?page=1>

Okay so it seems

# "Proteins with prion-like domains can form viscoelastic condensates that enable membrane remodeling and endocytosis"

[doi.org/10.1101/145664](https://doi.org/10.1101/145664)



Can I connect  
"Viscoelastic phase separation"  
with  
Synaptic exocytic pathways  
"Synaptic Vesicle Endocytosis in different model systems"

# Multi-receptor detection of individual bacterial products by the innate immune system  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6698371/>

# Astrocyte Calcium Signaling Leads to More Brain Complexity  
"The astrocyte network signals with (complex) calcium fluctuations" "gliotransmitters"  
"Astrocytes Are Half of the Brain" "astrocytes take up potassium released during neuron action potentials to maintain ionic balance and pick up neurotransmitters like glutamate and GABA that are secreted at synapses."  
<https://jonliefmd.com/blog/astrocyte-calcium-signaling-leads-to-more-brain-complexity>

# Extracellular Matrix critical to neuroplasticity" Jon Lief M.D.  
<https://jonliefmd.com/blog/extra-cellular-matrix-is-critical-to-neuroplasticity>

# Using a Supercomputer to Understand Synaptic Transmission  
<https://neurosciencenews.com/synaptic-transmission-20875/>

hebb synaptic memory ltp Review Article  
# "Is plasticity of synapses the mechanism of long-term memory storage"  
[https://www.nature.com/articles/s41539-019-0048-y?fbclid=IwAR3ZZN3YNhn73wml5e4kFUO-w4c9-uaQYaluY\\_tdb3ZTDBpP3A0rj2C-ut8](https://www.nature.com/articles/s41539-019-0048-y?fbclid=IwAR3ZZN3YNhn73wml5e4kFUO-w4c9-uaQYaluY_tdb3ZTDBpP3A0rj2C-ut8)

group with sharp wave ripples  
On how correlations between excitatory and inhibitory synaptic inputs maximize the information rate of neuronal firing  
<https://www.frontiersin.org/articles/10.3389/fncom.2014.00059/full>  
<https://www.jneurosci.org/content/31/47/17300>

separate exit terminal types?  
[https://www.google.com/search?q=neurons+have+separate+inhibitory+%26+excitatory+inputs&rlz=1CDGOYI\\_enUS929US929&oq=neurons+have+separate+inhibitory+%26+excitatory+inputs&aqs=chrome..69i57.22011j0j4&hl=en-US&sourceid=chrome-mobile&ie=UTF-8](https://www.google.com/search?q=neurons+have+separate+inhibitory+%26+excitatory+inputs&rlz=1CDGOYI_enUS929US929&oq=neurons+have+separate+inhibitory+%26+excitatory+inputs&aqs=chrome..69i57.22011j0j4&hl=en-US&sourceid=chrome-mobile&ie=UTF-8)

# Martin Karplus paper simulation of chemistry  
<https://pubs.acs.org/doi/pdf/10.1021/ar020082r>

dorean gregans  
bacteria global superorganism  
multicellularity

epigenetics discussion contrasting anchors your ideas  
use it or lose it rule more conducive

brownian

# "From Empedocles to Symbiogenetics: Lynn Margulis's revolutionary influence on evolutionary biology"  
<https://www.sciencedirect.com/science/article/pii/S0303264721000435>

# "Microcosmos: Four Billion Years of Microbial Evolution by Dorion Sagan, Lynn Margulis"  
<https://www.abebbooks.com/book-search/title/microcosmos/author/dorion-sagan-lynn-margulis/us-ed/>

# "what is life"  
<https://www.amazon.com/What-Life-Lynn-Margulis/dp/0520220218>

# "Molecular Dynamics Simulations of Biomolecules"  
<https://pubs.acs.org/doi/pdf/10.1021/ar020082r>

# "CHARMM: the biomolecular simulation program"  
Development of Multiscale Models for Complex Chemical Systems From H+H2 to Biomolecules  
Nobel Lecture, December 8, 2013  
by Martin Karplus  
Department of Chemistry & Chemical Biology, Harvard University, U.S.A. and  
Laboratoire de Chimie Biophysique, ISIS, Université de Strasb  
<https://www.nobelprize.org/uploads/2018/06/karplus-lecture.pdf>

# Three Distinct Brain Circuits in the Thalamus Contribute to Parkinson's Symptoms  
<https://neurosciencenews.com/parkinsons-thalamus-circuit-20780/>

# "Spatio-Temporally Efficient Coding Assigns Functions to Hierarchical Structures of the Visual System"  
[https://www.frontiersin.org/articles/10.3389/fncom.2022.890447/full?utm\\_source=S-TWT&utm\\_medium=SNET&utm\\_campaign=ECO\\_FNINS\\_XXXXXXXXX\\_auto-dlvrit](https://www.frontiersin.org/articles/10.3389/fncom.2022.890447/full?utm_source=S-TWT&utm_medium=SNET&utm_campaign=ECO_FNINS_XXXXXXXXX_auto-dlvrit)

It seems that just as flooding neurotransmitters inhibits a neuron from firing, flooding nucleotides inhibits cell growth, relevant also to spine & receptor growth

# "Gut bacterial metabolite promotes neural cell death leading to cognitive decline"

# "Nucleotide imbalance decouples cell growth from cell proliferation"

<https://www.nature.com/articles/s41556-022-00965-1>

# Cellular Oscillating Tomography: Cell Signalling

Connect the following with Jon Lief MD Map and Cellular Oscillating Tomography map

# Cell Surface Receptors: Types & Downstream Mechanisms

<https://www.lecturio.com/magazine/cell-surface-receptors-types-downstream-mechanisms/>

# "How Do Cells Respond to Signals?"

"Individual cells often receive many signals simultaneously, and they then integrate the information they receive into a unified action plan"

"But cells aren't just targets. They also send out messages to other cells both near and far."

"Once a receptor protein receives a signal, it undergoes a conformational change, which in turn launches a series of biochemical reactions within the cell. These intracellular signaling pathways, also called signal transduction cascades, typically amplify the message, producing multiple intracellular signals for every one receptor that is bound."

<https://www.nature.com/scitable/topicpage/cell-signaling-14047077/>

# on cell integration of signals

# "Cells Integrate Multiple Signals

"only cells that have the correct receptors on their surfaces will respond to the signal."

"Each cell receives a complex combination of signals which simultaneously trigger many different signaling pathways. Each step in a signaling pathway provides an opportunity for cross-talk between different signals. Through cross-talk, the cell integrates information from many different signaling pathways to initiate an appropriate response.

"Two pathways...

"Combinations of signals are important. Here, a cell responds only when both the yellow and the purple signals are present."

<https://learn.genetics.utah.edu/content/cells/insidestory/#:~:text=Cells%20communicate%20by%20sending%20and,itself%20can%20cross%20the%20membrane.>

I wish to reread the following article 100 times. It contains a lot of information that leads to expanding the granular resolution of Cellular Oscillating Tomography & Neural Array Projection Oscillation Tomography

# "Integration of signals"

<https://basicmedicalkey.com/integration-of-signals/>

# When receptors fire together, a learned pattern has been detected.

Donald Hebb's theory called Hebbian learning applies not just to neuronal cell assemblies but also to individual cells, non-neuronal cells, even bacteria. Essentially we go from "when neurons

fire together they wire together" to "when receptors receive coincident activations they compute unique functions" bringing a multi-neuron process backwards down to a single cells function, it means the physical configuration of the receptors represent memories, learn memory patterns, and only the right activations will activate those learned memory patterns encoded as receptor configurations

"Individual cells often receive many signals simultaneously, and they then integrate the information they receive into a unified action plan"

<https://www.nature.com/scitable/topicpage/cell-signaling-14047077/#:~:text=In%20order%20to%20respond%20to,into%20a%20unified%20action%20plan>.

# Cellular Oscillating Tomography: Interconnected signal pathways & context dependent cellular outcomes

This article below is an example of coincidence detection aka the mechanism referred to as when cells fire together they wire together, allowing a cell assembly to detect coincidences, but in this case the cell is detecting coincidences when it integrates multiple signals that result in a specific behavior activation from the cell, that is pattern recognition with a computed reaction (with Information Theory to explain how it is detected information incepting a function/behavior. Or what I call Cellular Oscillating Tomography

"A number of studies suggest that signaling pathways can regulate each other by direct control of ligand and receptor expression levels, triggering sequential signaling events in cells. "

"Signaling pathways are highly interconnected, and their cellular outcomes are context-dependent"

"Mapping signaling pathway cross-talk in Drosophila cells"

<https://www.pnas.org/doi/10.1073/pnas.1610432113>

# Cellular Oscillating Tomography: Epigenetics

"Integration of Signaling Pathways with the Epigenetic Machinery in the Maintenance of Stem Cells"

"Depending on the nature of the environmental change, a subset of membrane receptors gets stimulated, eliciting specific signaling pathways and enabling cells to make informed decision downstream" <https://www.hindawi.com/journals/sci/2016/8652748/>

# Cellular Oscillation Tomography: Bacteria moved to note a0283z

# Cellular Oscillating Tomography: Integration of coincidence temporal & spatial signal patterns.

"Integration of cellular signals in chattering environments"

"background noise effectively determines the information integration capabilities of the cell."

" In sum, precise orchestration of cellular events is a consequence of an efficient signaling modulation code involving upstream signaling dynamics and network motifs [1,32,33]. Hence, we hypothesize that functional information to direct cells towards specific responses is encoded in the temporal features of the signaling dynamics"

[https://www.researchgate.net/publication/224956868\\_Integration\\_of\\_cellular\\_signals\\_in\\_chattering\\_environments](https://www.researchgate.net/publication/224956868_Integration_of_cellular_signals_in_chattering_environments)

# Cellular Oscillating Tomography: Biochemical Gradient as tempo-spatial signals  
Chemical Gradients outside or inside cells may help facilitate cell behavior that requires coincident signal activation. (this concept might apply to pools of ions & pools of neurotransmitters & chemical gradients from vitamin deposits & oxidative or inflammatory debris = antigens)

# "Integration of cell cycle signals by multi-PAS domain kinases"  
"Cells must constantly make decisions involving many pieces of information at a molecular level. Kinases containing multiple PAS sensory domains detect multiple signals to determine their signaling outputs."  
<https://www.biorxiv.org/content/10.1101/323444v1>

# Cellular Oscillating Tomography: Procedurally Generation New Biological Functions inside multi-cellular organisms.  
is not just about novel receptor growth that forms responses to novel new patterns, its about how cells inside an organism compute/generate new functions, or novel responses, to signals they have never seen before, such as how cell might respond to new types of inflammation, or new environments. The principle of natural selection should work in any multi-cellular body, allowing cells to adapt, mutate, computer future structures, and evolve inside a single animal. It would be like growing a third eye while you are alive, and then passing it down to your offspring if that meant surviving where two eyed organisms did not.

# "The *Vibrio harveyi* quorum-sensing system uses shared regulatory components to discriminate between multiple autoinducers" 2006  
"this sensory information converges to control the expression of bioluminescence, biofilm formation, type III secretion (TTS), and protease production."  
"We propose that the *V. harveyi* quorum-sensing transition is not switch-like but rather operates in a graded manner, and that this signaling arrangement, which uses shared regulatory proteins, nonetheless provides *V. harveyi* a mechanism to respond uniquely to different AI input states."  
<https://pubmed.ncbi.nlm.nih.gov/17015436/>

My argument is that cell specificity, or the unique morphological architecture, receptor configuration, and combinatorial logical from protein interactions & signal cascades allows and is essential for each cell to represent a different memory, a different learned memory configuration. Every cell is managing, through it's physical structure, a learned memory state, that allows complex pattern recognition & function recall & the novel function computation from novel sensory inputs.

Every cell in the human body is an unconscious "oscillating tomographical memory pattern prediction" machine with "generative behavior or function outputs" and in a multi-cellular system it is analogous to an Entity-Component-System in the context of a game-engine, where the body

is the game engine, and the cells are individual entities that have their own set of components for reacting with system level oscillatory binding of learned reactions, learned & novel pattern sensing, and novel behavior/function/response generation.

# "Cross signaling, cell specificity, and physiology"

"Cell specificity results from the existence in any cell type of a unique set of proteins and their isoforms at each level of signal transduction cascades, from the space structure of their components, from their combinatorial logic at each level, from the presence of modulators of signal transduction proteins and of modulators of modulators, from the time structure of extracellular signals and of their transduction, and from quantitative differences of expression of similar sets of factors."

"The signal transduction machinery of a cell integrates all the signals it recognizes and translates them in a coordinated behavior. A signal for a cell is whatever is recognized as such by a receptor that itself initiates a response to this signal. A receptor is the structure that recognizes and reacts to the signal and interprets the specificity of the signal. "

<https://journals.physiology.org/doi/full/10.1152/ajpcell.00581.2001>

To over simplify, signals compound on top of prior signals to create feedback loops or oscillations of signal activity that integrate & amplify sensory integration & functional output (signalling output)

"By using a "non-binding" reporter of ligand shedding, we found that transactivation triggers a positive feedback loop from ERK back to the EGFR such that ligand shedding drives EGFR-stimulated ERK that in turn drives further ligand shedding. Importantly, activated Ras and ERK levels were nearly linear functions of ligand shedding and the effect of multiple, sub-saturating inputs was additive. Simulations showed that ERK-mediated feedback through ligand shedding resulted in a stable steady-state level of activated ERK, but also showed that the extracellular environment can modulate the level of feedback. Our results suggest that the transactivation circuit acts as a context-dependent integrator and amplifier of multiple extracellular signals and that signal integration can effectively occur at multiple points in the EGFR pathway."

<https://pubs.rsc.org/en/Content/ArticleLanding/2010/MB/c003921g>

Evolution gives us two big concepts, random mutation & natural selection, inbetween those two concepts the concept of "Cellular Oscillating Tomography" allows single cells & multi-cellular organisms, from bacteria to the entire animal kingdom including human beings to compute their future biological structure.

# Cellular Oscillating Tomography re-phrased:

So the new theory of evolution, that I am proposing, has 3 steps,

1. Random Mutation

2. Cellular Oscillating (Pattern) Tomography

Cell based novel pattern learning plus novel computed cell & multi-cellular structures (like organs & bodies)

3. natural selection at all scales,

Not just at the scale of organisms but also at the scale of proteins, virus's, bacteria, single celled organism, and multi-cellular organisms.

The oscillations or emergent behaviors from signal feedback loops and coincident & temporally cascading signal activations (at all scales) is part of how signals unify or entify tomographically to generate or program new biological structures & new behaviors or computed functions.

The same principles of cellular oscillating tomography, coincidence & pattern detection, being stored in the physical configuration of receptors applies to dendrites, the soma, & whole neurons & oscillating groups of neurons, and clusters of neurons with oligodendrocytes, microglia, and other cells.

# "Single Neurons Detect a Sequence of Events"

() Even more recent research shows for the first time that single neurons can detect and respond to a sequence of events.

() Individual dendrites also can distinguish these sequences.

() Each neuron can have tens of thousands of dendrites and each makes decisions that are then somehow merged into decisions for the entire neuron about whether to fire or not and what type of firing will occur."

<https://jonlieffmd.com/blog/what-do-single-neurons-know>

Functionally the morphological distinctiveness of a neurons dendrite is analogous to the distinctiveness of cellular receptor & protein configurations that allow a cell to have distinct unique behaviors reacting to distinct & unique signal patterns. This is why Cellular Oscillating Tomography leads directly into Neural Array (Signal) Projection Oscillation Tomography.

NAPOT Theory suggests that high phasic spiking inhibits the exit terminal array delaying an oscillating group relative to the larger oscillating group. IN other words Delayed Expression of the exit terminal of the activated neuron sets the new timing of the inhibited group by the decay rate of the fired action potential in the previous array. The tonic oscillation absorbs the burstlet, distributes it, and creates a synchronization pattern that dissipates the impact of the signal that group of neurons has received. Resulting in the temporal binding of your learned internal representations that are displayed to subsequent arrays that also embody learned internal representations.

# The Oscillatory "Memory Link"

"Delayed expression, How the brain segregates events that are temporally distinct is unclear.

Here we show that a delayed (12–24 h) increase in the expression of C-C chemokine receptor type 5 (CCR5)—an immune receptor that is well known as a co-receptor for HIV infection—after

the formation of a contextual memory determines the duration of the temporal window for associating or linking that memory with subsequent memories."

"This delayed expression of CCR5 in mouse dorsal CA1 neurons results in a decrease in neuronal excitability, which in turn negatively regulates neuronal memory allocation, thus reducing the overlap between dorsal CA1 memory ensembles. Lowering this overlap affects the ability of one memory to trigger the recall of the other, and therefore closes the temporal window for memory linking."

<https://neurosciencenews.com/memory-link-ccr5-20657/>

Pierre Janet in 1889 created a doctorate of science thesis that came with a graphical schema describing how he mapped his impression of distinct human personalities to different regions of the brain being activated. While this concept is simplistic if we scale up Cellular Oscillating Tomography to Cortical Column Oscillating Tomography we can imagine how at a large scale brain region activations map to different personality expressions.

This concept is covered very well in Dario Nardi's EEG Research with his students and his 2016 book "The Neuroscience of Personality" really good book.

^ ha I just invented a new term Cortical Column Oscillating Tomography CCOT but it is encompassed in the definition of NAPOT.

# NAPOT Motor Control: Why you are conscious of your muscle movement.

Notice that NAPOT, Neural Array Projection Oscillation Tomography, fits with the existing concepts of Hierarchical Tempo-Spatial Activation Sequences for incoming sensory inputs and outgoing motor sequences.

Concepts correlated with medical imaging data from systems like fMRI while subjects move their fingers.

What NAPOT is adding the picture of tempo-spatial activations is a framework that removes the predominant idea that what is being transmitted between neurons is electrical signals and replaces that with what is being transmitted between neurons & glial cells are phase changes in the oscillating group of cells read by neural arrays & shared & bound by the oscillating group, resulting in long lasting synaptic & dendritic morphological changes.

Whether the neuron is transmitting chemicals such as in a chemical synapse, or electricity in the case of electric synapses, what is really being transmitted is a phase change in the brainwave oscillation pattern for that group of cells.

These phase changes are detected by neural arrays and via neural arrays are observed by oscillating groups of cells, as physical changes to their baseline tonic oscillation activity.



So Hierarchical Motor Sequence Representations are Tempo-Spatial Phase changes. Think about that when you read the following.

# "Neural Organization of Hierarchical Motor Sequence Representations in the Human Neocortex"

"The findings challenge the common hypothesis of an orderly anatomical separation of different levels of an action hierarchy and argue for a special status of the distinction between individual movements and sequential context."

"Production of an entire sequence could then be achieved by sequential activation of the corresponding chunks, and new sequences could be generated by recombination of learned chunks (Sakai et al., 2003)"

"the core idea of a multi-level action hierarchy is that each level combines elements in the hierarchically lower level, facilitating the transition between lower-level elements."

"Each hierarchically higher level would lose some of the fine temporal details encoded at the lower level and, hence, represent the action at a more abstract level (Cooper and Shallice, 2000, Fuster, 2008, Humphreys and Forde, 1998, Miller et al., 1960)."

[https://www.cell.com/neuron/fulltext/S0896-6273\(19\)30567-7?\\_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0896627319305677%3Fshowall%3Dtrue&fbclid=IwAR0yUTZqUli6\\_s0GNWB09aIRSIjY7tZxV1TDfb8KL3mEM613hNUTxEfyU38#.YoP0\\_gZTLOM.faceobok](https://www.cell.com/neuron/fulltext/S0896-6273(19)30567-7?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0896627319305677%3Fshowall%3Dtrue&fbclid=IwAR0yUTZqUli6_s0GNWB09aIRSIjY7tZxV1TDfb8KL3mEM613hNUTxEfyU38#.YoP0_gZTLOM.faceobok)

The point in the article below about the same frequency content of the original data could point to validation for the Soliton Wave Hypothesis, or my new model of a neuron that integrates the Soliton Wave Hypothesis with the Hodgkin & Huxley model.

# Connect notes a0177z, a0286z, a0039z

Spatial and temporal muscle synergies provide a dual characterization of low-dimensional and intermittent control of upper-limb movements

"Second, we showed the existence of both spatial and temporal structure in the EMG data, extracting spatial and temporal synergies from a surrogate dataset in which the phases were shuffled preserving the same frequency content of the original data."

"Last, a detailed characterization of the structure of the temporal synergies suggested that they can be related to an intermittent control of the movement."

<https://www.biorxiv.org/content/10.1101/2022.07.11.499519v1>

a0271z

# Phase Shifts as Electromagnetic Wave Valence

What is "valence processing" in the context of biology? The following article talks about the BLA Basolateral Amygdala, the part of the Amygdala that receives most of the sensory information from the temporal lobe structures including the hippocampus, the auditory cortex, and other areas.

It is thought of as the emotional pipeline for emotional arousal in mammals. To the organism, some stimuli are repulsive, for example bitter, some are attractive, for example sweet. The organism's perception of the value of whether something is repulsive or attractive is called valence. Valence is like your built-in automatic attraction or repulsion, and the Amygdala, as a sensor transmitter node or an oscillating group of cells is thought to play a central role in valence processing, with the BLA being the sensor part of the Amygdala.

What caught my attention to this article was that the term valence has meaning in both the psychological and the physics realm. High valence in psychology is like the concept of good or positive relationship energy. In physics Valence electrons are the highest energy electrons in an atom, the most reactive electrons.

So I find it interesting that in a cognitive neurophysics article we have the emotional psychological concept of valence mapped to the concept of physics-based interactions in the brain, at the sensory input to the Amygdala, which involve electrical charges.

On top of that the concept of increasing or decreasing electrical valence maps directly to the concept of increasing or decreasing phase signals in NAPOT: Neural Array Projection Oscillation Tomography. What is being projected from a neuron & a neuron array is a phase change, that phase change could also be described as a change in relative electrical valence. On top of that interesting connection, your behavior in effect is absolutely mapped to the phase changes or valences moving between your neural arrays (which including any neuron and any oscillating group of cells such as a cortical column or an anatomical structure like the amygdala)

The memory patterns that form in each array, that define the morphology & synaptic connections of that oscillating group of cells, are formed specifically from temporarily & spatially oscillating signals that are encoding the structures of your brain with learned synaptic patterns.

The patterns that have higher valence, in terms of phasic spiking, are going to oscillate more, generating greater sharp wave ripples, that the tonic oscillations dissipate but are also changed by, that further encodes new long-term patterns with new synaptic changes. The higher valence patterns over time define your behaviors, your responses, but also the evolution of your responses overtime as your responses develop in increasing complexity.

# "Holographic stimulation of opposing amygdala ensembles bidirectionally modulates valence-specific behavior"

"Here we identify that neuronal encoding of valence in the BLA is graded and relies on the relative proportion of individual BLA neurons recruited in a stable appetitive or aversive ensemble."

<https://www.biorxiv.org/content/10.1101/2022.07.11.499499v1>

a0272z This note has high importance

# Taste & Hearing: Sensory Input Quantification

(taste, sight, hearing, smell, touch, feeling, balance, emotion)

(connected with note a0053z:The Phasic Tonic Relationship)

Cellular Oscillating Tomography means that the multiple activations of receptors & the subsequent cascading intracellular reactions & the signals that leave cells to affect other cells bind together via oscillation, and the changes in those oscillations create sensory patterns that we taste, hear, smell, see, feel, or sense in any other way.

This article below that makes the case for multiple receptors being useful for Umami detection is a great example of the concept I am describing with Cellular Oscillating Tomography, and also with Neural Array Projection Oscillation Tomography, multiple cell receptors are describe as being involved in the spatial & temporal detection of flavor & texture patterns over time.

The incoming patterns cause particular multiple receptor activations that constitute coincidence detections, the foundation of pattern detections, and cause cascading intracellular reactions, allowing the information to be first detected, as the protein morphology of the cell will respond only to certain patterns and only to certain patterns in certain ways, and then allowing the unique cellular responses leaving an array of cells to pass signals onward to other sets of cells in the oscillating cell assembling which acts like a collective sensor/transmitter awareness system through the oscillatory binding of distributed patterns.

# "Taste receptors for umami: the case for multiple receptors"

"umami taste detection may involve multiple receptors expressed in different subsets of taste cells. This receptor diversity may underlie the complex perception of umami, with different mixtures of amino acids, peptides, and nucleotides yielding subtly distinct taste qualities."

"Given the chemical and combinatorial diversity of umami tastants, it is reasonable to consider that the perceptual complexity of umami may be similarly encoded by multiple taste receptors."

"Using reverse transcriptase polymerase chain reaction, in situ hybridization, and a RNase protection assay, we identified mRNA for a variant metabotropic glutamate receptor (taste-mGluR4) that is expressed in rat taste cells"

"Biochemical and biophysical measurements further suggested that, in fish, glutamate and other amino acids may be detected via ionotropic receptor proteins, ie, ion channels that are gated open after binding of amino acids (7). In mammals, however, taste detection of glutamate (and presumably other amino acids) seems primarily to involve G protein–coupled receptors."

<https://academic.oup.com/ajcn/article/90/3/738S/4597159>

It is interesting to think that my taste buds depend on specific proteins inside metabotropic receptors. It's like wow metabotropic receptors can taste chemicals if they have the right proteins in them?

I think what this article does not explore is how the glutamate receptor activations might contribute to either neurons or glial cells firing. Most the work that I have done explores how ionic channels activate neurons, and specifically how variances in the quantity of potassium may change the duration that calcium channels are open for changing the number of vesicles releases and thus the valence of the activity being emitted from the nerve cell.

Although I have learned recently that glial cells can also spike, and transmit signals like a neuron, I do not know yet know how glial spiking might be different.

There was a recent article from Jon Lief M.D. about how the definition between ionotropic receptors & metabotropic receptors is blurring

# "Brain Receptors Just Got Even More Complex"

[https://jonlieffmd.com/blog/brain-receptors-just-got-even-more-complex?fbclid=IwAR1qC4q\\_e0U2ueJaceDQwkD0QW1UrtEtUOc0TRn55NvvTHMMhz3\\_o43vhbY](https://jonlieffmd.com/blog/brain-receptors-just-got-even-more-complex?fbclid=IwAR1qC4q_e0U2ueJaceDQwkD0QW1UrtEtUOc0TRn55NvvTHMMhz3_o43vhbY)

# The cAMP cascade in the nervous system: molecular sites of action and possible relevance to neuronal plasticity

<https://pubmed.ncbi.nlm.nih.gov/2445527/>

It seems that the metabotropic receptors might modulate the ionotropic receptors via the cAMP cascade, perhaps releasing potassium from the cell faster, and that is how they modulate the phase signal output of the neuron.

It is interesting to ponder next whether the output of individual exit terminal synapses might be individually modified so that the neuron could output even more complex patterns. I've been going on the assumption that the exit terminal outputs might be identical, but pattern distribution would multiple if each synaptic output was specially modified.

I need to understand a bit more about the differences between excitatory synapse & inhibitory synapses and whether cAMP cascades can selectively inhibit or excite these synapses.

# "Cyclic AMP modulation of a specific ion channel in an identified nerve cell: possible role for protein phosphorylation"

"serotonin-induced increase in potassium conductance in neuron R15 is mediated by cAMP."

<https://pubmed.ncbi.nlm.nih.gov/6269405/>

# "Modulation of calcium-activated non-specific cation currents by cyclic AMP-dependent phosphorylation in neurones of Helix"

"7. External application of serotonin (100-200 microM) caused a transition from bursting to beating activity of the neurones and mimicked cyclic AMP's effects on CAN currents."

"Two other neurotransmitters, dopamine and acetylcholine, were not significantly effective in reducing CAN currents."

" 8. Injection of a peptide inhibitor of cyclic AMP-dependent protein kinase suppressed serotonin's action on bursting and on CAN current."

"Our results indicate that CAN currents in Helix burster neurones are modulated by cyclic AMP-dependent membrane phosphorylation. They suggest that the physiological transmitter that induces this second messenger action is serotonin."

Serotonin triggers cAMP which triggers CAN channels.

"The dual control of CAN channels by two second messengers, namely  $\text{Ca}^{2+}$  and cyclic AMP, has important functional implications."

Dual control.

"While  $\text{Ca}^{2+}$  activates these channels which generate the pacemaker current in these neurones,"

The pacemaker current aka the tonic oscillation

"cyclic AMP-dependent phosphorylation down-regulates them, thereby resulting in modulation of neuronal bursting activity."

Bingo!

<https://pubmed.ncbi.nlm.nih.gov/1703569/>

receptor threshold research, cellular oscillating tomography

# Scientists make breakthrough in understanding serotonin receptors

<https://phys.org/news/2022-06-scientists-breakthrough-serotonin-receptors.amp>

# "Cyclic adenosine monophosphate"

"Cyclic adenosine monophosphate (cAMP, cyclic AMP, or 3',5'-cyclic adenosine monophosphate) is a second messenger important in many biological processes. cAMP is a derivative of adenosine triphosphate (ATP) and used for intracellular signal transduction in many different organisms, conveying the cAMP-dependent pathway."

"cAMP is a second messenger, used for intracellular signal transduction, such as transferring into cells the effects of hormones like glucagon and adrenaline, which cannot pass through the plasma membrane. It is also involved in the activation of protein kinases. In addition, cAMP binds to and regulates the function of ion channels such as the HCN channels and a few other cyclic nucleotide-binding proteins such as Epac1 and RAPGEF2."

"Cyclic AMP is synthesized from ATP by adenylate cyclase located on the inner side of the plasma membrane and anchored at various locations in the interior of the cell."

[https://en.wikipedia.org/wiki/Cyclic\\_adenosine\\_monophosphate](https://en.wikipedia.org/wiki/Cyclic_adenosine_monophosphate)

# "Fine tuning of neuronal electrical activity: modulation of several ion channels by intracellular messengers in a single identified nerve cell"

"Both of these effects of serotonin are mediated by the intracellular second messenger cyclic AMP"

"The results indicate that a single neurotransmitter, acting via a single intracellular messenger, can modulate several classes of ion channels in a single nerve cell."

"Furthermore a single class of ion channel, that is responsible for a voltage-dependent calcium current, may be the target for modulation by at least two different intracellular messengers."

<https://pubmed.ncbi.nlm.nih.gov/2428903/>

In essence what your neurons are tasting can affect the potassium channels changing the neurons phase output duration, (described in my article & notes on synaptic unreliability) but also it seems they can directly effect calcium channels which means in theory the outputs of individual synapses could be modified (excited or inhibited to release more or less vesicles when the action potential fires)

So the complexity of the pattern output of neurons is increased I hypothesized a few paragraphs above before looking up the research. (Humor).

Folks have been telling me that neurons can't self regulate, but via cAMP they actually can.

# a0272z.spring

# "New mechanism responsible for controlling auditory sensitivity"

"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."

"The mechanism discussed in the study works by modifying a physical property of the gating spring, its stiffness, which is responsible for controlling how much the channel opens and closes in response to sound vibrations that enter the inner ear. The researchers studied the properties of the gating spring and the resulting activity of the channel in single sensory hair cells, and found that cyclic adenosine monophosphate (cAMP), a specific type of signaling molecule, reduced the stiffness of the gating spring and decreased the channel's sensitivity -- which is the first time a physiological mechanism for controlling gating spring stiffness has been identified."

<https://www.sciencedaily.com/releases/2022/07/220722184825.htm>

Interestingly combined with the research above note, points to the idea that as the hairs in your ear respond to sound vibrations, they cause the Gating Spring to move, which causes cAMP to possibly modify potassium channels, which changes the duration of the action potential, which causes the calcium channel duration on the exit terminal side to change, which causes variation

in the number of vesicles released in the exit terminal, which changes the phase pattern that the neuron passes on to its exit terminal array.

"The researchers studied the properties of the gating spring and the resulting activity of the channel in single sensory hair cells, and found that cyclic adenosine monophosphate (cAMP) a specific type of signaling molecule, reduced the stiffness of the gating spring and decreased the channel's sensitivity"

a0273z

# Eye sight: Sensory Input Quantification

# Healing eyesight?

"Glia Regulate the Development, Function, and Plasticity of the Visual System From Retina to Cortex"

"Visual experience is mediated through a relay of finely-tuned neural circuits extending from the retina, to retinorecipient nuclei in the midbrain and thalamus, to the cortex which work together to translate light information entering our eyes into a complex and dynamic spatio-temporal representation of the world."

"In the zebrafish retina Müller glia have become an important subject of study following observations that they can act as late-stage progenitor cells that can functionally repopulate damaged retina in adult fish (Bernardos et al., 2007), something that is not normally possible in the adult mammalian retina despite a high degree of similarity in structure and function (Karl et al., 2008). This work has started to identify promising avenues for restoring function in the damaged mammalian retina as the transcription factor Ascl1 has been shown to be upregulated in Müller glia in the retina of zebrafish following injury and to mediate the regeneration of retinal tissue; while importantly, no such expression of Ascl1 occurs in mammals following retinal damage (Karl et al., 2008)."

"Encouragingly, it has been shown that when Ascl1 is overexpressed in Müller glia in mice, along with an inhibitor of histone deacetylase, retinal regeneration is possible following injury suggesting a potential avenue to induce retinal regeneration in mammals (Karl et al., 2008)"  
[https://www.frontiersin.org/articles/10.3389/fncir.2022.826664/full?twclid=21ijm03bb0bupu8bb0645nwx66&utm\\_source=ad&utm\\_medium=tw&utm\\_campaign=ba\\_sci-hz\\_fncir](https://www.frontiersin.org/articles/10.3389/fncir.2022.826664/full?twclid=21ijm03bb0bupu8bb0645nwx66&utm_source=ad&utm_medium=tw&utm_campaign=ba_sci-hz_fncir)

healing eye sight?

<https://www.pnas.org/doi/pdf/10.1073/pnas.1510595112>

a0274z

(oscillat)

"What you are observing as innate tribalism I am observing as an innate multi-spatial-multi-tempo-scale holonic rhythm. Humans link together because different neuronal oscillations link together." - Micah

a0275z

(dendrite, synap)

"Nonlinear dendritic integration of sensory and motor input during an active sensing task"

<https://www.janelia.org/sites/default/files/Labs/Svoboda%20Lab/nature11601.pdf>

Micah's notes: Neurons transmit a phase signal from a synapse, and a coincidence of phase signals is what a dendrite is receptive to

dendrites have leaky membranes that create the requirement for coincident pattern detection, if the dendrite receives a single signal, but there isn't a coincidence, its membrane will leak the energy instead of firing. many con-current coincidences might fill up the neuron to the point that the soma burst event happens, and in a way that symbolizes that some percentage of the pattern that the synaptic arrangement on the dendritic side represents has been detected, it's like the neuron saying that there is an 80 percent pattern detection, with the percentage representing the neurons firing threshold whatever that is.

a0276z

(oscillat, dendrite, synap)

Talk about Koch

basically how the gamma wave frequency was one idea for how consciousness might work then oscillations

but each time the idea was sort of pushed aside. because the complete concept picture of how and what was happening was missing.

A new way to look at what the human brain

A new way to look at what the human brain is doing.

So I can list all of the great names in the first couple of pages, sort of an intrologue

We had this thing called compatible canvas's

I mean the brain's oscillations are canvas's for phasic neural circuit firing, except the canvas is temporally observing and collectively learning the synapse, dendrite, neuron, and neural circuit firing.

look up dipole electromagnetic wave scattering

and dipole electromagnetic wave focusing

is there any EM wave focusing to the center parts of the brain, which areas?

the indentations on a record or the holes on a cd rom both become something when the record or cd is played,



the bumps or dots will often become music that is played back

so imagine that if we can encode music as bumps, or files as dots on a cd rom, or we can magnetize the harddrive or change the magnetic alignment of cells in some other kind of memory chip that it is not inconceivable for the human brain to play back music with remembered hertz frequencies stored in audio patterns

but what I am saying is that the neurons are helping to store the memories and to play them back,

they are helping the oscillator to have a pattern that the oscillator can observe, learn, update, combine and integrate with other patterns

a0277z

(cortex)

Multi-modal representations, the building blocks of everything we perceive, consisting of patterns encoded in phase differences combined with tempo-spatial patterns accomplished by spreading out the phase differences in complicated temporal-spatial play back neural column firing patterns played all over the brain, with parts of the brain intelligently waiting listening learning sequences in order to predict and in order to fire in the right sequence in the right place and the right time in order to participate in a global pattern playback system, with the whole neo cortex taking turns participating in playing back learned sequences and listening and learning new sequences.

a neuron fires in a millisecond, so to experience a place indoors or outdoors for a sustained period of time is going to require a lot of similar neural firing to fire over and over again cyclically, the place you are in has to be rendered and rerendered by different parts of the brain over and over again in order to give you the continuing impression that you are in an actual place over a period of time. If the place was rendered once and then turned off and then rendered once and then turned off then reality would be like a strobe light, if it was rendered for 1 second and then turned off then you would see the place you are in for that 1 second, with the neural correlates happening for that one second, and then you would be in darkness after that, without visual awareness of the place you are in.

So what I am arguing is that consciousness is like a persistent rendering, or a lot of collated renderings playing out over time, you can say well a movie or a 3D volumetric video is a rendering over time but what is watching or listening to the video? The brain is both rendering a video and watching the video, and its watching because predictive coding is the process of neurons listening to the activity of other neurons, predictive coding is the brain listening to itself, and there are a lot of repeating patterns, a lot of echoes, a lot of the same, so much that patterns are hallucinated like a virtual reality software program, so imagine if a virtual reality

software program, like beat saber, rec room, or tilt brush was instead just rendering a version of reality, but then also learning the 3D photogrammetry of reality, and then also

Can a dipole emit a soliton wave?

Does a magnetic dipole emit magnetic waves?

Dipoles: Your brain is a fractal of dipoles, both electric and magnetic with eeg we measure the activity of the largest electric dipoles, and with meg we measure the activity of the largest magnetic dipoles, and the resulting activity of each type of activity is very different.

a0278z

(observer) "There isn't actually a countably infinite number of computer files. We do not yet have a file system which can handle arbitrarily large files"

That you know of, maybe she was making a reference to the simulation, if we are all in a computer simulation of reality, every three dimensional object could be represented by two dimensional code (on the surface of blackhole?)

It's also interesting how the in the app No man's Sky they used procedural generation to create an entire universe's worth of content, that just appears near an observer/player

what if our cosmos was like that? it saves memory by only rendering the cosmos around an observer

then you wouldn't need infinite storage space to store infinity, you just procedurally generate the part of infinity that is around an observer, you could even like use foveated rendering to cut down on the computational expensiveness of the cosmos

a0279z

(synap, oscillat, electromagnetism) a top level notion is the idea of the brain //not just as an oscillation factory, but ./ Nick, his map of arrows represented by synapses electromagnetism in the old brain

You thought dungeons and dragons could create a society that has to be secretive because of oppression from non-player society

so only player society can get to the center top level

the core matrix

a0280z

Protein Oscillation Tomography & Protein Signal Processing & Novel Protein Function, Protein-RNA interaction with Cells. Exocytosis, Endocytosis, New Protein Synthesis, LTD, LTP, connects to Calcium Dynamics & synaptic plasticity.

# Protein Oscillation Tomography.

Cutting to the question of what a single neuron can do, can it self regulate? Well this says that a single protein is capable of integrating multiple signals, so the concept of Cellular Oscillating Tomography applies to individual proteins.

Proteins detect coincident or temporarily cascading activation patterns, because of their distinct structure & react or activate behaviors based on those incoming signals. The behaviors or functions or reactions that individual proteins make to novel or new incoming sensed patterns effect a computation of future protein structures, or computed biological structures, that go beyond random mutation, but are still subject to natural selection.

# "Integrating Multiple Signals into Cell Decisions by Networks of Protein Modification Cycles"

"We present a general model of reversible protein modification networks and demonstrate that a single protein modified by several enzymes is capable of integrating multiple signals into robust digital decisions by switching between multiple forms that can activate distinct cellular processes"

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3183812/>

# "An open invitation to the Understudied Proteins Initiative"

<https://www.nature.com/articles/s41587-022-01316-z>

To develop NAPOT theory even further, even more detailed studies are needed to map the actual physics of how cells communicate. The general theory ought to hold, even as specifics are added in such as how exactly vesicle fusion occurs. How exactly the Dendritic memories are calculated on before their summations end up changing what the neuron produces in its exit terminal. Finally a detailed map & model that predicts the exact phase changes that a neuron will produce given a wide range of possible combinations of messages that it's receptors will have at once time or over time. In the latter case the potential message complexity that a neuron can receive is vast, reducable perhaps only in terms of likely messages, and in terms of the finite number of ways the neuron might respond to the signals it's receiving.

# Video of Vesicle fusing with the pre-synaptic membrane.

"Chemical signaling at a synapse occurs when a synaptic vesicle fuses with the presynaptic membrane in response to calcium influx through voltage-gated calcium channels. Vesicle fusion results in the formation of a fusion pore through which neurotransmitter packaged in the vesicle can escape into the synaptic cleft."

[https://twitter.com/slava\\_\\_bobrov/status/1588948498283536384?s=20&t=X81UEJN0iO\\_corcYb4ueqg](https://twitter.com/slava__bobrov/status/1588948498283536384?s=20&t=X81UEJN0iO_corcYb4ueqg)

## # "Using a Supercomputer to Understand Synaptic Transmission"

"The brain is an amazing network of communications," said Rizo-Rey. "When a cell gets excited by electrical signals, very fast synaptic vesicle fusion occurs. The neurotransmitters come out of the cell and bind to receptors on the synaptic side. That's the signal and this process is very fast."

"Supercomputers weren't powerful enough to resolve this problem of how transmission was occurring in the brain. So for a long time, I used other methods," he said. "However, with Frontera, I can model 6 million atoms and really get a picture of what's going on with this system."

<https://neurosciencenews.com/synaptic-transmission-20875/>

"Using all-atom molecular dynamics simulations to visualize the pre-fusion primed state during synaptic vesicle fusion is very original and this approach will certainly be used by others in the future. This work provides new insights into the protein organization prior to vesicle fusion that will help better understand the mechanisms of vesicle priming and evoked-release."

<https://elifesciences.org/articles/76356>

## Protein-RNA

Biology is more badass than many realize. Protein-RNA can turn into a drop of liquid that needs no membrane, it's viscoelasticity becomes programmed with a custom time interval before the Protein-RNA becomes solid again. This is beyond human technology today, but not tomorrow.

## # "Programmable viscoelasticity in protein-RNA condensates with disordered sticker-spacer polypeptides"

<https://www.nature.com/articles/s41467-021-26733-7>

## # "Viscoelastic phase separation in biological cells"

<https://www.nature.com/articles/s42005-022-00947-7>

## # Synaptic Vesicle Endocytosis in Different Model Systems

<https://www.frontiersin.org/articles/10.3389/fncel.2018.00171/full>

## # Multivalent interactions between molecular components involved in fast endophilin mediated endocytosis drive protein phase separation

<https://doi.org/10.1038/s41467-022-32529-0>

## Can I connect this to Protein Oscillation Tomography & T-Cells?

## # "Cytoplasmic forces functionally reorganize nuclear condensates in oocytes"

<https://www.nature.com/articles/s41467-022-32675-5>

a0281z

(oscillat, field)

A particle could be space contracting and expanding at a faster rate relative to atom scale, atom is a vortex of space, like a whirlpool, cyclone, or dissipative system.

imagine that space at large scales is like a time stretched particle field, meaning the amount of time it takes for a particle to travel between two points creates a phase pattern that is space itself

so spacetime on a macro scale is a particle, which is a phase pattern between two points in time.

the oscillation of an atom would literally create spacetime as the oscillation is literally lengthening the amount of time it will take for the particle to complete its journey, and since the particle is a phase pattern that is defined by the amount of time it takes to finish its path a particle that has infinite oscillations would manufacture infinite amounts of spacetime stretching & warping

so the atom represents a vortex in spacetime that is defining the curvature of spacetime which starts to fold over onto itself because distances in space are relative to the duration/force of oscillations. When vortices combine they create even larger vortices which creates even more spacetime

the vortices themselves are each attracting particles, creating collisions that clump like glue.

the particle itself, like an electron, might represent the activity of space folding, between the two states of having a position or having a momentum.

Seeing the particle as a phase/frequency in a decaying oscillator or resonator, its pattern is not truly defined until it reaches its destination, because of scale dependent time dilation the delayed observation of a particle can seem to define its pattern in the past

a0282z

# The simplified version of Neural Oscillatory Tomography  
which can also be called: Neural Array Projection Slice Phase Oscillation Tomography.

Do you remember when you were a kid and your thought that your eyes were projecting light out into the world, well in a sense your eyes are projecting light into your brain, and you are seeing the world inside out, (and upside down), so your eyes are literally projecting phase pattern signals from light into your brain which is where your world is modelled. You are seeing reality inside out.

[https://en.m.wikipedia.org/wiki/Emission\\_theory\\_\(vision\)](https://en.m.wikipedia.org/wiki/Emission_theory_(vision))

"The model of vision as we now know it first appeared in the 16th century, when Felix Platter proposed that the eye functions as an optic and the retina as a receptor. Light from an external source enters through the cornea and is refracted by the lens, forming an image on the retina—the light-sensitive membrane located in the back of the eye. The retina detects photons of light and responds by firing neural impulses along the optic nerve to the brain. There's an unlikely sounding quirk to this set-up, which is that mechanically speaking, our eyes see everything upside down"

<https://www.mentalfloss.com/article/91177/how-our-eyes-see-everything-upside-down>

To explain this concept I need to write the chapter on fractals, how the brain is a fractal of an eyeball, the grey matter on the outside would be like the retina of the eyeball, the midbrain would be a focal point like the back of the eyeball, the repeating fractal at different scales serves to make the brain a giant lens, a fractal of how the eyeball is a lens

I want to create art that shows a grid of eyeballs each with an led behind them, creating an image for the next grid of eyeballs, but then explaining that the neuron is like the fractal of an eyeball, the dendrite is the sensor, the axon is like the cable, and the exit terminal is the light.

Imagine that your eyes are shining light into your brain, now this is not the case, photos bounce off proteins in the retina, causing them to flip which triggers those cells to spike, triggering cascades of neural activity, waves of electric & chemical signals that affect your entire brain.

In note a0569z from 2012 I wrote about an experience with psychedelic mushrooms that may have happened between 2009-2011

"Micah Blumberg Another time I traveled through a parallel dimension of spacetime, into another universe. To visit some amazing new people, who I had connected with because psychoactive mushrooms had become the gateway between realities, and as I walked Berkeley and San Francisco with these men who were both born assigned women, I was in three layers of reality at once, and reality was breathing, and I saw people who had seemed like individual before, but I realize that they were like 200,000 people all at once, each person was like another parallel reality of the same person. They all said "I am" as if they were all unique, but all of these unique individuals were all the same, sharing a quality of their personality. I realized the personality was transcendent, the personality was driving them and not the other way around."

in audio note b0100y I went into much more detail about that experience

I said:

"think it was The Holographic Universe. The first couple chapters of that book are really great. After I began reading that book I began to hallucinate from the mushrooms. I could see multiple versions of the universe overlapping one another like layers in a 3D virtual reality photoshop that was reality. As if reality was a transparent onion with many layers. Each of the layers was slightly different, as if they were distinguished by tempo-spatial distinctions, or slight differences in their scale, their properties, or their position in space.

"01:18

:The differences were so slight however that I could barely sense their phase shifts, the differences in their phase shifts.

If you imagine that you are basically experiencing, like when you look around in reality, that you're experiencing a compounded pattern, that is lots of different patterns that your brain is individually rendering are vibrating, oscillating, patterns that are harmonically unifying to create your whole experience.

"01:51

"I would say these are like oscillations that have been imprinted with neural patterns, but these are decoherence patterns, decoherent phase patterns, inside the oscillations normal sync."

For the ear, there are still neurons involved, but we will replace the imagery with grids of ears, and on the back of the ears are speakers, but each ear represents a dendrite, and each speaker represents the exit terminal of that neuron, and behind that grid is another grid of neurons that also have ears on them, and speakers behind them.

The grids of eyes with lights on the back, the grids of ears with speakers on the back, are really just arrays of dendrites from neurons with exit terminals going to other grids or arrays of dendrites with exit terminals going to other neural arrays or grids or cortical columns.

So NAPOT: Neural Array Projection Oscillation Tomography means that your "Neural Arrays" are Projecting an Oscillating Phase Pattern that other Neural Arrays perceive and then Project, and all the arrays are bound together in space & time via oscillation to collectively Sense & Render, Sense & Render, Sense & Render your perception of reality.

So you might have the intuition that your eyes are projecting light into the world, because in a valid sense your eyes are projecting light information into your brain that your whole brain is sensing & rendering and putting together a tomographic rendering of reality, that it can parse, segment, and understand in a distributed way.

If we consider that your eyes are like cameras, what is in the eye? neurons, and neurons sense with the dendrite. Then the same neurons send a signal, that signal a transmission. So neuron is a device that senses something and transmits something. The neurons in your eyes sense images and transmit them to the brain. The neurons in your ear sense sounds and transmit them to the brain.

Whether these sensor transmitters are located in your eyes or in your ears they are still just nerve cells, sensing with the dendrite, transmitting with the exit terminal, and the neurons they are transmitting to are also sensing with dendrite and transmitting with the exit terminal.

The interneurons, the neurons that are not in contact with the world directly, they also have to sense images or sounds or some tactile information or some other kind of information pattern.

What matters is what kind of information pattern is moving around the brain between these nerve cells, that could carry information.

Phase variations can carry information, and that is what passes between neurons, changes in phase patterns, from the normal oscillating tonic pace setting current, to high phasic phase changes resulting from spikes, to mid level plateau phase burstlets, to inhibited neurons.

Phase variations between neurons across the networks of the brain are enough to carry the information of the mind, a mind that can render a pattern of what you are looking at, what you are feeling, hearing, tasting, smelling, standing on, balancing, moving, planning to move, or inventing next week.

Phase variations in the oscillating networks of the brain are the substrate of the mind, they are the computational rendering of reality as you and I know it.

a0283z

Cellular Oscillation Tomography: Bacteria

# Cellular Oscillating Tomography: Information processing & signal integration

Someone applied information theory to bacteria in 2009, and essentially it works with Cellular Oscillating Tomography Theory as I have written it only it the same theory works with Bacteria without any modification, and thankfully their article dives deep, it's a good read. After reading this I just think of Cellular Oscillating Tomography as a framework for organizing decades of prior research in computational biology at all scales. From waves to proteins, from Prokaryotes like Bacteria & Archaea to Eukaryotic cells including advanced multi-cellular organisms like people.

Over the decades there have been many research on attempts to apply information theory finding the neural code, studying cellular communication. This is at the heart of biology research & the study of computational biology, connecting to study of genetics or transcriptomics.

# "Information processing and signal integration in bacterial quorum sensing" 2009

"Our detailed analysis of the *V. harveyi* quorum-sensing network has implications for other prokaryotic signal integration networks. Signal integration is a common feature of many organisms, and bacteria have developed sophisticated molecular mechanisms for integrating signals from a broad range of inputs using two-component systems and phosphorelays (Perego, 1998; Bassler and Losick, 2006; Kato et al, 2007; Mitrophanov and Groisman, 2008). Our information theory analysis suggests that the need to minimize interference between signals probably places strong constraints"



"Our results suggest that information theory may prove to be a powerful general tool for analyzing biological signaling networks. Information theory provides a natural language for formulating questions about information processing and signaling integration in . For these reasons, we expect the application of information theory to yield new biological insights into cellular signaling in the future."

"Here, we develop a new framework for analyzing signal integration on the basis of information theory and use it to analyze quorum sensing in *V. harveyi*. We quantify how much the cells can learn about individual autoinducers and explain the experimentally observed input–output relation of the *V. harveyi* quorum-sensing circuit."

"two distinct mechanisms that limit information transmission when bacteria integrate multiple signals, biochemical noise and interference between different signals."

This connects with the idea that neurotransmitter flooding inhibits neurons and nucleotide flooding inhibits cell growth. What kind of flooding might inhibit the gravitational warping of spacetime in Quantum Gradient Time Dilation?

"Our results suggest that information theory may prove to be a powerful general tool for analyzing biological signaling networks."

<https://www.embopress.org/doi/full/10.1038/msb.2009.79>

# Multi-receptor detection of individual bacterial products by the innate immune system

"studies in recent years have highlighted the complexity of innate immune detection, with multiple host receptors recognizing the same microbial ligand. Understanding the collective actions of diverse receptors that recognize common microbial signatures represents a new frontier in the study of innate immunity, and is the focus of this Review."

"as many as four different receptors (...)survey the extracellular or cytosolic spaces (...) & operate in a complementary manner to induce distinct cellular responses."

(Box 1 in the article contains a great list of receptor types, for example Complex carbohydrates can be detected with C-type lectin receptors (CLRs))

(Box2 Pattern-recognition receptors sense host-derived molecules)

"multiple signalling pathways evolved to recognize not only signatures of microbial infection but also signatures of dysbiosis: including aberrant host physiology and host tissue disruption that occurs with many microbial infections."

"CD14 is best known for its role in relaying LPS to TLR4, but recent studies have revealed that this PRR induces a cellular response — endocytosis — that is independent of (and upstream of) TLR4–TRIF signalling activity."

# "Thus, caspase 11 represents the first example of a PRR that has multiple activation states depending on whether PAMPs or DAMPs are bound, and these have different functional consequences."

BINGO!

"Although all cell-surface-localized TLRs detect PAMPs that are present in the bacterial cell wall, the mechanisms by which productive ligand–receptor interactions occur differ."

Figure 1 "Four receptors induce five lipopolysaccharide response pathways to promote inflammation."

Figure 2 "Three receptors stimulate two pathways to induce inflammatory responses to flagellin."

Figure 3 "Three receptors and pathways induce inflammatory responses to lipoproteins."  
"Different bacterial lipoproteins are sensed at the cell surface by distinct TLR2 heterodimers<sup>12,13</sup> (FIG. 3)"

Figure 4 "Three receptors and pathways induce inflammatory responses to peptidoglycan."  
"Intracellular peptidoglycan is detected by several pattern-recognition receptors (PRRs), including nucleotide-binding oligomerization domain-containing protein 1 (NOD1) and NOD2"  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6698371/>

a0284z

Aug 21, 2012

(oscillat, emotion)

about an hour agoMark Andrews

Does Neo Mind Cycle Measure Oscillating Brain Waves?

about an hour agoMicah Blumberg

yes

that's not the purpose of my system, so what I mean is that it can

about an hour agoMark Andrews

I Like To Know The Quantitative Part Of A Process Even If That Part Is Not Predominant In The Goal Of Your System. I Felt It Was.

about an hour agoMicah Blumberg

I'm not in the practice of making and storing records of brainwave activity, unless someone asks for that

about an hour agoMark Andrews

I Would Ask Just For My Personal Knowledge.

about an hour agoMicah Blumberg

if someone wants a chart of their brainwaves "for any reason" after a session its okay, its no problem

17 minutes agoMark Andrews

I Guess It Is The SciencE Behind The Process. Thanks

2 seconds agoMicah Blumberg

I prefer to think that its merely a small part of the process. 1. measuring the brainwaves 2. converting them into sounds 3. using them to drive isochronic beats 4. a mind machine turning the isochronic beats into light and sound pulses. 5. Your ears and eyes recieve the light and

sound pulses generating a new wave of brainwaves. 6 the new wave of brainwaves is collected by the machine that measures brainwaves. 7. this results in a new light and sound pattern. 8. you begin to recognize how your thoughts feelings, emotions, big picture predictions or visions are effecting the light and sound 9. you begin to control the light and sound consciously, and through doing that you begin to create a map of associations, neurons firing together wiring together regions of your mind involved in choosing your innerstate, your feelings, your emotions, what you focus on, your big picture predictions, you are realizing how everything you feel and think about is connected to your neurophysiology, you are becoming conscious of your brainwaves, brain self-awareness is increasing, and all the new connections mean more self coordination, improved neuroplasticity, which is your ability to flexibly react to whatever happens in life, more creativity, more great ideas, more great success's, more long term happiness increases! 10. So measuring your brainwaves is a small but important part of the process, its a key part of what makes this a "mind cycle" or "mind loop"

its different from other forms of neurofeedback and other forms of brainwave entrainment like equisync, because of the inclusion of EEG driven isochronic beats, the beats are stimulating your neurons to fire, releasing healthy brain chemicals, but unlike equisync which is a one way conversation, these bits are actually informed by your brainwaves, so its like a two way conversation. regular brainwave entrainment is like television, its one way, the tv screen actually broadcasts alpha waves, so does the monitor you use to connect to the internet, but the internet is two way back and forth dynamic conversation, thats what neo mind cycle gives, a more interesting and thus more effective brainwave entrainment. Because in the science of brain plasticity, it is mission critical that your exercise or treatment is interesting, engaging, novel, and fun, otherwise your brain activity is not being engaged, and it won't be as fun.

a0285z

(synap, oscillat, dendrite, cortex, vector) #5 #dendrites

ndma spike

backward spike

forwards spike

Wisam // Wiz-am We-Sam

Catarina says combined different inputs, sensory motor cortex input to striatum prediction cell, combined with

not all inputs are equal, sensory motor inputs in the amygdala, I just had to excite 5 boutons with a tiny laser could generate a way bigger upstate from current upstate, there are differences in brain regions and cell types from the intensity that it creates.

ON INTELLIGENCE spines might store temporal information

or temporal and spatial information to detect predict

a micro column within a cortical column might represent a vector

how might a dendrite pass on the detection of temporal information to the AP

how does a column affect the brains oscillations

do columns have their own neural oscillations

is there a mathematical structure of knowledge at the level of cortical column

does that involve wavelets,  
20 years of research of  
functional level

if you have a dendrite segment  
8 or 9 synapses within 5 milliseconds can imitate an ndma spike  
extremely sparse patterns detected by dendrite segment predisposes an neuron to fire stronger  
or more often

two answers

the synapses have to be co-active within a very short period of time  
a population code, instantaneous activation  
the same group of neurons, recurrently connected  
a layer of cells which is feeding onto itself  
the context is what the layer was representing a previous time step a few milliseconds ago

the layer has activity that predicts activity, that represents previous activity

in the 2016 you can learn non-markovian sequences  
different musical pieces will share notes in common

the same mechanism can store knowledge in a reference frame  
a coordinate by a collection of neurons is a prediction for what happens next

a0286z

(synap, oscillat, dendrite, electromagnetism, cortex, soliton, vector, dissipation)

# Connect notes a0177z, a0286z, a0039z

3 Types of Simultaneous Soliton Wave Transmission + Hodkin Huxley. The oscillatory dynamics of a neuron from dendritic computation to multi-vesicle release.

at a higher level the neuron firing could be seen as creating a magnetic arrow inside a four dimensional electromagnetic phase space created by the rest of the brain, essentially a vector written into negative space, because the action potential as an electrical event is probably creating an electromagnetic wave in the brain, at the same time the simultaneous creation of a mechanical wave & a magnetic wave, from the electrical wave would perhaps be of value for motor signals, moving the human body requires a lot more signalling power than what a single neuron transmits, for electricity to create soliton waves via the action potentials would potentially

create motor power, and the dissipation of those electromagnetic waves would probably increase the chances of oscillator behavior emerging as a consequence of a larger group of neurons receiving the same signal at the same time, or close to the same time.

The Synapse potentially transmits three types of soliton waves simultaneously, each exit terminal might be sending a smaller soliton wave fractal of the action potential's mechanical vibration wave, a smaller soliton wave fractal of its electrical wave via chemical transmission, and a smaller soliton wave fractal of its magnetic wave. This would allow each neuron to correlate the 3 types of waves with the dendrite serving as a detector, or a pooler that creates the 4 dimensional (3 dimensions of space and 1 of time) soliton wave form that neurons on the receiving end will use to compile their own picture or potentially a 4 dimensional pattern representation of what signals were transmitted that maps, correlates, crafts, produces and transmits more such combinations of soliton wave transmissions. If this is true then a neural firing sequence in the auditory cortex could represent a musical note at each interval, or at the firing of each neuron, that is then detected or observed by

Note that a soliton wave transmission is a phase with specific topological characteristics in 4 dimensions, so its four dimensional surface morphs over time. The next neuron is perhaps with its dendritic collection shrinking 4 dimensional wave patterns from other neurons into simply micro-voltage events over time, these would likely co-occur with micro vibration events, and micro-magnetic events that shake and pressurizes the mechanical wall of the cell that is held together by electromagnetism, allowing it to expand so transmitters can flood in, like a balloon sucking in neurotransmitters slowly, until it needs to blow them out with the action potential event.

Essentially the wave form of the action potential by itself is a frequency with amplitude, but the multi-possible microvesicle release, with options between 0, 1, 2, 3 vesicles being released, depending on the wave form of the action potential, that means that both the amplitude & frequency of the action potential is being transmitted, in a smaller form, across the synapse to other dendrite computers.

If the amplitude & frequency transfer does not include soliton waves, then at the very least patterns could still be computed at the network level, because you would have a situation where neurons could at least monitor the phase patterns of other neurons knitting together 4 dimensional pattern representations by themselves, but they would be distributed to other neurons through multiple firing events instead of with a single firing event. If the soliton wave hypothesis combined with Hodgkin & Huxley + Chemical Neurotransmitter are both true, then a single neuron would be able to observe, learn, and transmit 4D patterns to its network. If only the chemical neurotransmitter theory is true, then at least neurons can communicate both their amplitude & frequency via multi-vesicle-release, which by itself is going to transmit a temporal pattern that has spatial characteristic into the network. In both situations the neurons are using their dendrites to track 4D patterns (at least via the build up of ions in the branches & body that create the electromagnetic charge that distributes transmitters and opens up ion channels in the exit synapses) and their synapses to transmit patterns over time to the network. A tempo spatial

pattern can be as simple as a time series of voltages, so the synapse firing can create & track a time series of voltages, so can the dendrite through ion charge build up, including dendritic action potentials, the soma, where the cell's primary action potential event happens is a signal convergence event. The signal output could be a vector representing the frequency or phase or voltage or a wave, with one vector representing its frequency & amplitude (the magnitude of its chemical distribution) which are inversely related. The chemical pressure in the synaptic cleft could be increasing, which could lead to sodium ions being pushed into the next cell, even as the excitation of the membrane of the next cell is causing the next cell to explain and pull in new neurotransmitters like a balloon.

and electromechanical wave electromechanical wave through the air that could represent a sound or a light pattern or a touch sensation that is heard or felt or seen by the post-synaptic dendrite, and these mechanical waves are symbolic of the quantity of ions being let into the neuron by the neurotransmitters

# Multi-Vesicle -> Multi-scale Magnitude Neuro Transmitter Release (referenced in b0123y and b0067y.md)

# 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>

So imagine that a low amplitude high frequency phasic action potential spike transmits both neurotransmitters and a mechanical wave that is received as sodium channels open on the other side of the synapse. The delta (or amount) of the mechanical wave ought to correlate 1:1 with the delta of the synaptic transmission.

# The magnitude of the wave, determined by Potassium (see Synaptic Unreliability article a0221z.md) is passed via duration (calcium channels open longer)

Which translates to a great number of vesicle (lipid or fat sacs containing thousands of neurotransmitters to be release) 0, 1, 2, or 3 vesicles transmitted in each interval (action potential firing), representing oscillation phases for four neuronal phase states: inhibition, tonic firing, excited firing, and really excited firing. This allows the neuron to store the meaning of a phase event as a charge resulting from ion build up. Each event sets an interval for the neuron's clock, which is essentially counting until it fires, making it an oscillator that essentially learns patterns by changing the configuration of its synapses or having those synapses reconfigured by other neurons.

a0287z

# NAPOT Revision 3 The Anti-Spike: A negative soliton wave

# "Frequency-specific neural signatures of perceptual content and perceptual stability" doi: <https://doi.org/10.1101/2022.03.18.484861>

"Combining multivariate decoding and neural state-space analyses, we found frequency band-specific neural signatures that underlie the content of perception and promote perceptual stability, respectively. Across different types of images, non-oscillatory neural activity in the slow cortical potential (SCP, <5 Hz) range supported the content of perception. By contrast, perceptual stability is influenced by the amplitude of alpha and beta oscillations"

Actually a twist on the way I think about NAPOT but consistent with my prediction of inhibition being a code underneath the tonic oscillation. Inhibition therefore is like an anti-particle or anti-matter, or anti-spike, meaning your brain notices it. because it expects the tonic oscillatory synchrony, and this paper backs the idea I think of inhibition defining patterns in the brain. They document stable high magnitude tonic oscillations at 20hz and below (and above 5hz), but in this paper, instead of a high phasic spike causing a neural signature, its the lower sub <5 Hz non-oscillatory (inhibitions or negative spike or silent plateau firing) search notes for silent plateau & link here. Which means that in the 6th layer of cortex & thalamus, a delta frequency resulting from inhibition or silent plateau is like an inverted spike to the theta frequency. Awesome!

This is the beginning of NAPOT Theory Revision 3.

"The modern theory of antimatter began in 1928 in a paper by Paul Dirac. The Schrödinger wave equation for electrons predicted the possibility of antielectrons. Discovered in 1932 & named positrons."

"we applied time-resolved multivariate decoding to whole-brain MEG data (for details, see Methods). We tested three components of neural field potentials — slow- cortical potential (SCP, < 5 Hz), alpha-band amplitude (amplitude envelope of 8-13 Hz filtered data) and beta-band amplitude (amplitude envelope of 13-30 Hz filtered data) — in their ability to distinguish between the two percepts that are alternatively experienced for each ambiguous figure. The SCP activity corresponds to the low-frequency component of the broadband, non-oscillatory (i.e., aperiodic) activity (He et al., 2010; He, 2014), while the alpha and beta bands have prominent oscillatory activity (Figure S1 A-B)."

"Decoding accuracy in the SCP band was highest in the first second after image onset and then drops to a lower level (likely due to neural adaptation). The higher decoding accuracy in the Unambiguous condition as compared to the Ambiguous condition is likely due to the differences in sensory input that coincides with different perceptual contents, as well as consistent timing across all trials (all image presentations last 5 seconds, as opposed to variable percept durations in the Ambiguous condition). Lastly, as in the Ambiguous condition, the SCP decoder of perceptual content generalized well across time in the Unambiguous condition (Figure 2D, right column), suggesting that the underlying neural code is stable over time after the very initial image onset-related activity."

Stable information over time implies the SCP is a soliton wave. YESSSS!!!!!!

"Together, these results show that perceptual content information is decodable from SCP activity, but not from the amplitude of alpha or beta oscillations, regardless of whether sensory input is ambiguous or not."

because information theory the rare signals have high information (SCP) and the common signals (tonic alpha & beta) have low information

It's a song of fire & ice.

"Together, these results show a frequency-band separation of information related to perceptual content and perceptual stability, with the former encoded in raw fluctuations of low-frequency SCP activity, and the latter primarily influenced by the amplitude fluctuations of alpha and beta oscillations."

I will have to add to the note on the Phasic Tonic Relationship the 'SCP (Inhibited) Tonic Relationship', because its the inverse relationship.

The article below is evidence for what I call Soliton Slow Cortical Potentials (SCP) or (Anti-matter) Negative Action Potentials

# "Ultra-rapid axon-axon ephaptic inhibition of cerebellar Purkinje cells by the pinceau"

"Excitatory synaptic activity in the brain is shaped and balanced by inhibition. Because inhibition cannot propagate, it is often recruited with a synaptic delay by incoming excitation. Cerebellar Purkinje cells are driven by long-range excitatory parallel fiber inputs, which also recruit local inhibitory basket cells. The axon initial segment of each Purkinje cell is ensheathed by basket cell axons in a structure called the pinceau, which is largely devoid of chemical synapses. In mice, we found at the single-cell level that the pinceau mediates ephaptic inhibition of Purkinje cell firing at the site of spike initiation. The reduction of firing rate was synchronous with the presynaptic action potential, eliminating a synaptic delay and allowing granule cells to inhibit Purkinje cells without a preceding phase of excitation. Axon-axon ephaptic intercellular signaling can therefore mediate near-instantaneous feedforward and lateral inhibition."

<https://www.nature.com/articles/nn.3624>

# Medical Imaging Tech tool

"Compared to other multivariate analysis methods, the neural state-space method has specific advantages and is well-suited to addressing the questions investigated herein. First, compared to multivariate decoding, the state-space method extracts multivariate neural activity patterns relevant to multiple behavioral metrics simultaneously, as opposed to investigating neural correlate of one behavioral metric at a time. Second, compared to automatic dimensionality reduction, such as PCA and similar techniques (Churchland et al., 2012; Cunningham and Yu, 2014; Baria et al., 2017), the state-space approach directly identifies the neural activity pattern (i.e. neural sub-space) relevant to a particular behavioral metric, as opposed to being behavior-agnostic."



"While perceptual content is encoded in the activity pattern of low-frequency neural activity in the SCP band, perceptual stability and perceptual memory are influenced by the fluctuations of alpha and beta oscillation amplitudes."

"Neural state-space analysis: To work out the relative contributions of different behaviors to neural activity patterns, we developed a novel multivariate analysis method to extract the neural sub-space relevant to each behavior, following the approach used in (Mante et al., 2013). While perceptual content is clearly an important aspect of behavior, there are other aspects of behavior which account for the perceptual switching dynamics (Ambiguous condition) and perceptual memory (Discontinuous condition). For the Ambiguous condition we defined 4 behavioral metrics for each time point that occurred between button presses for the two percepts (i.e. not for time points preceded or followed by an unsure button press). The 4 behavioral metrics were:

- Type, a binary variable indicating the current percept.
- Duration, a continuous variable which takes the same value throughout a percept and is normalized within subject (i.e., 0 for the shortest percept reported, and 1 for the longest percept).
- Switch, a continuous variable that was 0 at the time of a button press and 1 at the midway point between button presses, indicating the relative temporal distance to perceptual switches.
- Direction, a binary variable indicating whether the current percept is stabilizing (i.e., timepoint is in the first half of its duration) or destabilizing (i.e., in the second half of its duration)."

"Significant temporal clusters of image/percept decoding exist in the SCP range throughout image presentation, but not for alpha/beta amplitude. (Right) Temporal generalization matrices showing significant generalization across a large proportion of the image presentation duration."  
<https://www.biorxiv.org/content/10.1101/2022.03.18.484861v1>

"Spatiotemporal properties of glutamate input support direction selectivity in the dendrites of retinal starburst amacrine cells"

"Using a connectomics-inspired computational model, we demonstrate that input kinetics play an important role in shaping direction selectivity at low stimulus velocities. Together, these results provide direct support for the 'space-time wiring' model for direction selectivity."  
<https://www.biorxiv.org/content/10.1101/2022.07.12.499686v1>

Functional fractal pattern of heterogeneity at the person level and at the neuron level, but perhaps this means each neuron has an identity or an address that represents a specific memory through its learned connections and a specific pattern to its exit terminal network when its action potentials (of different scales) fire (transmitting phase waves differentials with neurotransmitters).

"Neural diversity quenches the dynamic volatility of balanced neural networks"

"Heterogeneity is the norm in biology. The brain is no different: neuronal cell-types are myriad, reflected through their cellular morphology, type, excitability, connectivity motifs and ion channel distributions"

<https://www.biorxiv.org/content/10.1101/2022.08.25.505270v1>

The following is an example of a recurrent neural network model that rediscovers the concept of coincidence detection (humor) but the model also backs the concept of excitability (phase wave variation) for linking memory sequences over time, backing NAPOT theory.

"Intrinsic neural excitability induces time-dependent overlap of memory engrams"

"Our results suggest that the temporal linking of memory engrams arises from co-activation of different neural ensembles, mediated by the interaction of time-varying excitability and synaptic plasticity. Our model makes testable predictions about how the balance among inhibition, feed-forward inputs and excitability is crucial for determining the extent of overlap among engrams of temporally close events."

<https://www.biorxiv.org/content/10.1101/2022.08.27.505441v1.full.pdf>

Good paper on oscillatory dynamics

"Boosting of neural circuit chaos at the onset of collective oscillations

Agostina Palmigiano, Rainer Engelken, Fred Wolf"

doi: <https://doi.org/10.1101/2022.08.28.505598>

Might be relevant to people working with Neuropype, integrating sensor data

Medical Imaging tech

"Linking neuronal and hemodynamic network signatures in the resting human brain"

<https://www.biorxiv.org/content/10.1101/2022.08.28.505586v1>

A low dimensional cognitive-network space in Alzheimer's disease and frontotemporal dementia

<https://www.biorxiv.org/content/10.1101/2022.08.29.504748v1>

"Local Field Potentials, Spiking Activity, and Receptive Fields in Human Visual Cortex"

This paper shows the inverse relationship between magnitude & frequency, exactly what NAPOT theory predicts, when you decrease frequency magnitude (spatial area effect) increases.

"We recorded LFPs[local field potential] via macro-contacts and discovered that RF[Receptive Field] sizes estimated from low-frequency activity (LFA, 0.5 – 30 Hz) were larger than those estimated from low-gamma activity (LGA, 30 – 60 Hz) and high-gamma activity (HGA, 60 – 150 Hz)." <https://www.biorxiv.org/content/10.1101/2022.08.28.505627v1>

Super interesting article on Grid Cell Percolation, I will read it tomorrow

<https://www.biorxiv.org/content/10.1101/2022.08.26.505489v1.full.pdf>

Evolvable neural units that can mimic the brain's synaptic plasticity

<https://techxplora.com/news/2021-01-evolvable-neural-mimic-brain-synaptic.html?fbclid=IwAR2H6-9F0NfGcEHXal-0hJZ0FgK2RBluqYgd1jzebLYLLR78YNt5xd0sv5Y&fs=e&s=cl>

Medical Imaging tech tools

"Multivariate Pattern Analysis and Confounding in Neuroimaging (MVPA)"

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5154735/>

I like this article on PCA Principle Component Analysis

"Variance is information." This quote is exactly in alignment with NAPOT, variances in Neural Array Projection Oscillation Tomography is the information that neural arrays are rendering to other neural arrays that when oscillated becomes the canvas of the mind

<https://towardsdatascience.com/principal-component-analysis-pca-explained-visually-with-zero-math-1cbf392b9e7d?gi=d9c9a09b0b0a>

Maybe I should add data scientist to my resume.

In the rendering + tomography section that is where I combine notes on the Holographic Brain/universe with neural coding, and tomography

Consider a wave, the height of the wave is the amplitude, and the width of the wave is the duration, if you increase the frequency then the magnitude must decrease (the magnitude is the additive combination of amplitude & duration) in EEG measurements the amplitude appears to have an inverse relationship with frequency. (EEG frequency/hz is sampled at regular intervals such as 256hz per 1 second of time). If duration is consistent and frequency is changing then there has to be an inverse relationship between amplitude & frequency. If Amplitude is consistent (such as with all or none action potentials) and frequency is changing then duration has to change (which is part of how I connected in my mind that magnitude (via the duration of the Action Potential) has to be changing with frequency, and thus frequency cannot be the only thing that a neuron passes onward, I didn't discover this fact but I knew to look for it in the research because of my understanding of waves.)

EEG Sampling rate explained

"The sampling rate describes the number of times that the signal is measured per unit of time, usually given in Hertz (Hz) = 1/second (Figure 1). Notice that although the EEG is an analog signal (continuous in time), it has to be converted into a digital signal (discrete in time) in order to be processed by the computer"

"Generally, sample rate selection works as follows. For neuroimaging research, the minimal acceptable sample rate is 256 Hz. For more challenging scenarios, 512 Hz is typical, but this can be increased up to 1024 Hz, which is considered a very high frequency for EEG data. In real-time neuroscience (neurotechnology and biomedical applications) or mobile applications, 256 Hz is usually the standard as the data need to be transferred and processed in near real-time."

<https://www.bitbrain.com/blog/eeg-amplifier>

The point is that because magnitude is inverted to frequency, if frequency changes then either the amplitude changes, or the duration changes, or both the amplitude & duration changes. This is true for all waves at all scales of the cosmos, from gluons to Ganymede to Gamma ray bursts, if the frequency increases the sum magnitude decreases, and if the sum magnitude increases the frequency must decrease. (That is why if you fly faster you get heavier and for you time slows down. You are also a wave and if your frequency increases, your magnitude must

decrease, which usually means that either you get smaller in area (experiencing greater gravitational force) or time for you slows down (Reference Quantum Gradient Time Crystal Dilation in my notes aka Quantum Gradient Time Dilation.)

"Multimodal Object Representations Rely on Integrative Coding"

"Combining information from multiple senses is essential to object recognition. Yet how the mind combines sensory input into coherent multimodal representations, the multimodal binding problem, remains poorly understood"

Actually I defined this concept in NAPOT theory that predates your paper.

"Our novel paradigm decoupled the learned multimodal object representations from their baseline unimodal shape and sound features, thus tracking the emergence of multimodal concepts as they were learned by healthy adults"

Your novel paradigm (humor)? Your paradigm describes part of NAPOT. Neural Array Projection Oscillatory Tomography. Which is my thesis. (Lets be friends though.) I will cite your paper in my book.

"Critically, the representation for the whole object was different from the combined representation of its individual parts, with evidence of an integrative object code in anterior temporal lobe structures."

"Intriguingly, the perirhinal cortex, an anterior temporal lobe structure, was by default biased towards visual shape, but this initial shape bias was attenuated with learning. Pattern similarity analyses suggest that after learning the perirhinal cortex orthogonalized combinations of visual shape and sound features, transforming overlapping feature input into distinct multimodal object representations. These results provide evidence of integrative coding in the anterior temporal lobes that is distinct from the distributed sensory features, advancing the age-old question of how the mind constructs multimodal objects from their component features."

Great work!

"One theoretical view predicts that multimodal objects are built from component 16 unimodal features represented across distributed sensory regions.<sup>2</sup> Under this view, when a child 17 thinks about "frog", the visual cortex represents the appearance of the frog whereas the auditory 18 cortex represents the croaking sound. Alternatively, other theoretical views predict that objects 19 are not only built from sensory features, but that there is also an explicit integrative code distinct 20 from the features (i.e., the whole is different than the sum of its parts).

"We found that multimodal object concepts were represented as distributed sensory-  
4 specific features along the visual and auditory processing pathways, as well as explicit  
5 integrative combinations of those features in the anterior temporal lobes."

This confirms high level sparse distributed memory or sparse distributed representation (SDR, Numenta)

<https://www.biorxiv.org/content/10.1101/2022.08.31.504599v1>

a0288z

## # SCP Slow Cortical Potential

"The Slow Cortical Potential (SCP) is a potential shift of the electrical activity in the brain lasting from several hundred milliseconds to several seconds. The user can learn to voluntarily influence the cortical positivity/negativity.

The SCP can be generated even if the motor periphery is completely disconnected from the central

nervous system. It can be used as a binary signal, using a certain amplitude threshold as selection

criterion [24], but can be artificially extended to offer more choices like in figure 2.15." from

"Pioneering research into

Brain Computer Interfaces

Mark Wessel" [http://www.kbs.twi.tudelft.nl/docs/MSc/2006/Wessel\\_Mark/thesis.pdf](http://www.kbs.twi.tudelft.nl/docs/MSc/2006/Wessel_Mark/thesis.pdf)

"Specialized mother wavelet functions of Continuous wavelet transform (CWT) for using on sliding window. Morlet Wavelet gives good frequency resolution when analyzing gamma activity. Bi-scale wavelet for 1-4 Hz asynchronous BCIs during imaginary movement. Daubechies wavelet for Slow Cortical Potentials (SCPs)  $f < 1$  Hz Nicolas-Alonso (2012)."

# "Brain Computer Interfaces, a Review by Luis Fernando Nicolas-Alonso \* and Jaime

Gomez-Gil" <https://www.mdpi.com/1424-8220/12/2/1211/htm>

<https://doi.org/10.3390/s120201211>

### "3.2. Slow Cortical Potentials (SCPs)

SCPs are slow voltage shifts in the EEG that last a second to several seconds. SCPs belong to the part of the EEG signals below 1 Hz [116]. SCPs are associated with changes in the level of cortical activity."

"Negative SCPs correlate with increased neuronal activity, whereas positive SCPs coincide with decreased activity in individual cells [116]."

These brain signals can be self-regulated by both healthy users and paralyzed patients to control external devices by means of a BCI. SCP shifts can be used to move a cursor and select the targets presented on a computer screen [117].

People can be trained to generate voluntary SCP changes using a thought-translation device [117]. The thought-translation device is a tool used for self-regulation SCP training, which shows visual-auditory marks so that the user can learn to shift the SCP. The thought-translation device typically comprises a cursor on a screen in such a way that the vertical position of the cursor constantly reflects the amplitude of SCP shifts. Although most thought-translation devices show continuous feedback, it is possible to train SCP self-modulation in the absence of continuous feedback [118].

Success in SCP self-regulation training depends on numerous factors, such as the patient's psychological and physical state, motivation, social context, or the trainer-patient relationship [117]. It is known that the learning capability of the user drastically affects SCP modulation training. Self-regulation training is therefore strongly recommended for patients at the early stage of a progressive disease [117]. Furthermore, initial SCP modulation skills have an effect on future performance following training [119]. Therefore, the value of SCPs as a suitable control signal for each patient can only be determined on the basis of initial trials. Other factors, such as sleep quality, pain, and mood also have an influence on self-regulation performance [117]. Their effects are not identical for all patients and further investigation is certainly needed to establish general rules on this matter.

Self-regulation of SCPs has been tested extensively with patients suffering from ALS [120–122]. Typical accuracy rates achieved for SCP classification are acceptable and vary between 70 and 80 per cent, but the rates of information provided by SCP-based BCI are relatively low. Besides, longer training is required to use SCP-based BCI and it is likely that users will need continuous practice for several months."

# "Neurons of the cerebral cortex exhibit precise interspike timing in correspondence to behavior" (2005) <https://pubmed.ncbi.nlm.nih.gov/16339894/>

"In the cerebral cortex, where each nerve cell is affected by thousands of others, it is the common belief that the exact time of a spike is random up to an averaged firing rate over tens of milliseconds."

"We show that times of spikes can be very precise."

"In a brain slice, precise time relations of several neurons have been observed."

"Here we show () time intervals between spikes, measured in correspondence to a specific behavior, may be controlled to within the milliseconds range."

"most nerve cells in the brain communicate with each other by standard pulses called action potentials (or spikes)"

"However, if time relations among different neurons could be precisely controlled and read out, complex representations could be built from simpler ones efficiently and very fast"

"In a brain slice, precise time relations among several neurons have been observed"

"Could this phenomenon be also observed in brains of behaving animals?"

"We show, ()when time intervals between spikes of different neurons are measured in correspondence to a specific behavior, timing may be controlled to the milliseconds range with the best case reaching 0.5 ms."

"However, there are cellular mechanisms and experimental artifacts that may generate precise spike timing. These include the following: (i) neurons can recover rapidly from the refractory period; (ii) spike intervals within a burst may repeat with high precision; (iii) periodic activity driven by internal pace-maker processes (not due to network oscillations); (iv) dead time for spike detection when recording is made through the same electrode; (v) sharp on or off responses to an external stimulus with abrupt onset (or offset). "

# a0288.genesis

# "An electrodiffusive neuron-extracellular-glia model for exploring the genesis of slow potentials in the brain" (2021) <https://pubmed.ncbi.nlm.nih.gov/34270543/>

"A common experimental method for investigating brain activity is to measure the electric potential outside neurons. These recordings usually only capture the high-frequency part of the potential while ignoring frequencies below a set cut-off between 0.1 and 1 Hz. Therefore, standard recordings cannot tell us what the slow frequency potentials might say about on-going brain activity."

"These recordings are traditionally done using a low-frequency filter, with a cut-off frequency normally set somewhere between 0.1 and 1 Hz (see, e.g., [2–4]). Frequency components below this threshold are often referred to as slow potentials, standing potentials, sustained potentials, or DC potentials. We will here use the term slow potentials."

"A multitude of brain processes have been associated with slow potentials, including both physiological phenomena, such as brain-state transitions and readiness potentials, and pathological phenomena, such as spreading depression, stroke, and epilepsy [4]."

# Slow potentials & Potassium K<sup>+</sup>

"Slow potentials are often correlated with changes in extracellular ion concentrations, and especially with rises in the extracellular K<sup>+</sup> concentration"

"Slow-potential shifts are normally reported to follow similar depth profiles as the extracellular K<sup>+</sup> concentration"

"Since currents always travel in closed loops, an intracellular current that, for example, goes towards deeper layers through (M1) neural dendrites or (M2) a glial syncytium, requires inward currents entering the cells (sinks) in the superficial layers, and outward return currents (sources) in the deeper layers. "

When greater numbers of potassium  $K^+$  channels are opened more extracellular  $K^+$  will concentrate, the cell then acts like an electrical sink, creating a slow potential, taking energy out of the circuit, but that energy is distributed to the extracellular space to dissipate randomly in the brain. Perhaps this extracellular current becomes part of the aggregate electromagnetic brainwave energy in between cells.

This could be how brainwaves are formed, as the result of extra extracellular ion current, when the cell acts as a sink, taking energy out of the neuropath, and randomly distributing it to the extracellular space of the brain.

Okay. For those of you who have been following my incredible work, you may need to sit down for this one. "It means buckle your seat belt, Dorothy..." I think I may have isolated how brainwaves are formed from neural activity, & it involves inverted or negative action potentials.

# extracellular potassium  $K^+$  contributes to the electrical sink

"Sink and Source are terms used to define the flow of direct current in an electric circuit."(...) "Such a sink and source configuration requires an extracellular current going towards the superficial layers in order to complete the loop, and thus a gradient in the extracellular potential." (...) "A sinking input or output circuit provides a path to ground for the electric load. A sourcing input or output provides the voltage source for the electric load." Source <https://blog.orientalmotor.com/what-is-the-difference-between-sink-and-source-logic>

# Diffusion Current (Brain Cells)

"The spatial  $K^+$  buffering current in astrocytes [14] is a well-known example of such a slow current loop. In addition to M1 and M2, diffusion of ions along extracellular concentration gradients can (M3) give rise to a so-called diffusion current. The diffusion current is a direct function of the concentration differences and the diffusion constants of the involved ions, and will contribute to completing the current loops between the membrane sources and sinks (see, e.g., [15]). The three components (M1-M3) are therefore not independent (see Fig 1, figure caption)."

"Computational modeling in neuroscience has largely focused on simulating the fast electrical activity of neurons and networks of such, while ignoring other components of brain tissue, such as glia cells and the extracellular space."



"Within that paradigm, multicompartment neuron models are typically based on a combination of a Hodgkin-Huxley type formalism for membrane mechanisms (see, e.g., [16, 17]), and cable theory for how signals propagate in dendrites and axons (see, e.g., [18, 19])."

"Two underlying assumptions in these standard models are that the neurodynamics is unaffected by changes in (i) extracellular potentials and (ii) extracellular ion concentrations. Models of this kind thus do not account for so-called ephaptic effects, where neurons may affect their neighbors non-synaptically through inducing changes in the extracellular environment"

#### # Medical Imaging tech tools

"The edNEG model (electrodiffusive neuron-extracellular-glia) (i) keeps track of all intraneuronal, intragial, and extracellular ion concentrations and electrical potentials, (ii) accounts for action potentials and dendritic calcium spikes in neurons, (iii) contains a neuronal and glial homeostatic machinery that gives physiologically realistic ion concentration dynamics, (iv) accounts for electrodiffusive transmembrane, intracellular, and extracellular ionic movements, and (v) accounts for glial and neuronal swelling caused by osmotic transmembrane pressure gradients."

\* "endocannabinoid system (ECS) is a lipid signalling system, comprising of the endogenous cannabis-like ligands (endocannabinoids) 2009 Z Mouslech"

"Using the edNEG model, we analyze these effects by splitting the extracellular potential into three components: one due to neural sink/source configurations, one due to glial sink/source configurations, and one due to extracellular diffusive currents. Through a series of simulations, we analyze the roles played by the various components and how they interact in generating the total slow potential. We conclude that the three components are of comparable magnitude and that the stimulus conditions determine which of the components that dominate."

Electric ephaptic effects have been the topic of many studies (see, e.g., [21–28]), as has the effect of changing ion concentrations on neurodynamics (see, e.g., [29–33]). The justification for neglecting such effects in standard simulations is that they often (and by assumption) are quite small, at least on the relatively short time-scale considered in most neural simulations.

#### # a0288.volume

#### # Volume Conduction Theory

# Introduction to Volume Conduction <http://eknygos.lsmuni.lt/springer/586/43-53.pdf>

"The term "volume conduction" refers to the complex effects of measuring electrical potentials a distance from their source generators. Near-field potentials refer to those recorded in relative close proximity to the detector, whereas far-field potentials refer to those recorded at a considerable distance, as is most commonly the case in evoked potentials."

"In fact, all motor and sensory nerve conduction waveforms are substantially impacted by volume conductive effects. "

"Volume conduction is the term used to describe the effects of recording electrical potentials at a distance from their source generator."

"In truth, volume conduction plays a role in almost all clinical neurophysiological recordings, both central and peripheral, because recording electrodes are never placed in direct contact with the nerve cells generating the signal."

# "ELECTROPHYSIOLOGY OF A DENDRITIC NEURON MODEL" (1962)

NIH <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1366481/>

PDF <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1366481/pdf/biophysj00657-0144.pdf>

"Wavelength is usually denoted by the Greek letter lambda ( $\lambda$ ); it is equal to the speed ( $v$ ) of a wave train in a medium divided by its frequency ( $f$ ):  $\lambda = v/f$ ." Source <https://www.britannica.com/science/wavelength>

"Relationship Between Wavelength and Frequency

A simple equation relates wavelength to frequency:

$$v = \lambda f$$

$v$  = wave velocity (how fast the wave propagates in a medium)

$\lambda$  = wavelength (distance over which a wave shape repeats)

$f$  = wave frequency (number of waves per unit of time)"

"Wavelength and frequency are inversely proportional. As wavelength increases, frequency decreases. As frequency increases, wavelength decreases."

"What is magnitude formula? the formula to determine the magnitude of a vector (in two dimensional space)  $v = (x, y)$  is:  $|v| = \sqrt{x^2 + y^2}$ . This formula is derived from the Pythagorean theorem. the formula to determine the magnitude of a vector (in three dimensional space)  $V = (x, y, z)$  is:  $|V| = \sqrt{x^2 + y^2 + z^2}$ " source wikipedia

# Magnitude Frequency Inverse Relationship as long as Voltage, Current & Resistance remain constant.

My conjecture is that it's actually Magnitude that has an inverse relationship with Frequency. So if Amplitude & Frequency both increase the wave length is shorter than if Amplitude decreased while Frequency increased (as long as voltage remains constant, with voltage increase you could see an increase to both magnitude & frequency at the same time)

"These theoretical results contain several points of physiological interest. For the

centrally distributed excitatory conductance increase, the initial rate of soma membrane depolarization is twice as great as when the same amount of excitatory conductance is distributed uniformly over the receptive surface. However, for the peripherally distributed conductance increase, there is a zero initial rate of soma membrane depolarization. In the case of the square conductance pulse, this particular example shows a peak soma membrane depolarization that is twice as great for the centrally distributed case as for the peripherally distributed case. This could easily represent the difference between success or failure in the initiation of an axonally propagated action potential."

### # NAPOT Revision 3

Imagine after reading this that brain cells are effectively accomplishing neural rendering & inner qualia & your mind's perception of reality through tiny data driven electromagnetic ion changes, phase changes, that are changes in the timing of signal propagation across the network.

From changes in the timing of phases, your 3D neural & glial network of cells, computational renders your experience of reality.

The phasic action potential, the burstlet, and the burst firing (many burstlets) are less common signalling compared to the default tonic firing (in information theory that means they contain more information) but the slow waves, or inhibited firing, or what I call negative action potentials are also less common or more rare signal differences, differences in timing (thus containing more information in information theory compared to the more regular tonic firing rate.)

"In contrast to these transient phenomena, it can also be seen that the steady depolarization of the soma membrane produced by sustained G. is only about 20 percent less for the peripherally distributed case as compared with the centrally distributed case. This suggests a need for modification of the widely held belief that synaptic excitation delivered to the dendritic periphery could produce no significant passive electrotonic spread of membrane depolarization to the soma. On the contrary, because of the very large dendritic surface area and the high density of synaptic contacts over the entire soma-dendritic surface (e.g., Wyckoff and Young, 1956; Rasmussen, 1957; Young, 1958), dendritic synaptic activity would be expected to dominate the slowly changing background level of the neuron's excitatory state. A relatively small number of (synchronously active) somatic synapses would seem to be especially well suited for precise timing (triggering) of nerve impulse initiation."

"This suggests that synaptic inhibition may operate mainly by decreasing the background level of the neuron's excitatory state;"

Effectively this is like a conjecture that suggests that the Basal Dendrite's inhibitory (potassium) synapses perform the role of increasing the resistance to current (from sodium excitatory synapses) They were correct.

## # This was Dendritic Computation in 1962

So when burst firing is triggered in the soma reflecting a coincidence of signals from both basal & apical dendrites, the voltage of the cells phase magnitude (waveform) is increased and it is translated into a soliton waveform message to it's exit terminal, but also a phase wave change to it's extracellular space (depending on concentrations of ions (mainly potassium) inside & outside the cell).

"At the beginning of this talk, I remarked that the dendritic neuron model may have relevance even to the problem of learning. What I had in mind was the growth of dendritic trees and the possibility that learning might involve preferential enlargement of certain dendritic branches.<sup>13</sup> It seems reasonable to suppose that different dendritic trees (or portions of these trees) provide the receptive surface for synaptic activity of different functional pathways to which a given neuron may belong. Conditioning and learning might involve an increase in the caliber and surface area of the appropriate dendritic branches. This would enhance the synaptic effectiveness of this pathway in at least two ways: it would provide additional surface for either additional or larger synaptic terminals; at the same time, the enlarged caliber of these branches (and perhaps of their trunk) would increase the amount and rate of electrotonic spread from this region to the central convergence zone (at or near the soma). Thus, the influence of this entire synaptic and dendritic system would be increased."

"A simplified treatment of synaptic excitation and inhibition leads to the theoretical prediction of a functional distinction between somatic and dendritic synapses: dendritic synaptic activity would be expected to dominate slow adjustments of the background excitation level, while somatic synapses would be best suited for triggering of impulses. "

## # a0288z.refined

I began this book after writing the Synaptic Unreliability article on SVGN.io News. This led to NAPOT, Neural Array Oscillating Tomography that defines with the idea Arrays of Neurons are emitting phase wave changes to Neural Arrays defined by their exit terminals, with 0, 1, 2, or 3 Vesicle sacks and that this represents the essence of computational rendering & pattern detection between arrays of neurons, that when oscillated in feedback loops allows the mind to become conscious of it's own internal models.

I then refined this idea in NAPOT Revision 2 to apply the concept of Sparse Distributed Representation at the Synaptic level to clarify that the model output from each neuron in each part of one array creates a specific inceptive synapse specific pattern to it's exit terminal represented by the next neural array. What I found out when researching upregulated & downregulated synapses, including backproagation from a postsynaptic array to a presynaptic

array, and back propagation from an Apical Dendrite to the soma (or from an exit terminal to the Soma) led me to the concept that Burst firing is actually a coincidence detection between both sides of the neuron (the dendrite + the backpropagating signals from the exit terminal or apical dendrite) and this allows a single neuron to detect coincidences across seconds instead of just milliseconds (Read my notes on Behavior Timescale Synaptic Plasticity). I also began to analyze how the thalamic output to multiple cortical layers simultaneously allows the 5 Layer Pyramidal Neurons to selectively respond to patterns detected across multiple cortical layers simultaneously. This allows incoming sensory inputs from the thalamus to the layers that intersect with the basal dendrite, to be compared with the tonic oscillating brainwave patterns looping in the apical dendrites. So that coincidences are mapped between your mind state (in the apical cortical to cortical & cortical to thalamic loops), and coincidences between your incoming senses (from the lower layers of the thalamus connecting to the basal dendrites.)

In NAPOT Revision 3 I found evidence that the release of 0 vesicles, compared to the usually 1 vesicle per tonic interval, constituted the transmission of information (rare signals have higher information) and this was validated when I came across research on slow wave potentials, slow potentials, or DC potentials, which appear to be soliton waves, stable information containing waves, or negative action potentials, that have an effect on the tonic oscillating pattern, and these SCP waves appear to be created when extracellular potassium increases (because more potassium channels opened) which means the neuron has acted like an electric sink, pulled energy out of the neural circuit (inhibition) slowed down it's phase pattern (relative to the group oscillation) Essentially DC potentials or Slow Wave Potentials are negative action potentials, your brain still detects them because they are changes in the rate of oscillatory firing, which affects all neurons in an oscillating group (which is striving to reach equilibrium or synchrony). In the process of studying this I realized that the extracellular potassium gradient is like the grounding of current, or the dissipating of current to the extracellular membrane (to the brain) and my conjecture is that this process is what gives rise to brainwaves, or how brainwaves emerge from oscillating groups of braincells. These brainwaves are in effect the volume conduction that is observed with electrode based medical imaging.

The extracellular potassium gradient is of course an inverse of quantity to the intracellular potassium gradient. This is interesting to think about for EEG Source Localization, when we know we are measuring aggregate brainwave activity, a dipole change in electric voltage, from thousands of apical dendrites, at the location of each electrode on the scale, but we can source localize signals as deep as the thalamus, even though we are probably reading voltage changes from the extracellular potassium gradient when a cell fires. That extracellular voltage change effectively mirrors, or is an inverted mirror of the phase wave change that neuron transmitted to it's exit terminal.

"Subcortical electrophysiological activity is detectable with high-density EEG source imaging"  
<https://www.nature.com/articles/s41467-019-08725-w>

Effectively the EEG frequency wave spectrum is encoding the inverse of phase wave changes (inverse in the sense of photography, an inverted color image), at the soma level, released to

the extracellular space, and with source localization the refraction of that signal dissipation is being reversed.

a0289z

(field, oscillat) The Feynman Lectures

[https://feynmanlectures.caltech.edu/flptapes.html?fbclid=IwAR2So2OWT7SVR5zveZvB6o6jttZNw0-kZFUb63uleKUE\\_fIC\\_wivGQRSVw](https://feynmanlectures.caltech.edu/flptapes.html?fbclid=IwAR2So2OWT7SVR5zveZvB6o6jttZNw0-kZFUb63uleKUE_fIC_wivGQRSVw)

its like the universe is a place field of relative frequencies that warp space itself when they collide or form vortices

the vortices form atoms and bounce off each other and form oscillations,

everything is made of these atoms

but its like an oscillation of space time creating a frequency

its frequency is an attractor to other particles, so they start clumping together over time, eventual stars planets and even what we call life which is actually just a continuation of the fractal of the cosmos on increasingly complex scales because they follow the laws of entropy by exporting increasing chaos over all to a surrounding environment and getting enough energy to maintain its oscillation equilibrium

So I imagine that space started everywhere at the same time, and essentially our existence has folded on it self through natural selection as an atomic process combined with adjacent

a0290z ctp

(oscillat)

I can set an oscillation in my head to remember something, and it will remember a pattern for me, but the memory oscillates in my experience. If you are alone in a dark room, ask yourself to remember a numerical sequence like a phone number, pick the length, but keep it in your memory for several minutes while you do stretches. Think, does the memory of the number oscillate for you, like blinking in and out of existence? the more I think about this the more I realize that all my memories must be oscillating and then I begin to notice them oscillating, I am noticing the size shape, color, and other wavelength attributes, and imaginary physical properties of concepts that were learned with different kinds of sensory representations.

a0291z

(field, oscillat, tomography, neuralink, super position, emotion, cortex) alzheimers has oscillatory brain changes really specific ones, your peak alpha frequency shifts

- if you have this particular hippocampal wave ripple phenomema, electromagnetic wave signature

- fwr thumbprints of disease in brainwaves

- You are only actually using a subset of coding genes at a particular time in your life.

- alzhierns has oscillatory brain changes really specific ones, your peak alpha frequency shifts

- In terms of talking about changing psychiatric understanding of psychoactive drugs from a perspective of whole brain computational neuroscience electromagnetic imaging, and neuromodulation.

- Neurophysics approach to reinterpreting neuro drug action or brain drug action in its real complexity

- In psychiatry there are big problems we know that there are a lot of drugs that affect the brain, and the fact that we don't have any new drugs coming from the pharmacuetical industry we can follow on Tim Ferris's coat tails.

- How well can we see cortical brain activity

- Harvard work in terms of temporal interference transcranial stimulation

- leverage Morgan's experience in terms of whole brain conductivity mapping EIT for transcranial deep brain electrical stimulation and high resolution EEG that's your sensing system, and your injection system. You need to do the conductivity mapping. You need to be injecting current at different locations and have them temporarily super imposed deep in the brain.

- To do that means that you know, if I inject current at this scalp electrode, the wave from it is going to be cresting in the amygdala. You need to do that with multiple scalp electrodes. I know the electrical properties of that person's piece of meat & skull so that you can have all the current injections, all the waves that you are injecting into the head can all be cresting at the same time deep in the brain at the same time. 3 or more different waves to all be raising at the same time only in the amygdala.

- "Temporal interference TES super position of multiple wave crests makes it so that you have stimulation in deep tissue and no intervening, Cell paper June 1rst

- Suresh by moving down to New Zealand. has papers with David Wiley, he was an advisor at Electric Geodesics

- Ayawasca alter's brain

- Its pretty obvious, Robin Carhart Harris and David Nutt, they've been the early proponents of hey we should treat psychedelics as something that is for research worthy work, always turning to brain imagers in terms of what the hell is this doing, bringing Suresh in was the smartest thing they did.

- Suresh cites one of his own papers, tsai and wolf science? his 2018 paper 1 over 5 spectra drug induced states. Is it funny when researchers cite their own papers.

- A post doc does EEG, they've taken figure 2. I know how to use the EEG tool lab toolbox. They have lentil.

- I can see David Wiley's finger marks

- Brad Voytek 1/F stuff,

- Projects
  - The long story there was that it would help us to emphasize the kind of neurophysics approach to pharmacological EEG.
  - focus on developing the neuro
  - how does the cell level influence the system level
  - the whole brain eeg, how does
  - the ai would run a search program to affect the human brainwave state, AI could drive a person into a lucid dream state, through audio, visual and brain stimulation
  - you are going to want to have the data that Morgan is talking about like what is dreaming
  - Multi-dimensional representation that maps to a set of a smaller set of cognitive bias
  - How we operationalize, this is how cognitive neuroscientists operationalize cognitive bias, yes no decisions we have to study it, gambling tasks, we need to assign quantitative values to the decisions you are making
  - operationalize all the stuff you are talking about in terms of loss avoidance
  - traders loss adverse
  - that means they did the subjects become very conservative in their loss risk?
  - you can figure that out mathematically, have them make 100 decisions, 100 bets, their cognitive bias will come out,
  - avoiding loss
  - computational concept,
  - to operationalize this you made a stupid task, betting stock broker type tasks we need people to make short term value judgments on a repeated basis to figure out what their bias is
  - if we make these multiplayer
  - Virginia Tech, Steve Laquant
  - What they do give you is an operational bias estimator
  - I can turn that stuff that docs been talking about, you play this game for half an hour and I can figure out what your bias is, if its a two player game, where you have the option of collaborating or competing you have people who will burn their partner for a short term game even though long term this is a non-optimal strategy
  - The one that you are talking about currently is this one called: An adaptive individualized FMRI delay discounting procedure to
  - how do we estimate these kinds of cognitive bias in as shortest time as possible for this subject
  - FMRI points to a
  - if I could point you to the 2nd paper. the paper
  - pupillary correlates of computations underlying human response behavior
  - these are oxford psychiatry people,
  - smaller amounts of money now or larger after a delay
  - delay discounting tasks, reported various contrasts
  - Dversky his research guide in all this. I think of their work in terms of reaction time analysis, pupil time, reaction time, pupillary response
  - their pioneering methods in behavioral economics tests
  - Wrapped up in what doc what talking about.



- having people talk about money?
- here we report pupillary correlates of the computations human response behavior, in which the opponents facial emotions and their offer amounts were drawn probabilistic based on their decisions
- modelling
- regardless of what they think consciously they are being influenced by me putting a face on this task
- if I take faces out of this task we can put it down to loss aversion
- a game where you can save people or kill them to save other people,
- violate the assumptions of the rational actor model
- all offers should be accept irrespective of the authors facial expression
- If we build it there is a chance Google will be interested
- they really didn't think they could get this from mobile data
- Get the California Surgeon General, if we are already
- Get the demo up, startup? leeway? we need to dev contacts with subjects, healthy controls
- quantitative self nootropic experimenters
- likely to go through regular drug approval,
- approval to import docs drugs under dea procedures
- do a lot of documentation, this amount of compound x, none of it can disappear
- cocaine as a lab drug
- how prepared we are to having 12k a month in revenue.
- startup you don't know how long its going to take to do the new thing that you are going to do
- we could order the tms, the eye tracking the eeg setting that up, training people to use it, and getting back office stuff necessary for running this business
- that would all be a pre-requisite to doing 12k a month turn over
- 6months to a year to get the kind of regulatory approval and all our ducks in a row to be doing brisque sales and participant testing
- trained procedures for staff to follow
- you want to set up the franchise so someone else can run the fulltime lab operation
- set up an experiment so someone
- ramping up experiment time
- when everyone is signed off on the exper
- the analysis is doing what it is supposed to be doing
- then you train lab assistants to run the subjects
- you are collecting subjects for the next year
- in this case, child mind institute is this ongoing thing, it's not just the 100 or 200 that we collect, the yare always going to be comparable to the 2000 or 3000 that NY is collecting, that's for starters,
- how important it will really be to have the same people come back and fall sleep
- both EEG systems
- get the drug session for another day, coming in for 2-4 different drugs, pharmaceutical
- we are trying to find psychoactive drugs that change your brain dynamics, capture that, and build the bigger picture across lots of different, now we have seen your brain in many many

different states, we want to be in the best position to talk about what is your resting brain state, what would be our best model based evidence for how it should be modified,

- we will have this huge database to compare it with for people who get labeled with diagnosis, and maybe there will be spectral similarities
- there will be a personalized precision model of your brain activity
- All of the other documents #soon
- Testing
- People
- When we program you into particular states there will be biological addition physiological response, eeg heart rate, galvanic skin response.
- A lot of drugs make people anxious
- there are people who are stopping to take drugs because they get too anxious
- the pharmacological interaction is still working but its still stuck in a rut
- we will be collecting more than just EEG, heart rate, blood pressure, galvanic skin response, fnirs,
- the best way to get someone interested in something is to build something that they want to be apart of it.
- brain training/ neuromodulation field
- It's built on a couple key pillars. Like high density electro (down the road magnetic also) imaging, whole brain computational modelling, cellular level model of psychiatric states and pharmacological interactions, and mapping neurotransmitter effects during sleep cycles? what is our deliverable? what we are hoping to offer people? What our value proposition, individuals would pay \$1000. Oh Morgan everything you are saying is right but its too much data to collect, too complicated in analysis pipeline,
- We are in the Stone Age of brain science, but with Neuralink and Openwater we are looking at the coming of an Industrial age for brain science
- CMS so that we find patients who will come back repeatedly, we need people who can stick with the program, self experimenters, quantitative self people. We need a meetup that is about people who are committed long term self-experient.
- We what we are interested in is people coming in for 5 sessions over multiple weeks?
- bringing us up to where neuroimaging is currently
- they've done all these studies for 20-40 people,
- the tasks that they have people do with EEG and MRI are still very amenable to cellular based analysis
- the other thread here that has really come out in the past 2 years, collecting a lot within the subjects data, russ poldrac at Stanford started the center for reproducible neuroscience, scanned himself daily for a year, with an MRI machine,
- talk to him for a podcast and a Neurotech talk and news
- really thinking outside our traditional data collection we can start to imagine what is really possible, what if we could put an MRI on someone's head while they walked around during their regular days.
- Jack Gallant, his stuff that is focused on v1 v2 v3 visual cortex,

- Higher order associative areas vs early visual areas have done YOLO meaning is an algorithm in computer vision, because its opensource a lot of people run yolo on visual scenes and it does object segmentation

- it doesn't have any training data so thats why its training data, it's from

- We've got face areas.

- It was only the 1920s that brain surgery changed from being more likely to kill you, about a 100 years of being more likely to kill you if we opened up your skull

- People like Cullen Spectre present visual stimuli to get your face area mapped out.

- Do we want to have a phone call about everything we

- our inkling about what we can offer that's different and valuable

- propose that we are not talking about doing any drug stuff for six months to a year just because Morgan doesn't see how we get all our ducks in a row such that we can say that we are ready to use that,

- what is his interest, are we just buying compounds from him and that's it, or does he want to actually put up the money to support a lab, does he want a lab?

- Morgan Hough is putting together a story for what we can do with this, to some degree, why he should want to do this with us, sort of like lets imagine that we are trying to get investors and his compounds are just the examples, what we would be really saying is that together with the kind of community of people that we could get coming back

- what exactly are we saying in terms of clinical trials? does Doc Zee

- Not trying to get 600 people to drop acid and see if they are happy, or cognitive bias testing.

- Can we get the same subjects to take multiple drugs,

- computational modelling of personality, and cognitive bias,

- you are a friendly person means you are more likely to share stuff, you are more likely to see or do delayed gratification, by having

- what Doc brings are multiple compounds that have different affects. if we can get the same people to come back in and have different drugs and be ready to assess them and have different metrics to have brain imagining,

- this is our true deliverable,

- we want a precision, brain model, brain behavior model for each person, wake, sleep, potentially inbetween, anethetics, dissociatives and psychedelics, interested in, plays to the strengths of docs synthetics, we want drugs that have a big effect with a single dose,

- if psychiatry was bolder it would be using more powerful drugs to explore a person's brain space

- it would feedback on us in terms of their response to each of these drugs is going to tell us something

- how do people respond differently to different drugs

- and the differential drug interaction with ritalin

- and the procedural generation

- alcohol flush reaction

- a profile across a number of different reactions

- the brain is so much more

- what's the equivalent of tapping the knee bone, what are the neural correlates of that?
  - what we actually want to do is something more like what allergists do, or even more like what cardiologists do
  - a stress test, multiple medical discipline analogies about what we need to bring to brain medication, lower hanging
  - minimum viable product, what machine, what researcher
  - hey getting to what Doc was theorizing?
  - what is numbers, if we can get 100 people to pay 500 a month,
  - are people willing to pay 300
  - 50 people a month to pay 250 dollars, we would come out at 12k a month
  - 2 people a day max, collecting the data is time consuming
  - we want people
  - we need a lounge in the clinic so people stick around a long time so we can operate slowly as needs to be
  - if we can get those people to come back
  - my perspective is how we can do the customer management solution, one office person, plus experimenter tech, two people a day, then you need
  - a morning subject, and an evening subject
  - getting people to come in at 5 or 6pm and people will fall asleep in the chair, it opens us up to people who work 9 to 5.
  - Overlapping hours, have 2 patients at the same time,
  - all the documents we need to have checked off for each patient, modelling it on the lab, what Gazzlab is asking for, what Morgan would do, its partly practical and partly
  - want to be collecting the same data at minimum the same data they are collecting at Child Mind Institute,
  - finding out how to run a TMS clinic because that will give you all the admin software what we need, are there enterprise solutions for this? Can we make this someone else's problem.
- Cloud solutions for running a TMS clinic that includes insurance reimbursement
- semi treatment with a research component who will sign off on it psychiatrist
  - this is where we could add value
  -
- [https://www.biorxiv.org/content/10.1101/740621v1?fbclid=IwAR2dTqK-9sj4Mo4q-0qfGh6vCVCo12OtUI0iGhmDvK7lc1lfCL1vU\\_c0EhE](https://www.biorxiv.org/content/10.1101/740621v1?fbclid=IwAR2dTqK-9sj4Mo4q-0qfGh6vCVCo12OtUI0iGhmDvK7lc1lfCL1vU_c0EhE)
- [https://www.ncbi.nlm.nih.gov/pubmed/27153976?](https://www.ncbi.nlm.nih.gov/pubmed/27153976?fbclid=IwAR2xL-aTbXtE0l-KQ74V8guYE2Uvpz6GdO5YGGmPhbDvEszSj5DqYWAE8Bw)
  - fbclid=IwAR2xL-aTbXtE0l-KQ74V8guYE2Uvpz6GdO5YGGmPhbDvEszSj5DqYWAE8Bw
  - EGI-electrical stimulation, conductivity mapping, trying to map electrical mapping
  - Olivia davide 2nd paper, put the tms coil on a robot, move it around, recording the eeg, tomography from moving tms, flash photograph from different perspectives, put the coil over the motor cortex to connect with the eeg twitch
  - great comment from bixom at neurological "we know a lot about tDCS's effects on tms"
  - what nih, we don't understand tms effects on tms? tms is a physics tool, stop thinking of it as a controlled brain blast, a physics tool, your brain's response to this blast
  - tms-eeg, pharmaco-eeg is a thing because your eeg spectra changes when you take drugs

- sleep eeg, tms eeg and pharmaco eeg, having a real physics cellular model of whole brain electrical
- no one is trying to make a single head brain model
- subcortical electrode paper we have a bunch of patients 3 that have subcortical electrodes, high density, if we use our intracranial measure as our aggressor, we are sensitive to that deep activity
- if you try to do the same thing without that intracranial electrode
- you can't hear that deep.
- everything with superficial cortex is so much louder.
- higher
- this is why we can change things
- totally change the field, collecting sleep data on the same subject
- sleep data, tms eeg data, eit, what we pioneered at electrical geodesics, EIT-EEG we inject electricity into the head, figuring out physics properties of the meat in between, if we do that we are in a better position to do noninvasive targeted deep brain stimulation and diagnosis,
- diagnosis, accelerate ways to diagnose patients early
- we can do alzheimers, early alzheimers diagnosis, prognostic diagnosis,
- with the ability, the hard part, by our ability to detect subcortical brain activity non-invasively
- that includes the need to make it necessary to EIT,
- you can analyze someone's gait to detect dementia
- psychiatry is not a branch of medicine, to give psychiatrists the ability to collect data from the object of interest
- we are not looking for a cheap alternative to give the field for the very first time to give people a prognostic marker of disease
- alzheimers has only been diagnosed post mortem
- pet imaging, and stuff like that allows you to say you have Alzheimer
- Lauren Frank paper hardcore uscf neurology
- here are some world renowned experts that we could talk to separately that are not involved and we could get their opinion. they could be participants, Dave Wiley, rests more on the data collection,
- what I am trying to give you is a viable somewhat tomorrow timeline if we could connect these various datasets, Morgan has been working on related projects for 25 years
- Christian Beckmann resting state analysis
- ICA is widely applied in EEG for artifact removal.
- Christian Beckmann gaussian mixture model ICA components, bayesian model doing hypothesis, add a gamma in the tail, then you do a model comparison, the model with and without the gamma distribution, given the small penalty, you've added a gamma so you have lost a degree of freedom.
- do I have a better distribution of the  $\alpha$  with the gamma included, you've got no signal? 1 over  $f$  with alpha beta frequencies
- $1/f$  fit non-oscillatory, multiple lorentzian fit of how many lorentzians do I need to add to explain all the oscillatory peaks in that subject. some people have a beta peak and how some

people don't. so is my power spectra explained better with an additional power component or not

- collecting the data as fast as possible,
- 1000 samples per second limit
- we want to well characterize that subjects alpha.
- Go Forward, VR Health Institute tests, measure gasses, heart rate while running, eye tracking, video of gate, tms-eeg, bmi fat/muscle percentages, blood tests, VR interaction eye tracking, stress test and create a program where people come, and the idea is that people come in once a year? split it into one hour blocks

- The space would have a treadmill, a fitness room, an examination room, quest diagnostic
- longevity blood tests? dna tests, crisper kits

Congress has allowed extracts, metabolites and biologicals without FDA approval, whoever does the biohacking right will strike gold.

The key to believing it is finding the finger prints of the first molecules

finding finger prints in the brain based on what other chemists create

Connecting neuroscience researchers to chemical researchers to create chemical finger printing they

a0292z ctp

(field, oscillat) orch-or

I was trying to come up with several additional arguments for why pan-psychism is wrong, and why Orch-Or is unlikely, and that's when I came up with some novel ideas about gravity. spacetime, atoms, particles, and also new novel ideas about the human brain. However I will only dedicate a few pages to these ideas because what is a discussion of the neurophysics of consciousness like without a little speculation about the nature of the cosmos am I right? lol  
[https://en.m.wikipedia.org/wiki/Orchestrated\\_objective\\_reduction](https://en.m.wikipedia.org/wiki/Orchestrated_objective_reduction)

Today I was crafting new arguments for why pan-psychism is wrong & why Orch OR is unlikely when I came up with novel new ideas about how particles create gravity, and how atoms create space. What is a discussion of neurophysics without speculating on the nature of the cosmos?  
[https://en.m.wikipedia.org/wiki/Orchestrated\\_objective\\_reduction](https://en.m.wikipedia.org/wiki/Orchestrated_objective_reduction)

<https://www.rialian.com/rnboyd/laplacian-gravitation-and-relativity-theory.htm>

Some or all of ideas in this book might not be correct. I will need to consult with other researchers in various fields before improving these ideas for a 2nd edition. However many of these ideas will be novel to the average reader, some people may have heard similar ideas before, but I think at the very least these ideas make for a good story and that is why they were included. I hope you leave this book with some new ideas of your own about the human mind,

specially about neural functions that lead to human consciousness, new artificial intelligence ideas, new brain computer interfaces, new ideas about quantum physics, gravity, what life is (a new definition), what a bit of information is to your conscious brain, how the self emerges from the brains networking functions and so on. While the idea that one person could have so many new ideas on so many diverse topics might seem unlikely its just that there are common physical mechanisms connecting all these different things, and really at the core of it its one new idea that has led to all the others.

An idea that begs a question. The idea that we are all oscillators in a phase space that is defined by oscillators. What do oscillators do in a phase space? The answers may or may not help provide some partial but incomplete answers as to why space & time is the way it is, and how the human brains mechanics lead to each persons individual experience of consciousness.

The answer to that question crosses many disciplines, and in a sense it pulls together Ila Prigogine, Einstein, Buzsaki and others into a conversation that travels from astrophysics, to neurophysics, to brain computer interfaces, virtual reality, and deep learning. Also this book comes with new ideas about how human decision making works from neurophysics to the human experience of consciousness and self-awareness.

a0293z.md

(cortex, synap, thalamus, perception, oscillat, neuralink, dendrite, emotion) #2 #Dendrite

can we reduce the emotional & social entrainment to a 4 dimensional story , and how are the brains of autistics different when there is an emotional social binding, and how does their

the brain has noise that changes with great variability but it's gaussian and tonic, so scientists ignored it, but recent focus on the great variability of this tonic frequency is causing scientists to rethink the noise as potentially containing more information

because when we speak, imagine holding just a vowel sound, in your voice, it sounds like noise, and maybe your voice pattern oscillates a little bit, and only through changes in the noise pattern does meaning emerge, only changes in the vowel sounds, as changes in the noise pattern, result in words forming

so basically our brains are making variable noises, just like our voices,

or our sentences are sequences of variations in noises, and logically then our thoughts may also be variations in noises

the spike might last less than a millisecond  
calcium channels (only open during a spike) calcium binds to and then the neuron spits out

don't mess with the potassium.

dendrite ho

if you fuck with the potassium, that action potential you made it made it last a 2 or 5, ms is just when it went very positive

10 millisecond is the whole process after it went down

so much more potassium will come

messing with the K channels, you are changing the shape of the spike, more spread out, more milliseconds, because more calcium channels are open for longer, more vesicles releases

before the AP, its in a docked state,

if the two oil droplets touch they become a bigger droplet

synapto tagmen molecule  
doesn't do its job until calcium

dendrite

nmda receptors

multivesicle/ every vesicle has roughly 2000 neurotransmitters, bind to to things including the receptor on the other side

the lateral spread, because there is 10,000 now they are diffusing laterally

spatial neurons

alternate between a neural network, an neuron only talks to part of the upper neuron,

ampa and nmda can both be fast,

both on scale of a few milliseconds

calcium

nmda channels let calcium exceptions

a pattern of signal firing,

the exact same neurons doesn't happen, but the areas do happen



a bunch fire here, then here, Area A, are b, then area C are a direct result of wiggling the whisker

how is the path of the signal regulated?

30 neurons firing at the same time, to get a second to fire, within 2 milliseconds,

500 neurons, a couple super strong neurons can almost drive a spike

a neuron has 1/30 the size it needs to be to drive a spike

the outside world just shifts the activity that already happens

the neurons are waiting around on near threshold hold

saddle points, attractors states, on the edge

dendrite hairs or spines could store temporal memories

so the neuron knows

it will change what it listens to?

all the dendrites, 500 areas where the axons from other neurons, 500 synapses, if any of

what can change the receptivity of an ndma receptor, phosphorylated?

gpcr receptors, change the phosphorylation

express more kinase from the center of the cell that is not directed, its global dist

the cells in the network might modify the ndma receptors

acetyl choline cell (instead of sending glutamate) gpcr g1 coupled receptor, decreased the local activity

signalling

or gets them ore activated, or removes them from mem

not a gaba

inhibitors response

amrican cells have an inside to outside, temporal summation, the action potential starts at the cell

dendrite is a leaky voltage (water) hose  
enough water is an action potential

the dendrite temporal memory has to impact when the cell fires,

10 dendrites, the soma is where the hoses is they all meet

all the dendrites are different sizes

all the water will reach at the same time

if you put water in the shortest hose first

if the organization if the dendrites is changes

dendritic spines, hairs, points on the dendritic, effect the voltage hoses, if there is more

Tim Urban wrote: introducing article for neuralink, wait but why

most cells have them,

dendritic spikes  
spikes prediction

back prop

op amp with feed forward, nmda channels can contribute

dendritic spikes, can happen through calcium channels

Hawkins was talking about the dendrite spike as preparing the neuron to fire, as the basis of a neuron predicting that it was about to fire.

can a dendrite spike be a large factor, a forward dendrite spike, the layer 5 pyramidal cells, you need that plus something else,

if neurons fire in the 1st layer after the 2nd layer the connection is weakened  
in the book called spines

if you plug up the holes? it makes it with 9 inputs, you can plug the leakiness  
the little bumps

spines is where the voltage gets into the dendrite?

calcium buffer proteins, if it holds calcium long enough, a back prop

spines,

the spine connects to the ampa ndma receptor,

spines get bigger and smaller

the receptors on spines increase and decrease in number getting added and removed

receptor ms, seconds, minutes

the spines getting added or removed, hours or days,

long term potentiation happens that is part of spines getting added or removed,

protein synthesis

might be connected to spines being added or removed

spines, calcium might RESEARCH AREa

## ARTIFICIAL PERCEPTION

instead of needing to decode the entire brain

if you could just record of all of what happens in layer 2

Touch cortex

primary somatosensory area in the human cortex is located in the postcentral gyrus of the parietal lobe. This is the main sensory receptive area for the sense of touch

parietal and post parietal or just multi modal areas

horizontal feedback or vertical feedback

more feedback than feed forward horizontal?

v2 has project back to v1 so that's vertical feedback

there could be more axons with weaker

loops

loops in microcircuits nearest 300 neurons around that neuron

is that a micro column a microcircuit?  
getting in

column  
hexagonal pattern

grid cells

from the bottom to the top

thalamus to v1 2, 3, 4, 5, 6,

they all go back to thalamus

it's a

a0294z

## "GERALD EDELMAN'S STEPS TOWARD A CONSCIOUS ARTIFACT"

"In a series of books, Edelman described his theory of consciousness, which was based on the TNGS [4, 5]. A key to this theory, as enumerated in some of his later publications, was the concept of a Dynamic Core [6]. The Dynamic Core was essentially reentrant signalling between the thalamus and the neocortex. The dynamics of the Dynamic Core were necessary to produce conscious thought or higher order consciousness."

"At the time of the meeting, researchers at the NSI were developing extremely detailed computational models of the thalamus and neocortex. These models showed sleep wake cycles, as well as other other brain rhythms observed during

conscious thought [7, 8]. In one such model, Eugene Izhikevich and Gerald Edelman were able to show the formation of neuronal groups due to plasticity and dynamic neuronal activity [9]."  
<https://doi.org/10.48550/arXiv.2105.10461>

a0295z ctp

(oscillat) from a valid perspective self is a memory, and a prediction.

from another perspective its a rendered information pattern, with phasic spikes contrasting against the tonic oscillation, with small differences between the frequencies patterns representing expectations, shaping your chill perception, and high phasic spikes representing startling new information that attracts your attention.

a0296z

Whiskers

Regarding the article below (Internal Brain State...): 1. The following reference points to top down control. 2. A process of how this can work is described in note a0007z.loop as 6th layer pyramidal neuron tuning. When signals are sent from the 6th layer pyramidal neuron through the thalamic loop back down to the somas of pyramidal cells in the 2nd & 3rd layers those Somas are excited and the signal to noise ratio lowers so the cells become more sensitive. The reverse situation could happen if inhibitory interneurons inhibit incoming signals, reducing the sensitivity or changing the signal to noise ratio. It's interesting because regular whisking desynchronizes the LFP (local field potential) and EEG (Electroencephalogram), and that is what sensor input is supposed to do, in Self Aware Networks NAPOT theory, it's up to the tonic oscillation to absorb decohering sensory inputs, to noise them away, into a synchronized pattern again. The decohering distinctions of which are the phase wave differentials that define the rendering of qualia, that is the abstraction of whisker feeling as the mouse knows it, it's rendered in the decoherence pattern.

# "Internal brain state regulates membrane potential synchrony in barrel cortex of behaving mice"

" However, when the mouse is whisking, an internally generated state change reduces the Vm correlation, resulting in a desynchronized local field potential and electroencephalogram. Action potential activity was sparse during both quiet wakefulness and active whisking. Single action potentials were driven by a large, brief and specific excitatory input that was not present in the Vm of neighboring cells. Action potential initiation occurs with a higher signal-to-noise ratio during active whisking than during quiet periods. Therefore, we show that an internal brain state dynamically regulates cortical membrane potential synchrony during behavior and defines different modes of cortical processing."

<https://sci-hub.se/10.1038/nature07150>

# Read 5 times

# "Signaling of layer 1 and whisker-evoked Ca<sup>2+</sup> and Na<sup>+</sup> action potentials in distal and terminal dendrites of rat neocortical pyramidal neurons in vitro and in vivo"

<https://pubmed.ncbi.nlm.nih.gov/12177197/>

# "Rapid Arrival and Integration of Ascending Sensory Information in Layer 1 Nonpyramidal Neurons and Tuft Dendrites of Layer 5 Pyramidal Neurons of the Neocortex"

"Remarkably, the latency for primary whisker-evoked responses is as short as ~5-7 msec in layer 1 neurons and tuft dendrites of layer 5 pyramidal neurons. In addition, the latency for primary whisker-evoked responses in tuft dendrites of layer 5 pyramidal neurons is ~1 msec shorter than that in somata. These results indicate that ascending sensory inputs arrive in layers 1 and 4 concurrently, which provides a neural mechanism for rapid integration and coincident detection of salient sensory information."

"However, this dendritic coincident detection mechanism requires the concurrent arrival of sensory inputs in layers 1 and 4 which is contradictory to the customary view that sensory inputs to layer 1 are relayed primarily by the secondary sensory ascending system, in which neurons respond to tactile stimuli and convey information sluggishly"

The fact that the thalamus routes information to multiple layers simultaneously is explained with the need for multi-layer dendritic coincidence detection (dendrites have a leaky membrane, so signals have to arrive within a short time window, or all at once, to trigger the cell to fire)

<https://pubmed.ncbi.nlm.nih.gov/14960597/>

# "Long-Range Neuronal Circuits Underlying the Interaction between Sensory and Motor Cortex"

"These interactions between sensory and motor systems are crucial for haptic perception (Diamond et al., 2008, Gibson, 1962, Wolpert et al., 1995). Sensorimotor integration in whisker-based somatosensation is mediated by brain structures that form a series of nested loops, at the levels of the brainstem, thalamus, and cerebral cortex (Diamond et al., 2008, Kleinfeld et al., 1999). Little is known about the cellular architecture of these different loops."

<https://www.sciencedirect.com/science/article/pii/S0896627311006829>

a0296z.corticalwingspan

# "Spatiotemporal properties of whisker-evoked tactile responses in the mouse secondary somatosensory cortex"

"However, upon vibrissal stimulation, tactile information first reaches S1 but also, almost simultaneously, the secondary somatosensory cortex (S2). To further understand the role of S2 in the processing of whisker inputs, it is essential to characterize the spatio-temporal properties of whisker-evoked response dynamics in this area"

My hypothesis is that the thalamus is sending almost identical information to multiple layers of cortex simultaneously so that the Layer 5 neuron which spans the cortical column can parse out

coincidences in the data, which help to create a tomography map of reality, which becomes a rendering that is oscillated in a looping fashion that is also tomographically mapped & rendered by the brain continuously.

<https://www.nature.com/articles/s41598-020-57684-6>

a0297z

(conjecture)

It's my opinion that some of the leading neuroscientists have solved the essential corner stones what human level self aware phenomenal consciousness is and how it works. I came to similar conclusions earlier this year only to discover just today that what I thought was going to my contribution to the topic is something that has already been previously discussed openly & in public by leading minds with other leading minds. Perhaps out of humility these leading neuroscientists are being rather quiet about the real profound impact of what they have found given the world shifting implications of their discoveries. Perhaps its humility or perhaps its uncertainty in the face of needing more data to validate their awesome hypothesis, and perhaps its the modern research culture of making small claims, and not making big claims, so as to not scare off investors from future research. Alas my book is more of conference with many exhibits, and a narrative that ties it all together. My research for this book is tracing the path through past research done by others. My contribution I hope will be a compelling narrative that ties it all together. However that only describes Cycle 1 of the book. Cycle 2 is about a new artificial neural network, and Cycle 3 describes next-gen nervegear -Micah Blumberg.

a0298z

Tags: Mechano interactions, Soliton wave, acoustic, vibration, feeling, multi-modal, dendritic expansion, cell body expansion & contraction during APsyn

Neurons feel the force—physical interactions control brain development

[https://medicalxpress.com/news/2016-09-neurons-forcephysical-interactions-brain.html?utm\\_content=bufferf61e1&utm\\_medium=social&utm\\_source=twitter.com&utm\\_campaign=buffer](https://medicalxpress.com/news/2016-09-neurons-forcephysical-interactions-brain.html?utm_content=bufferf61e1&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer)

a0299z

This was about the capabilities of my EEG based Neurofeedback brainwave entrainment system that I was operating from 2012 to 2014

Neo Mind Cycle

volume, pitch, modulation frequency, LFO speed, LFO depth, wave shape and reverb. It includes a basic visualization of your audio waveform, a visual feedback of sensor connectivity and an interface with visual controls for the various audio properties. It also provides you with the ability to customize links between the various cognitive and emotional aspects provided. The basic setup is controlling pitch by thinking "up" and "down", while you can control the other aspects by thinking "rotate clockwise" and "rotate counter clockwise"

a0300z

Debevec expects that compression technology will be useful for

AI for

Super resolution

Stitching

Compression

On Debevec's speech it sounded like he is using AI to predict the view points between camera lenses, interpolation.

Urbach

He left the spinning camera volumetric capture experiment because he felt like the next step was to recreate the real world as cgi

Neural Lace Podcast Season 2 Episode 1 Neurohackers <https://youtu.be/aexQwTpOwYc>

a0301z

A GPU flocking simulation similar to. boids or voids?

network topology influences behavior

hyper parameters

turn up alignment

a lot more flow

a0303z

(optogenetics, synap, LTP, LTD)

RNA malfunctions would lead to malformed synapses during LTP based protein synthesis throughout our lives we are constantly writing over ontop of our old memories

because our long term memories are represented by the active synapses, and form when a new bouton is either added or taken away, while short term memories are expressed by buzaki's idea about the brain re-arranging the genetically learned alphabet to make words. because the shape of the synapses (and their properties like how many boutons they start with) are folded proteins that are folded from rna, so if human memory is our synapses, editing the synapses will change long term memory and effect the patterns of short term memory



I would be interested to understand how the history of past memories might continue to exist over time, but perhaps memory formation is like winding a clock that cycles in one direction forever, in that the complexity of the bouton formation might allow it to contain enough data to last a lifetime without erasing past memories, but I suspect that the brain can only retain traces of long term memories, like the new synaptic arrangement retaining a ghost of some past synaptic dendritic configuration, simply because only some minor changes needed to be made to create a new pattern, the density of patterns stored in synaptic configurations is potentially massive. It would help to understand a bit more about how it actually works from real studies on organoids. You would likely use optogenetics to study LTD and LTP processes at the synapses in much greater detail.

a0304z

(cortex, layers) Artificial Cortex (Neo Mind Cycle 2)

It would be neat if future Augmented Reality allowed me to illuminate the world around me. Like colored in night vision. I imagine this is what extra layers of cortex are doing for me, adding color spectrum and light spectrum as needed to amplify my awareness of my surroundings.

In this way Augmented Reality glasses could be the most natural way to sort of merge our minds with Artificial Intelligence in a natural way. Such glasses and headsets could be equipped with a variety of bio sensing brain computer interface sensors but we could make full use of the entire library of work in the topic of biology to non-invasively link the human being with intelligence enhancing artificial intelligence, it would in theory extend you, your mind, with a sentient external cortex.

# "Spontaneous Spiking Is Governed by Broadband Fluctuations"

[https://www.jneurosci.org/content/42/26/5159?fbclid=IwAR19baZLNB8xLkn4g2LOFMHWWJFMtXmbSGDGSy1Ltb12kvjJ\\_0TXxVLheY](https://www.jneurosci.org/content/42/26/5159?fbclid=IwAR19baZLNB8xLkn4g2LOFMHWWJFMtXmbSGDGSy1Ltb12kvjJ_0TXxVLheY)

"fluctuations can be seen in the local field potential (LFP), which reflects summed return currents from synaptic activity in the local population near a recording electrode."

"the phase of narrowband oscillations is often correlated with cortical excitability and can relate to the timing of spiking activity and the fidelity of sensory evoked responses."

"neural activity may be fundamentally broadband and composed of transient, nonstationary rhythms that are difficult to approximate as oscillations."

"the instantaneous state of the broad ensemble relates directly to the excitability of the local population with no particular allegiance to any frequency band."

Wow! Is there perhaps no inherent preference for any part of the frequency spectrum in theory? Why then do areas in the brain seem to have regional preferences for power band spectrum? Perhaps it's just about the 3D morphology of the brain and the sensory inputs that cause the appearance of powerband preferences.

I suspected that the types of neurotransmitters in each area could also be related to regional power band frequency preferences.

"These results challenge the view of the neocortex as a system composed of narrowband oscillators and supports a view in which neural activity fluctuations are intrinsically broadband."

That's what the theory of Neural Array-Projection Slice Oscillating Tomography agrees with.

"broader representations may provide higher fidelity in describing moment-to-moment fluctuations in cortical activity."

Broader representations meaning the slower tonic frequency band, exactly what Neural Oscillatory Tomography predicts.

a0306z

The experiences of redness and or the Standard A Tones are differentials in the phase pattern (between the inhibited, the tonic baseline brainwave activity, the phasic & high phasic bursts.)

Expanded: The experience of redness, and or the experience of the Standard A Tone is a difference in a phase pattern (That can range from the tonic baseline state, the phasic burst (maybe this is comparable to a Plateau frequency), the high phasic burst, and the inhibited state).

The phase wave (its frequency & magnitude) pattern differential embodies properties representative of that pattern (a red color or a Standard A tone). The phase differentials representing Redness and or the Standard Tones would be detected by dendrites, and re-rendered by exit terminals for other arrays, and entified in your mind via temporal & spatial oscillation.

Broccoli Properties example: All the properties of Broccoli are features learned by the neural network of the human brain. So the color, texture, feel, crunch, taste, smell these are learned patterns, information patterns are detected first as coincidences in firing by receptors, and as patterns by dendritic & other cell activity, then by whole neurons with the soma burst action potential, then by arrays of neurons, and by nuclei in the thalamus, then by cortical columns & the hippocampal entorhinal circuit, then by the thalamus again. Essentially learned phase wave differential patterns circulate throughout your brain in a spatial temporal oscillating feedback loops.

# "The basic circuit of the IC: tectothalamic neurons with different patterns of synaptic organization send different messages to the thalamus"

Neuron Morphology relevant to response to sound "This morphology may be important to shaping the inputs of the IC neuron and relevant to the frequency bandwidth of the response to sound. "

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3405314/>

# "Visual recognition of social signals by a tectothalamic neural circuit"

"Thalamic neurons encode biological motion"

[https://www.nature.com/articles/s41586-022-04925-5?fbclid=IwAR3V85iuTpCf3qboo44ADK\\_35UsI7MxF0kD4HauFYuGeYb77V0pn9WqwsyE](https://www.nature.com/articles/s41586-022-04925-5?fbclid=IwAR3V85iuTpCf3qboo44ADK_35UsI7MxF0kD4HauFYuGeYb77V0pn9WqwsyE)

# "Stanford researchers observe memory formation in real time"

"When the researchers tested the animals' memory of this new skill weeks later, they found that those mice that still remembered the skill showed increased activity in the same neurons that were first identified during the learning period, showing that these neurons were responsible for encoding the skill: the researchers had observed the formation of memory engrams."

"Motor cortex engram cells took on new synaptic inputs — "

"It was the first time anyone had observed the creation of new synaptic pathways on the same neuron population — both at the input and the output levels — in these two brain regions."

<https://neuroscience.stanford.edu/news/stanford-researchers-observe-memory-formation-real-time?fbclid=IwAR2XCXABr8umQUcV1qYJj5t84I2hHn032-89EI6GCTVIRuf4CpGfy9p1iHM>

The point of the Broccoli Properties example was to show that if we could intercept at the Thalamus how the properties of Broccoli are signals being passed to the neo cortex, then we could recreate the experience of Broccoli in the Thalamus by creating that set of temporal & spatially distributed phase changes. This could be done at any point in the brain, or on any part of the body, as illustrated in the example of the tongue strip with a grid of electrical signals that correspond to the pixel changes of a camera's viewfinder, a device that allows people to see through their tongue or via any part of their body.

David Eagleman talks about this and he talks about the experiment of pulling a rats eyeball out and plugging it into the auditory cortex, and the rat learning to see. Eagleman then goes on to speculate that human brains could be plugged directly into abstract data sets like Nasdaq Exchange data, and they would begin to make useful representations and predictions about that data, because every part of the brain is a general or generic learning system, or is otherwise capable of handling a broad spectrum of sensor modalities, which might be different from one another in terms of what part of the frequency spectrum they persist in.

but what is special about the thalamus, beyond the concept of the thalamus being a router for information from the senses to the cortex, is that it is one of the intersections in the brain where signals from different senses come together, there are other major intersections of course, like the Parietal Temporal Junction, but what is even more special about the thalamus is that signals leave the thalamus to enter the neocortex, travel up the layers of the cortical columns and then return to the thalamus, so the thalamus is the alpha and the omega of brain signals, the

beginning and the end of a feedback loop, the biggest feedback loop perhaps. (I will have to study further to make sure)

There are papers that suggest the hippocampus is like a cortical column, and or a comparator to cortical column data, maybe its cortical column #1, and maybe that is where the base rendering of consciousness begins, or likes to sit, like the central locus of focus, but the information in just the hippocampal-entorhinal loop might be like you, the room, the walls, and where you are in the world, and following the book A Thousand Brains by Jeff Hawkins it might be true that each of your other cortical columns gets busy representing other objects, sounds, concepts, and things that are part of your experience in the room, so the cup on the table, and the hot sauce, are each managed by different cortical columns, all the properties of the cup might be sent to a cortical column that is managing the sensory integration for that object, its orientation, position, temperature, texture, sound etc... and when your awareness of that cup increase that is plausibly going to be an increase in the synchronization between that cortical column and the hippocampal entorhinal loop & the parietal temporal junction all at once, this is something we could look for with current medical imaging technology, whether there is brainwave frequency synchronization between hippocampal frequencies and the parietal temporal junction and or specific cortical columns.

The main idea that I have about the importance of brainwave synchrony between brain regions when objects become conscious comes from thinking about Tim Mullen's neuropype, and how he aligned unstructure data like EEG, EMG, ECG (Brain, Muscle, Heart sensors) by understanding the assumptions made in each technology and figuring out how to correctly align the signal differences temporally, so that when a brainwave spikes, one might associate it with a heart rate spike, given a time based association.

In the same way if one part of the brain wants to understand unstructured data from another part of the brain, I suspect synchrony (achieved by listening to one's self) is creating a temporal alignment between two oscillators so that correlations between the two sets of unstructured data can be found by the neural network of your mind, and you make sense out of an association between lightning & thunder for example.

So if we knew how the properties of broccoli were represented by scanning them at the Thalamus at the moment you were thinking about them, then we might identify which cortical column is managing those properties when you are not thinking about them, and even if you have a completely different personality that manages broccoli in a different region of the cortex, by stimulating the thalamus with the properties of broccoli that we learned from watching your thalamus we might trigger the experience of broccoli in your brain, we might have a next generation brain computer interface for bringing Augmented Reality & Virtual Reality experiences not through glasses but through direct brain stimulation, to recreate known patterns.

"Science has known for a hundred years that Conscious Experience is Correlated with Neural Activity. But what is the Redness itself?"

My theory answers this question, the main thesis is called NAPOT. Neural Array Projection Oscillation Tomography, in part it means the phase differentials (the contrasting wave forms) are the units of neural rendering, a stable diffusion network is a type of neural rendering.

What is the redness inside human experience?

It's a rendering. The front of a neural array observes signals, the back projects signals to the next neural array. The projection is the rendering, the dendrites in the 2nd array see the rendering, and then they project their own rendering to the 3rd array and so on. All the different renderings are part of the picture of what you are seeing now, temporal & spatial oscillation binds them into your lived in experience.

The human being has a tonic oscillatory brainwave pattern state. The state of readiness, all your cells are on the edge of criticality, metaphorically that is the state of awareness, the ground of being, redness is a phasic brain wave pattern that is different from the tonic state.

How does this rendering happen? Okay. When you have an array of nerves projecting transmitters onto the next array of cells, that transmission is a rendering that the next array observes. The picture of reality you see is a lot of little pictures bound together with oscillation.

That theory is called NAPOT Neural Array Projection Oscillation Tomography.

Oscillating arrays of Neurons observe. Dendrites & Receptors are like sensors on a neuron, their exit terminals project a transmission. Cascades of arrays of neurons detect, sense, and observe patterns as the phasic signals dissipate their energy into the tonic oscillation.

a0307z

dendrites Notes including the term dendrites

[dendrites](simplenote://note/8188900b578d4768b59cf48126df8b09)

[some rapid fire questions](simplenote://note/bb1e69b3-bbbb-4f76-b4ac-3f5036a667a5)

This news article explains one way that human neurons are special and different.

[Brain Neuroscience](simplenote://note/17378d1dba3148b6bf3452f6e060fa0a)

A recommended book:

Soul Dust by Nicholas Humphreys

Symphony of the Mind

The brain as a piano

(field) Volumetric Video & Lightfield Capture

Jack Gallant Perceptual Object and Action Maps in the Human Brain

[http://www.youtube.com/watch?client=mv-google&gl=US&hl=en&v=u9nMfaWqkVE&feature=player\\_embedded&nomobile=1](http://www.youtube.com/watch?client=mv-google&gl=US&hl=en&v=u9nMfaWqkVE&feature=player_embedded&nomobile=1)

Perceptual Object and Action Maps in the Human Brain

Perhaps your word representations are siloed in specific cortical columns inside the semantic map in your brain, and your brain activity is just very persistent at sticking to it's preferred silos?  
<https://gallantlab.org/brain-viewer/>

(dopamine) SEROTONIN

<https://neurosciencenews-com.cdn.ampproject.org/c/s/neurosciencenews.com/serotonin-social-memory-19489/amp/>

DOPAMINE

GABA

Tags:

dopamine, neurotransmitter, serotonin

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Ponder Net

PonderNet: Learning to Ponder

DeepMind

<https://arxiv.org/pdf/2107.05407.pdf>

Pointnet++

[http://stanford.edu/~rqi/papers/pointnet2\\_poster.pdf](http://stanford.edu/~rqi/papers/pointnet2_poster.pdf)

Tags:

deep, deeplearning, deepmind, learning

(super position)

a narrative about conscious perspective probably not going in the book

As I see it the physics or Isness that created me guides the braincells interacting with the ecosystem of life to develop predictions in reaction to life experience, and sequences of patterns over predictions becomes my inner life narrative, a song sung by the 200 billion plus vibrating neuron instruments in a symphony of I amness through which my musical soul is inspired to achieve G\_d's greatness, my intuition is a narrative crafted by the physics of the Isness defining my souls path, my intentions, wants, desires, actions and results are defined by this mathematical creation preceding consciousness even, to what then is the illusion of a choice that defies the law that I am, the law pf physics, no choice can be independent from the truth of the divine nature within us all, and this is why hatred is immature, this is why destruction of another is from another point of view the destruction of self.

Life is a dissipative system, consuming energy and exporting chaos to maintain some stability as long as it can, it is fundamentally isomorphic to the spinning hurricane, or the spinning galaxy, or the spinning possibilities of a quantum particle in super position.

We are not in the cosmos, we are it, the human mind has more connections than we have visible stars in the sky. Your mind is on the scale of an entire galaxy, its that massive inside.

a0308z Consciousness Not Explained: Thoughts on Daniel Dennet's Illusion, and the Hard Problem.

My criticism of Daniel Dennet's Consciousness Explained, other topics include emotion, emotion, internal representations, and synaptic rendering,

In chapter 8 of consciousness explained Daniel Dennet mentions the concept "rendering in the brain" but he doesn't take it in the direction that I took it. I argue that the brain is literally doing computational rendering, oscillating the signals projected to the inceptive fields of the exit terminals of neural arrays.

Imagine that a neuron, in a very abstract way, was making a drawing, like the controller on an etch in sketch, and its inceptive field, that defines its synaptic connections to downstream neurons, is its display. Then imagine that the brain is like many frames, or many displays, of many etch & sketches (synaptic configurations) with many trillions of controllers (neurons).

Dennet seems to use color for all of his examples of qualia being something that seems to be vs something that substantially is, a distinction he never makes clear, evoking in my mind the phrase "sweeping it under the rug" he cites a philosopher who treats color as something different from shapes, and in the early part of the book. Tragically all of his descriptions of Qualia are dismissed as illusions of color, but at the same time he treats color as something different from geometry, and avoids making an argument that dismisses the Qualia of geometry, leaning instead on the crutch of color as an illusion.

Dennet seems to argue that there is no color that can be found in the brain, and when we are asked to imagine two different types of color patterns our brain is not recalling color, recalling a stored memory of color, it is just seeming to recall color again he makes distinctions that are not really distinct except for the concept of "seem." His argument seems to be that because a surgeon cutting into the brain doesn't see any colors representing qualia in the brain tissue that color is not literally rendered on a literal screen of the mind. I argue that color is a phase wave differential in space, and it's a phase wave differential in the brain, but that what we have in the brain is a coarse grained or high level rendering of color that exists as a phase wave differential that is different from the tonic oscillation pattern, and is different or distinct from other phase wave differentials representing other colors and it is different from phase wave differentials that represent geometries, people, objects, places, concepts, feelings, tastes, smells, anything and everything.

Daniel Dennet's consciousness explained is a book that seems to have meaning, but in totality his argument is ironically also an illusion, because as far as I can tell he does not offer a real distinction, in terms of neural correlates, between substance and illusion. He does not bother to describe the difference between the neural correlates of substantially seeing & known and the neural correlates of seeming or thinking we see & know something. Without a clear difference between real qualia and seeming qualia Dennet is not really saying anything, but his work is still worth thinking about, in the sense that the contemplation of the abstraction of imaginary numbers provides a useful contrast for thinking about numbers, and it has a mathematical value in calculating certain equations.

Dennet's distinction without a real distinction is as useful as imaginary numbers are to math, which is to say that it's useful for wrapping your mind around what the mind is, even if in the end you have to back away from his descriptions, because if there is no real, then how is illusion any different from real knowing? If illusion has no real difference from real knowing, in terms of neural correlates, then whatever neural correlates apply to Dennet's illusion actually also simply apply to what real knowing is.

The Self Aware Networks theory is different however because I am arguing that while the visual rendering of reality is a coarse grained computationally generated graphical representation of reality, not an exact representation of reality, it does exist, at least at some time step, as some sequences of brain states looping inside active memory for some duration, as a rendered representation from the brain unto the brain.

I argue that redness is a phase wave differential, uncoupled from the frequencies of the light spectrum only to the degree that perception is a calculated rendering. The phase wave differentials that define red are many, but they are distinct from phase wave differentials that define other patterns, and they are different from the baseline tonic oscillation of brainwave activity.

I argue that the perception of color has no special slipperiness that makes it more of an illusion compared to the perception of shapes & the geometry of the world. both the shapes of the world



and the color of the world must share the same status of representation in the brain both are phase wave differentials, and what applies to the illusions of color in human perception must also apply to shapes and to every other perception

What applies to the rendering of reality as qualia also applies to the seeming of the rendering of qualia

Dennet argues that we are not perceiving the qualia of redness but instead it just seems like we are, and yet he provides no neural correlate of distinction between an actual experience and the seemingly subjective illusion of experience, instead he makes distinctions with words that are groundless, insubstantive, hollow, meta, like putting an asterisk around an internal representation to mean 'it seems to be' rather or instead of saying that 'it simply is', but there is no reason for it that I can see, it's a distinction without purpose, no purpose except to try to tease apart what phenomenological consciousness is from what it isn't.

I argue that color & shapes as organisms perceive them are distinct differences defined by the phase wave differentials from the tonic oscillations and also from other phase wave differentials, and in the way I describe the brain there is no difference between recalling a memory of yellow and seeming to recall a memory of yellow, no meaningful difference anyways, just an asterisk, a note that has no meaning except to say this rendering is just seeming to be a memory.

Dennet's core argument paraphrase: Either this memory is a just memory, or this memory is just seeming to be a memory. If the first conjecture is false, and second is true we need to write a book about this.

I am arguing that the distinction between 1 & 2 is irrelevant as 2 is just 1 with different words.

That Dennet seems to have no consciousness of this is puzzling to me. Dennet argues that for instance the brain is not storing a picture but instead a partial similar difference, but he does not consider that a picture is a partial similar difference. What is a picture if not a series of partial similar differences?

Dennet says that his work takes after Wittgenstein. "Wittgenstein doesn't regard consciousness to be the essence of mind or mental phenomena. He criticizes the Cartesian theory of consciousness, which regards consciousness to be a private inner essence."

It's sort of like how Daniel Dennet argues that consciousness is an illusion or something that just seems to be, as in you can report that you think you know something or that you think you experienced something but the facts of your situation might be very different from the reality of your situation. In the case of Dennet I argue that there is no real distinction between experiencing reality, and seeming to have an experience, because both are flawed computational renderings rendered by tissue experienced by brain tissue. Experience is a cascading loop of detected renderings. Existing in space & time over such a duration that your

mind can report on its own experiences to others, to itself, and it can act on or change its actions in response to conclusions.

### On Emotion

Imagine the hypothalamus as an input controller (for emotion) to the brain similar to how the visual cortex might be considered an input controller (for visual information) to the brain. This means that changes to, including destruction of areas in the hypothalamus can trigger dramatic emotional experiences, while changes to including destruction of areas in the visual cortex can trigger dramatic visual changes.

This doesn't mean that all visual information is calculated in the Visual Cortex, and it doesn't mean that all emotional information is calculated in the Hypothalamus, but because the information related to visual experiences move through the visual cortex at some point your vision is affected by changes to that area, and because emotional signals move through the Hypothalamus at some point your emotional experience is affected by changes to the Hypothalamus.

Emotional processing & Visual Processing, I argue, are both processed by the whole brain, but not processed in equal amounts in every location. Every oscillating group of cells is going to react differently to emotional signals and to visual signals relative to every other group of cells. Some groups of cells will barely register responses to certain types of signals, and some groups of cells will be hyper responsive to certain types of signals, and this is because the dendritic & synaptic morphologies inside every oscillating group of cells, grow & decay to customize their own responsiveness to very specific types of signals.

It is as if the brain areas were each akin to stained glass windows. I pick stain glass windows as an analogy for synaptic frequencies, dendritic, and somatic frequencies states, because they sit there and wait for incoming signals to change their frequency patterns, and like color stained glass, when signals arrive their configuration response uniquely in terms of what it passes onward to the room.

The stained glass analogy breaks down of course because stain glass doesn't update. In that case we could consider a different analogy for the synaptic configuration filtering incoming signals as more similar to Quantum Dot LCD Liquid Crystal Displays, where the synaptic frequency represents a color filter that modulates the information from the sensory input signal for the next neural array.

The synapses, dendrites, and soma's are filtering the incoming sensory signals, to the subsequent array, represented by light in this analogy to the whole brain

This is a great analogy because then we can discuss how damage to Wernicke's or Broca's areas which are far from sensory input areas but received signals from many areas can result in specific issues with regard to speech, or understanding words, a stained glass window is a window that has many different pieces of colored glass that when combined produce a pattern.

What I am imagining is closer to a virtual stained glass window (or Quantum Dot LCD panels), one that is defined by synaptic frequency states which are like stained glass reporting the change or modulation of a signal to the next synaptic frequency state.

The Hard Problem:

"David Chalmers 1995: The easy problem of consciousness is concerned with mechanistic analysis of neural processes: EG Visual information is sent to the primary visual cortex, how does it happen mechanistically?

Solving the easy problem results in identifying the Neural Correlates of Consciousness

The Hard Problem: Why do things feel the way they do? Is what one person feels the same as another? If the mechanisms are the same, why can things feel different to different people?

The Hard problem is the experiential dimension of consciousness (phenomenological, subjective)." Quoting or paraphrasing a slide from this presentation titled "Paper presentation on "Theories of consciousness" by Anil Seth & Tim Bayne 2022 Nat Rev Neuroscience"

<https://youtu.be/AQHm1AtaMBU?t=156>

Self Aware Networks address the Hard Problem directly and fill in the explanatory gap between the easy problem & hard problem.

Is consciousness a hard problem or is it a meta problem? I think if one thinks of illusion as a persistent pattern in spacetime that renders the felt description of being someone, then Dennet's illusionist theory is close to Self Aware Networks: Neural Array Projection Oscillation

Tomography (NAPOT) Theory. I say the solution to the Hard Problem is that it feels like being someone because that feeling is computationally generated as something that is distinct from everything else. Computers do not process feelings, and they don't do non-linear calculations, to build sensory representations of reality, but they could.

Feelings are a non-linear volumetric calculation, that a four dimensional system with biological neurons, or simulated biological neurons could compute, and feel, because the structure enables this kind of calculation to exist, what is require is either physics, or a simulation of physics for this kind of calculation that allows the rendering & the detection of feelings in a feedback loop, and then a robot is someone. What observes the feelings generated by this machine? The very same machine, but could a machine feel simulated feelings? Of course. The point is that if the simulated structure is able to react the exact same way as a real structure, then the frequencies of rendered information will become distinct in all the abstract ways that make rendering information inside human phenomenologically conscious experience distinct. Artificial computers will compute the abstractions of qualia, following an understanding of how human brains compute the abstractions of qualia. What does it mean to feel like someone? However you describe, that feeling of being someone is a calculated abstraction that is different from some other state, and it has all the properties that you can identify, with all of them being, in the sense that Daniel Dennet means it, an illusion, or as I would like to say a temporary and distributed rendering from phase wave differentials between cells bound by oscillations. (Neural Array Projection Oscillation Tomography)

a0309z

a0309z.sharp

Sharp wave ripples, sequences brief high frequency bursts & spikes triggering phase wave oscillations of local field potentials greater than 150ms in duration. Some people in the medical imaging community think of burst firing & sharp wave ripples as brainwaves in the fast range 80hz-200hz frequencies, but brains can issue burst firing at frequencies as high as 600hz.

Sharp Wave Ripples, or sequential patterns of bursting & spiking include coincidental patterns of synchronous inhibitory waves or slow downs in the rate coding of nearby cells that emerge from the bursts & spike sequences.

High Phasic bursts, aka Sharp wave ripples trigger collective synchronous events. (Their decay rate or action potential duration sets the timing of the neural array defined by it's exit terminal that is inhibited after the Sharp wave ripple.)

Neuroimagers notice that Sharp wave ripple events in the Hippocampus it mark a time when the Hippocampus is sending something really important to the rest of the brain, that causes coordinated synchronous activity (the memory is scaling up, for a visual imagine a stone skipped across a pond causing ripples where it bounces.)

# "Dr Itzik Norman on "The Role of Hippocampal Sharp Wave Ripples in Human Episodic Memory <https://www.youtube.com/watch?v=ZF3aomDmmDc> "

"Ripples have been linked to spatial learning in Rodents Jadhav et al., 2012; Fernandez-Ruiz et al., 2019"

"Critical for offline memory consolidation" Girardeau et al. 2009, 2016; van de Ven et al., 2016

"Memory reactivation during sleep Ji and Wildon, 2007; Peyrache et all, 2009; Rothschild et al, 2016 "

"Ripples reactivate memory traces"

Sharp Wave Ripples are activated memory-prediction-renderings, and what they represent to your brain depends on where they came from, what they were connected to, and

But essentially High phasic ripples or bursts are the key process for how a memory prediction stored in a synaptic location scales up to become part of a whole brain pattern.

Paraphrasing the video linked above: "A ripple event in the hippocampus causes place cells in the hippocampus to become active during the ripple, they are activated one after another, in otherwords a sequential activation of ripples happens across many place cells during a sharp

wave ripple, and this has been shown to correspond to specific trajectories, representing learned paths or learned strategies."

High Phase Burst Sharp wave ripples cause sequential activations of spiking activity in the brain that can be observed with medical imaging. This phenomena is not restricted to the Hippocampus, but most of the research on SWR has been done in that area.

I think the big difference in the research on Burst firing & Sharp Wave Ripple events is simply that the study of Sharp Wave Ripples is focused on the sequential activations that follow the burst firing. To rephrase that I think Burst Firing & Sharp Wave Ripples are both about Burst firing, but the Sharp Wave Studies are about studying the sequential activations of spikes across the brain that result from the Burst firing. Whereas studies on Burst firing tend to be focused on just one neuron.

When researchers use the phrase Episodic memory, such as in the context of you ate something and then you had a (video or emotional or other sensory) flash back to your childhood, because the taste triggered a memory, what I think they are describing is a volumetric rendering, in terms of sensory modalities of vision, taste, smell, sound, feeling & emotion. The concept of Episodic memory implies a volumetric reconstruction of a remembered past lived in experience. Perhaps I should say a volumetric video, with volumetric audio, with volumetric feelings, tastes, smells, etc.... Episodic memories have spatial & temporal dimensions. They begin they last for a time, they end. The experience was felt somewhere.

a0271z.self

The feeling of being somewhere, of being here in your body is a spatial & temporal rendering, that your brain is producing with messages between cells, between synapses, that are stitched together with phase wave oscillations. This feeling of being somewhere exists in contrast to the tonic oscillation brainwave pattern that you have in which there is no intrinsic feeling of being anywhere. In other words your sense of location is created by the shapes of your active neural paths (from active synapses) as your brainwaves thread your neuropathways with oscillating (looping, cyclic, feedback) activity.

In a nutshell researchers associate sharp wave ripples, or phasic spikes that trigger cascades of spiking, and waves of synchronized oscillations (via the inhibited exit terminals from each spiked neuron) with episodic memories, because sequential activations, in brain activity, is what you might hope to see if you were looking for the neural correlates of a memory movie being played back in the brain. Similar in concept to how a movie is constructed from a sequence of individual pictures frames.

When you remember something, that memory starts with a sharp wave ripple, which begins with a high phasic burst, that inhibits its exit terminals, followed by a sequence of action potentials, each of which are inhibiting their exit terminals, and the Sharp Wave Ripple sequence is triggering both sequences of inhibitions (anti-action potentials that have lower frequency but higher magnitude (they affect a wider radius and magnify the area of the signal)) and sequences

of excitations (that lead to action potentials they have lower magnitude but higher frequency, they affect fewer neurons by area, but they travel farther in terms of distance in the brain).

#### # "Burst Firing in the Electrosensory System of Gymnotiform Weakly Electric Fish: Mechanisms and Functional Roles"

"Natural electrosensory stimuli consist of sinusoidal variations in the amplitude of each fish's own EOD that arise in multiple behaviorally relevant contexts. For example, when two fish are located close to one another (i.e., <1 m), interference between their EODs will cause a sinusoidal AM (i.e., a beat, whose waveform is considered a first-order stimulus attribute, Figure 1B) at temporal frequencies of 0–400 Hz depending on the EOD frequency difference between the two fish (Hupé and Lewis, 2008)."

In fish that have electrosensory temporal (read tonic beat, or first order stimulus) frequency spikes in the range of 0-400hz. (This is the tonic firing not the burst firing)

Those same fish are going to have high phasic burst firing in the range of 150-600hz

"Burst Firing in Peripheral Afferents. We first describe burst firing at the sensory periphery (Figure 2A). EAs display strong heterogeneities in their baseline activity (i.e., in the absence of stimulation but in the presence of the animal's unmodulated EOD). Indeed, their baseline firing rates range between 150 Hz and 600 Hz (Nelson et al., 1997; Gussin et al., 2007; Metzen and Chacron, 2015; Metzen et al., 2015b)."

<https://www.frontiersin.org/articles/10.3389/fncom.2016.00081/full>

Your brain is capable of burst frequencies as high as 600hz

#### # "EMERGENCE OF A 600-HZ BUZZ UP STATE PURKINJE CELL FIRING IN ALERT MICE"

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4860878/>

\*\*SWR are sequences of synchronous bursting of cells.\*\*

#### # "Hippocampal sharp wave-ripple: A cognitive biomarker for episodic memory and planning"

"These sink-source distributions are strongly correlated spatially with the evoked LFP responses of electrically evoked discharges of CA3 pyramidal neurons (Fig. (Fig.6B),6B), the relationship suggests that [SPW-Rs Sharp Wave Ripples] reflect the excitatory depolarization of the apical dendrites of CA1, CA3 pyramidal neurons by the synchronously bursting of CA3 pyramidal cells (Buzsáki et al., 1983; Buzsáki, 1986; Suzuki and Smith, 1988b; Sullivan et al., 2011)."

#### # "The hippocampal sharp wave-ripple in memory"

"One such pattern is the sharp wave-ripple (SWR), an event associated with highly synchronous neural firing in the hippocampus and modulation of neural activity in distributed brain regions.

Hippocampal spiking during SWRs can represent past or potential future experience, and SWR-related interventions can alter subsequent memory performance."

"Taking into account classic psychological theories and recent molecular results that suggest that retrieval and consolidation share mechanisms, we propose that the SWR mediates the retrieval of stored representations that can be utilized immediately by downstream circuits in decision-making, planning, recollection and/or imagination while simultaneously initiating memory consolidation processes."

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6794196/>

# "Normal and Abnormal Sharp Wave Ripples in the Hippocampal-Entorhinal Cortex System: Implications for Memory Consolidation, Alzheimer's Disease, and Temporal Lobe Epilepsy"

"It is posited that these waveforms reflect rapid network interactions among excitatory projection neurons and local interneurons and that these waves may contribute to synaptic plasticity underlying memory consolidation. Further, SWRs appear altered or ectopic in AD and TLE. These waveforms may thus provide clues to understanding disease pathogenesis and may even serve as biomarkers for early-stage disease progression and treatment response."

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8273653/>

# "High frequency burst firing of granule cells ensures transmission at the parallel fiber to Purkinje cell synapse at the cost of temporal coding"

"Nevertheless, high-frequency burst activity induced a short-lived facilitation to ensure signaling within the first few spikes, which was rapidly followed by a reduction in transmitter release."

^ High phasic firing, burst firing, also triggers inhibition, inhibitory waves, alternating inhibitory & excitatory sharp wave ripples. Like waves in the water. Like sinusoidal waves but played out in sequences of neurons. A sine wave is a curve describing a smooth repetitive oscillation.

What is funny is that some researchers think the goal of the brain is synchronous firing.

"The notion that frequency coding is partially lost in individual GrC firing patterns has interesting implications for the cerebellar network as a whole and challenges the idea that GrCs merely act as interposed relay-neurons. What is the purpose for a GrC to fire a high-frequency burst when actual release falls behind?"

"This means that a brief PF burst could overcome the initial low RP to ensure release within the time window of the burst. Moreover, as the presynaptic insufficiency caused a rapid fall in RP, restricted release prevents immediate saturation of the postsynaptic site, thus leaving room for temporal summation at a lower rate. Ultimately, these characteristics point toward a non-linear mode of synaptic transmission, in which the actual occurrence of a synaptic event bears significance as well as its timing within a burst."

In the context of the physics of oscillations a slow down in the frequency of one metronome clock that was previously synchronized with another metronome clock matters. When the two metronomes resynchronize it means the difference between them has been dissipated between

them evenly, slowing down the faster metronome by 1/2 the difference in the slow down of the slower metronome.

Some folks think this "frequency coding is partially lost in individual GrC firing" is an accident, or a loss in precision, an error in the system, an inefficiency. I don't agree.

I think it's how the signal gets magnified from high frequency low magnitude signal, to a low frequency high magnitude pattern.

# "Preconfigured Dynamics in Our Brains by György Buzsáki, M.D., Ph.D."

<https://youtu.be/izVCKEsDSq0>

A Sharp Wave Ripple might have 3 stages, such as a 200hz fast pre-play sequence, then a slower more space out firing sequence as the organism acts out the sequence on a behavioral time scale, then another very fast replay that is played back in reverse (past memories of what we did are played back in reverse in the brain.)

a0007z.interneurons

a0309z.interneurons

György Buzsáki, M.D., Ph.D. says "the goal of interneurons is nothing else but to guide the traffic of the action potentials of the principle cells or the pyramidal cells in the right direction. The interneurons are the traffic lights of the brain that allow that the messages in the brain go in the right direction at the right speed"

a0007z.starburst

a0309z.starburst

In the retina the "Starburst Amacrine Cells (SAC)" inhibit the "Direction Selective Ganglion Cells (DSGC)" in just the right places at the right time to allow the DSGC to not fire when it see's the wrong pattern of what it is wired to detect, so that it does fire when it see's the correct pattern. In theory a left to right direction selective cell might fire if it's receptive field receives stimulation from an object that appears right in front of it but does not move from left to right. The SAC cell can recognize other patterns that the DSGC is not supposed to recognize, and if it does, it can inhibit the DSGC from firing.

So we can imagine that the inhibitory interneurons are helping to shape or bifurcate neural paths by doing their own pattern detections like the Starburst Amacrine Cells, which the path of signals determining which neuron's receive signals, and also what renderings appear in your mind from the output of the neurons that received signals and fired bursts that created sharp wave ripples across the brain.

György Buzsáki, M.D., Ph.D. also says that "Sharp Wave Ripple from the Hippocampus both fan-out to the neo cortex and at the same time they fan-in to lateral septum and then to the



hypothalamus" He says also that the dense connections from the Hippocampus to the Hypothalamus allow for SPW-Rs Sharp Wave Ripples to phase reset glucose level fluctuation (our blood sugar). Essentially your 24 hours blood sugar oscillations are driven by your 24 Sharp Wave Ripples, and my conjecture is that Sharp Wave Ripples are activated memories. Rephrased, your past memories are driving your blood sugar levels throughout the day.

a0310z

Watch the Neural Array Projection Oscillation Tomography Revision 5 video that I did.  
<https://youtu.be/vixhppNAKPs>

NAPOT Revision 5

# b0010y and a0310z

The original 40 minute audio that inspired note a0310z and the audio file called b0010y can be listened to here: <https://recorder.google.com/6e2e499f-5cf8-4b2f-8e64-e77f44a9b2de> The b0010ywhisper.md markdown file contains a human level transcription of the original 40 minute audio.

I added did a lot of rewriting & editing to the text after the original audio, and that is why a0310z was created, and reading a0310z out loud led to the video linked above.

# A short poem before the article:

"drifting off when I saw "fermi(...)" my mind starts to wake up, my poetic EPSPs innervate my Layer 2/3 Pyramid Soma's, I think "wow new article on fermions" alas not fermions, "fermi paradox" ugh, then I feel my inhibitory interneurons decoupling my excitement for a physics post."

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Disclaimer for this note: I use the word neurons almost exclusively in this note but a lot of cellular computation in the brain is done by other types of cells that interface with neurons, the mains ones being glial cells like astrocytes, oligodendrocytes, microglia, and there is a lot of interaction between neurons & t-cells, and all the other cells of the body interface with brain cells. So while neurons are the focus of this note, keep in mind this is not the whole picture. An astrocyte cell is thought to be able to carry out essentially the same types of functions of a neuron, but at a slower time scale, with different internal processes, a slightly different set of gliotransmitters (with some overlap with neurotransmitters) and they have a slightly different role to play in the brain. Also while I talk about neurons generally the primary focus of this note is about pyramidal cells in particular, a type of neuron that maybe have branches for the soma in addition to branches for the basal dendrite, and computationally sophisticated apical dendrite branches. I would like to think other types of neurons share the same functional framework with

albeit different morphologies, but obviously 6th layer neurons do not burst (at least not with the frequency seen in 5th layer neuron bursting) and so there are going to be functional differences in non-pyramidal neurons that do not have fancy apical dendrites, but do have backpropagating action potentials.

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# Neurophysics: Linear Non-linear Computation at the neuron, neural array, cortical column, and column assembly scale memory-prediction-rendering of the mind that is the phenomenological conscious experience of being someone and or being somewhere.

Essentially phase wave differential oscillation patterns formulate a tomographically shaped topological experience. In other words the computationally rendered experience of reality is both threaded & observed piecemeal by cells in oscillating feedback loops. Our cells are printing the patterns of the mind onto each other inside cyclic oscillations that are functional fractal feedback loops. Our brains are computationally printing our sense of being somewhere, and or our sense of being someone, from the contrast of our raw sense. Our raw sense is a formless awareness established by tonic oscillatory brain activity, and in this formless awareness of raw sense forms arise that shape the experience of being someone and forms arise that shape the experience of being somewhere. The forms of all distinct things arise in contrast, as contrasts, or phase wave differentials, from the tonic oscillation background pattern, what I call the formless raw sense, or the ground of being, or the mind in its awake criticality state.

Essentially communication in the brain at the neuron level is about phase rate changes with varying neurotransmitter magnitudes resulting in unique communication patterns that recode the synapses of each neuron. An array of neurons pass their phase wave changes to other neural arrays, and columns of neural arrays in the neocortex maintain an active memory state with a regular tonic firing of action potentials, at a certain cadence such as 20hz, 40hz, 60hz, 80hz, and also these are identified as the powerband frequencies in EEG imaging: Theta, Alpha, Beta, Gamma, and High Gamma. Tonic frequencies are thought to be gaussian, or like pink noise, or almost random, with low to no information, they have high magnitude which enables widespread synchronized firing, and low frequency. They manage to keep the brain in a ready state, or a criticality state, and their pattern fluctuations are very precise, serving as attractors in neural activity to maintain patterns that are changed by irregular action potentials, burst rate firing, and slow wave potentials which when absorbed by the regular tonic firing result in your mind being changed by new rendered patterns that oscillate and then are observed by the brain the same way patterns from the world around you are observed by the brain, in fact this is one unified process and I just said that in two ways to help explain the idea.

The varying magnitudes & frequencies of synaptic transmissions, dendritic activity, and the soma burst rates of whole neurons, plus the changes in the frequency patterns encoded in whole columns of the brain, and across the columns of the brain, the thalamus, and the hippocampus result in varying levels of inhibition & excitation, variations in the timing of

oscillations, and tomographically entified rendered patterns that are observed by the same cells that are making the rendered patterns which are phase wave changes passed by the neuronal outputs, the neurotransmitters.

The synaptic, neuronal, column & brain wide network oscillations sculpt and render the experience of reality from the brain to the brain via oscillating feedback loops. The brain is effectively doing computational rendering & then reading it's own output pattern, from neuronal outputs, as that pattern is looped or played back to the neural network of the brain which detects it, with neuronal inputs, and re-renders (outputs it again) with new sensor input data.

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# This is Neural Array Projection Oscillation Tomography Theory Revision 5.

The varying frequencies & magnitudes of action potential transmission & the varying frequencies & magnitudes of neural transmitter release result in the unique transmission of patterns from neuron to neuron, from neural arrays to neural arrays, within cortical columns, and across custom cortical column assemblies in the brain's macroscopic networks via the Thalamic Matrix Inhibitory Interneurons, and also Thalamic EPSP relays from 6th Layer Pyramidal Cells.

With each transmission of phase wave change differentials, including forward & backward propagation at the synapse scale, forward & back propagation at the soma scale, and looping signal transmission across cortical column assemblies, there are cortical column frequencies that are changing, and individual neuron tonic frequency patterns changing, and frequencies encoded in each synapse of each neuron are changing.

With individual synapses upregulated in frequency or down regulated in frequency affecting different neural patterns that result in different neural pathways that shape the configuration of patterns in your mind as you experience them.

This phase rate coding with varying magnitudes of neurotransmitter release, plus individually encoded synapses, results in a considerate detection: Meaning the neuron & the dendrite consider patterns that they have grown to prefer, and their physical & synaptic phase rate configuration allows them to selectively ignore or pay attention to patterns on a millisecond to second timescale at the single neuron level, at the neural array scale, and longer time scales at the column scale, and longer timescales at the multi-column or whole brain scale.

Considerate Detection at the neuron scale is paired with a consequent emission, a phase wave rate change & a magnitude release of neurotransmitters that is different from usual, and or it can be described as an unusual pattern change. To the brain an unusual phase change is information the context of information theory, In fact it is rendered information because the phase change is persistent, it oscillates in time & space like printed object with low persistence

(a term from Virtual Reality when discussing displays that lose the image they are holding quickly to prevent image blurring, and also they transition faster to update to the next version of the image from the new head position.).

The neuron with its synaptic configuration represents the considerate detection because it's detecting clusters of patterns in a stepwise manner. The dendrite is doing a step wise, or computational, or a mostly linear summation of nonlinear cluster based computation. (See the Clusteron) (ordered or clustered via arrival times & arrival proximity) from its synaptic inputs across the neurons whole body over time.

I argue that the metaphor of the leaky integrate & fire neuron is conceptually flawed, because the control of potassium outflow is very precisely controlled because the up or down regulation of individual synapses is critical to the phase wave shape change. So it's metaphorically incorrect to say that dendrites have leaky membranes, and it's more correct to say that neurons have precisely regulated valves that open & close to compute the phase wave output of the neuron.

We could say the neuron doing a non-linear input computation, but that just means the inputs can arrive in any order from any of the synapses, and basically a non-linear input means that the neuron's threshold mechanisms at different scales are considering the sum of the aggregate charge from all possible inputs within a temporal window that is in part also configured by the morphology of the cell & it's connections, plus the up or down regulation of individual synapses. These are the neuron's pattern detection mechanisms.

The neuron's output is formed from the clustered sum of its inputs over time so a neuron considers the clustered sum of its inputs over time which is the same as a non-linear computation inside a linear computation. The non-linear computation is also described as the gradient potential, and the linear computation can be described as the synaptic thresholds that feed into the dendritic thresholds that feed into the somatic thresholds.

In other words the neuron detects spatially distributed inputs across its membrane, and computes them with almost a combination of summation & multiplication (of the inputs) (multiplying charge if for example two NMDA synapses on the same branch located next to each other fire within milliseconds of one another, adding the charge if two synapses fired from different branches of the dendrite) and via the synaptic, dendritic, and somatic thresholds the Neuron is converting the spatially collected information into a temporal pattern, creating a phase wave variation or differential that has a magnitude & frequency. The magnitude & frequency of a wave have an inverse relationship, so that when one grows the other shrinks, and that phase wave change results in change in the magnitude of neurotransmitter release (which is part of the phase wave), which results in changes to the synaptic frequencies of down stream (and sometimes upstream) neural arrays. In short, small synaptic changes result in bigger somatic phase wave differential patterns and vice versa.

The Neuron is effectively considering information patterns through the weighing of charges, positive and negative ion charges, and the clustering of these charges, based on where they are coming from and at what rate, and its doing this complex pattern detection with its unique dendritic branching & synaptic connections with its social network (it's network of synchronously oscillating cells).

Side note: Also a human being is essentially a fractal of a neuron. Perhaps your digestive system is a fractal of the mitochondria, your heart might be the soma, your head might be the nucleus, your hand and arm on the left side might be the basal dendrite, and your hand & arm on the right side might be the apical dendrite. Your head is like the fractal of an eyeball, the outer layer of grey matter is analogous to the retina, and the thalamus is analogous to the focus point where light converges, as all the sensory inputs signals eventually connect the thalamus at some point and the thalamic matrix inhibitory interneurons connect all of your cortical columns together, and co-regulate the configuration of your cortical assemblies. Your fingers & toes are also like dendrites and the palm of your hands & feet are like the soma, and the legs & arms that connect to your body are like axons. I imagine that in the future we will have machines that can instruct your body to reconfigure its biological shape, because your proteins can turn into viscous liquid temporarily and then reformulate into solid structures. A human being is essentially a liquid metal robot that is apparently without the processor or energy to facilitate a real time biological transformation, but biological transformations are computed and they happen over the course of evolution. With advanced computers we could in theory expedite evolution to happen many times in a single lifetime, and we could in theory transform our bodies & minds into anything we want (as long as what we want is biologically possible)

The primary input to the neuron, the dendrite, is doing the detection or computation of patterns with branches of synaptic inputs. These synaptic inputs are accepting or releasing charged ions (or other receiving other signals) based on signals from other cells, allowing a single neuron to represent a unique temporal & spatial pattern on a millisecond to second timescale (BTSP). Its pattern is encoded by other neurons, but a single neuron can also help re-code its own patterns via signal feedback loops with other neurons.

The result is a change in the neurons output, and that means a change in the neurons phase wave, which translates into a change in the magnitude of the neural transmitter release. The neuron will fire an action potential every so often at some tonic firing rate, it has a clock like regularity, and a neuron is effectively a biological clock. You can imagine the large Layer 5 pyramidal cell with its apical & basal dendrites as a clock that has a regular cycle for soma bursts, and that its clock speed for soma bursts is changed by phase changes in its synapses across its membrane, and the changes in the upregulation & downregulation of ion channels, including input from metabotropic sensory receptors are changing the charges in the apical & basal dendrites which change the timing, or the priming of the clock's readiness to change its timing in response to certain signals, (the parts of the (Pyramidal in this example) neuron which may include the basal dendrite, the soma, and apical dendrite are constantly being either excited or depressed towards a change in the neurons whole phase rate or burst rate) resulting

in a change in the neurons output (the neurotransmitter release (that is the attractor that represents the phase wave pattern change, that then modifies the synapses of other neurons).

The change in the neuron's output, or phase wave pattern, has several options. 1. It can return to spiking at some regular interval, what I call the tonic firing rate, that could be at 20hz, 40hz, or 80hz for example. These are powerband oscillations like Theta, Alpha, Beta, Gamma, and High Gamma. Tonic firing is higher magnitude and lower frequency but the important characteristic is that it synchronizes broadly with other neurons. It becomes part of a group oscillation, usually whole cortical columns will oscillate together at the same frequency range, but in addition the brain unites cortical columns that are oscillating in the same frequency range, and it inhibits connections between cortical columns & cells that are not firing in the same tonic frequency.

Synchronous phase rates link cortical columns across the brain change depending on the task that you are focused on. The change is accomplished by feedback loops between the cortical columns & the thalamus. The combination of tuning from 6th layer Pyramidal Cells via thalamic neurons excites somas of 2nd & 3rd layer Pyramidal Cells with EPSP and this programs the phase rate changes of the cortical column. This excitatory synchronization from 6th layer pyramidal cells to the somas of 2nd & 3rd layer Pyramidal cells via Thalamic Neurons helps synchronize multiple neurons & cortical columns across the brain as long as they are firing at the same tonic frequency (power band frequencies like Alpha, Theta, Beta, Gamma, and high Gamma).

Also the synchronous activity between the 6th layer Pyramidal cells, and the Thalamic Matrix Inhibitory Interneurons that connect cortical columns together will use GABA neurotransmitters to inhibit communication between cortical columns & cells that are not oscillating together at the same tonic firing rate. This inhibitory interneuron process allows your brain to change the tasks that you are focused on very quickly, by realigning which cortical columns are working together, and which cells are working together, and which patterns are evoked in which sequence.

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# "Dual midbrain and forebrain origins of thalamic inhibitory interneurons"

"In contrast to cortical networks, excitatory neurons in the thalamus do not connect with each other (Bickford et al., 2008; Hirsch et al., 2015; Jones, 2007; Rikhye et al., 2018b). Instead, local connections and computations within TC circuits are dominated by the resident inhibitory, GABA-releasing neurons (interneurons) (Hirsch et al., 2015; Montero, 1987; Pasik and Pasik, 1976; Sherman, 2004)."

<https://elifesciences.org/articles/59272>

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# 1 "Neuroelectric Tuning of Cortical Oscillations by Apical Dendrites in Loop Circuits"

<https://www.frontiersin.org/articles/10.3389/fnsys.2017.00037/full>

Cited in a section of my notes (search [github.com/v5ma/selfawarenetworks](https://github.com/v5ma/selfawarenetworks) for "a0007z.loop" to find my notes about this paper.

The 1st paper links to the 2nd & 3rd papers below.

# 2 "Membrane Resonance in Pyramidal and GABAergic Neurons of the Mouse Perirhinal Cortex" <https://www.frontiersin.org/articles/10.3389/fncel.2021.703407/full>

Cited in a section of my notes (search [github.com/v5ma/selfawarenetworks](https://github.com/v5ma/selfawarenetworks) for "a0007z.resonance" to find my notes about this paper.

The three papers explain how the Pyramidal Excitatory Tuning in 1st paper, and the Thalamic Matrix Inhibitory Interneuron Networks described in the 3rd paper are cooperating in synchronous activity via the 2nd paper. In other words your excitatory Layer 6 Pyramidal Cell signals, and your GABAergic Inhibitory Interneuron signals are cooperating to coordinate your global brain function from the synaptic scale upwards moment by moment. On the astrophysical scale everything in your brain is driven by the physics of oscillation.

# 3 "Core and matrix thalamic sub-populations relate to spatio-temporal cortical connectivity gradients" <https://www.sciencedirect.com/science/article/pii/S1053811920307102>

"(...) thalamocortical connectivity recapitulates large-scale, low-dimensional connectivity gradients within the cerebral cortex. (...) diffusely-projecting Matrix regions preferentially correlate with cortical regions with longer intrinsic fMRI timescales.

"(...) Core–Matrix architecture of the thalamus is important for understanding network topology in a manner that supports dynamic integration of signals distributed across the brain."

"The complexity of cortical circuitry has also been shown to underpin a gradient of temporal scales across the brain, with associative regions fluctuating across relatively longer time scales than sensory regions (Murray et al., 2014)."

"A phylogenetic perspective on the brain (Cisek, 2019) suggests that the cortex is supported by several subcortical structures that shape, constrain, and augment its activity on a moment-to-moment basis. One such structure that is crucial for shaping whole brain dynamics is the thalamus (Halassa and Sherman, 2019; Jones, 2009; 2001; Shine et al., 2019b) (Fig. 1). Located in the diencephalon, the thalamus is reciprocally connected with the entire cerebral cortex, along with primary sensory receptors (such as the retina and dorsal column tract) and numerous other subcortical systems (such as the basal ganglia, superior colliculus and cerebellum). These inputs innervate distinct, anatomically-segregated sub-nuclei within the thalamus (Fig. 1) that are surrounded by the shell-like GABAergic reticular nucleus (Jones, 2001). Through activity-dependent GABAergic inhibition of cortically- and subcortically-driven activity, the thalamus likely plays a crucial role in shaping and constraining patterns of whole-brain dynamics (Halassa and Sherman, 2019; Jones, 2009, 2001)."

"3.3. Matrix thalamus preferentially couples to regions with slower timescales. We observed a significant positive correlation between CPC and both: the intrinsic timescale, (...) suggesting that regions the longer integration windows in associative regions of the cerebral cortex (Murray

et al., 2014) may be due to an increase in regional fractality (i.e., larger H value; Dong et al., 2018) and the presence of long-range correlations.

"these results suggest that the associative cortical regions preferentially supplied by the Matrix thalamus were associated with a longer intrinsic time scale when compared to the regions supported by the Core thalamus, at least during the resting state, and may support the notion of quasi-criticality in the resting brain (Wiltning and Priesemann, 2018, Moretti and Munoz, 2013)"  
"Our results describe relationships between the relative weighting of distinct cell populations in the thalamus and low-dimensional spatial, temporal, and topological gradients in the cerebral cortex."

"the interaction between the gradient structure across these diverse systems may represent a key organizing principle for the nervous system"

<https://www.sciencedirect.com/science/article/pii/S1053811920307102>

<https://doi.org/10.1016/j.neuroimage.2020.117224>

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# "A midbrain-thalamus-cortex circuit reorganizes cortical dynamics to initiate movement"

"Motor behaviors are often planned long before execution but only released after specific sensory events. Planning and execution are each associated with distinct patterns of motor cortex activity. Key questions are how these dynamic activity patterns are generated and how they relate to behavior. Here, we investigate the multi-regional neural circuits that link an auditory "Go cue" and the transition from planning to execution of directional licking. Ascending glutamatergic neurons in the midbrain reticular and pedunculo-pontine nuclei show short latency and phasic changes in spike rate that are selective for the Go cue. This signal is transmitted via the thalamus to the motor cortex, where it triggers a rapid reorganization of motor cortex state from planning-related activity to a motor command, which in turn drives appropriate movement."

"Many behaviors, including purposeful movements, are composed of sequential phases that require different computations. For example, while waiting at a red light to make a turn, we plan to rotate the steering wheel while pressing the gas pedal. After the signal turns green, we achieve our goal by executing a program of skilled movements effortlessly. The planning and execution phases are produced by distinct patterns of neuronal activity (Svoboda and Li, 2018; Vyas et al., 2020)."

"Our experiments suggest that the midbrain sends simple contextual signals to the cortex via particular thalamic nuclei to modulate cortical activity modes. Different thalamic nuclei contain neurons with different projection patterns (Steriade et al., 1997; Clascá et al., 2012). For example, VM contains neurons that have broad projection patterns to layer 1 ("matrix"). VAL instead projects in a more focal manner to middle layers ("core") (Jones, 1998; Kuramoto et al., 2015). These different thalamocortical projections activate cortical microcircuits in specific ways (Anastasiades et al., 2021). The spatial distribution of thalALM neurons with short latencies to the Go cue appears to differ from those showing delay selectivity"

<https://www.sciencedirect.com/science/article/pii/S0092867422001465>



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Columns in the NeoCortex maintain a synchronized firing state with other neurons in that same cortical column, and these synchronized states are primed by the 6th Layer Pyramid Cell Apical Dendrites via the thalamic relays to excite the somas of the layer 2 & 3 pyramidal cells making the cells effectively more attentive to incoming signals.

The tonic synchronous criticality ready, achieved by EPSP Excitatory Postsynaptic Potentials sent to the soma's of Layer 2 & 3 Pyramidal cells makes your mind excited, ready, sensitive to incoming signals. This is how your mind is alert & paying attention, the higher the tonic frequency, the more alert you are, and the more awake you are. This priming of the mental alertness state makes the brain more sensitive to irregular spikes, whether they are phasic spikes, high phasic bursts, or slower inhibitory patterns or slow wave potentials.

The neurotransmitter release change is an attractor that changes the neural oscillation patterns that your brain is in subsequent neural arrays via chain reactions, with Sharp Wave Ripples being one example of a chain reactions. In my conjecture the Sharp Wave Ripple sequence not only produces a chain reaction of action potential firing, but also a chain reaction of inhibitory slow wave potential firing that disperse more widely but travel less distance.

Maybe I should say slowing wave potentials because the effect of inhibitions & slow wave potentials is to slow down the aggregate sum of brain activity by some tiny but precise amount. Slow wave potentials, or as I also term them negative action potentials, are also soliton waves that have a persistent oscillatory effect that travels, and has information value in the context of information theory where less common signals have higher information than more common signals.

Whether it's a phasic, high phasic burst, or a slow wave potential what is changing is the relative clock rate or frequency of neural action (at multiple scales) and the phase wave changes of burst rate firing event trigger a change in the magnitude of neurotransmitter release that sends a unique message rippling through the brain (via chain reactions, and this is called a Sharp Wave Ripple), and the cell grounds it's remnant energy or inverse charge in the extracellular potassium gradient contributing to the brainwaves we measure with Electroencephalogram (EEG). The phase rate changes are also encoded in changes to blood glucose levels, blood oxygen levels, and blood flow so we can study brain activity with a broad variety of other medical imaging techniques MRI, MEG, and infrared light, or FNIRS, to name a few (actually there are a lot more medical imaging technologies that I'm not going to list in this paragraph but you will be able to learn more about them in the Medical Imaging Technology Section of the book & the Institute.)

To recap, a neuron can be inhibited for a duration, or it could fire at some faster range, and there are multiple faster ranges, with burst rate potentials that range from 150hz up to 600hz in special situations.

The irregular phasic action potential, that fires irregularly, fires faster than the tonic action potential. Inhibition fires much more slowly. Bursts fire much faster and travel the farthest, and they have both the highest frequency & the lowest magnitude, because with waves there is an inverse relationship between magnitude & frequency.

The lower frequency tonic waves cause mass synchrony in part because low frequency waves have high magnitude in terms of their area, regional, or spatial effect, but the distance they travel is also shorter, so it takes a lot of links (the Thalamic Matrix Inhibitory Interneurons) between a lot of little cells to maintain synchrony across vast distances.

Rephrasing: Normally a neuron is going to fire regularly at a tonic rate, but it might fire phasically faster at an irregular interval that is both different & faster than the tonic firing rate. Irregular intervals provide a contrast to the regular intervals, and their irregularity implies that they have information value (in the context of Claude Shannon's Information theory) and the irregular intervals affect the clock cycles of every other neuron in it's synchronous assembly via the physics of oscillation that apply to everything including clocks & fireflies (reference to Steven Strogatz's work.)

If that action potential happens again at the same time or place as the previous time or place then it represents a concurrence of past & future events in spacetime, and the brain tracks this by having the post-soma side of the neuron, sometimes called the Apical Dendrite, sometimes call the Exit Terminal, learn the patterns from the Soma, and send a back propagating action potential towards the soma when the spacetime event is expected, if the front side of the neuron, the dendrite or basal dendrite receives the expected event at the same time the charge that it sends to the soma combines with the charge that was back propagated to the soma and that creates a high phasic burst potential. An example is that a neuron that was oscillating at 80hz could suddenly burst to 200hz, creating a Sharp Wave ripple or a cascade of action potentials in a firing sequence across the brain, that mirrors a series of steps that the organism acts out in the real world, followed (after the action is completed in the real world) a backwards playback of the same sequence (which is how your brain understands that you did something in the past, it plays back the internal mental sequence backwards really fast).

Interspersed between the chain of action potentials in a sharp wave ripple are low frequency high amplitude inhibitory waves set by the decay rate of the Action potential or the plateau phase, or the action potential duration, resulting in the magnification of the pattern that action potential represented by the synaptic configuration of its exit terminal. These inhibitory waves cause tiny shifts in the oscillatory timing of the widespread high magnitude tonic frequencies and this changes the magnitude of our expectations in a subtle but noticeable way.

I'm thinking that emotions are probably changes in the tonic frequencies, like big emotional shifts may amount to big shifts in tonic frequencies of whole cortical columns and column assemblies. Big shifts in the tonic frequencies may result in whole brain areas becoming re-aligned, like several cortical columns are shifting at once from a tonic oscillation of 40 hz to 60 hz or 10hz to 80hz.

This correlates with the research on depression where people who are depressed have a greater activity in the delta & theta frequency ranges, the lower frequency tonic oscillations, and people who are drinking coffee and are very alert & focused might have many more beta waves, and people who are very happy might have a lot of gamma waves and so on. When you feel relaxed, such as after drinking a beer you might have many more alpha waves. It seems that there is tonic brainwave frequency correlation with emotion, and so the idea that emotions are actually the low information tonic frequency patterns that are also high magnitude so you feel them in a lot of areas but there is not a lot of data in your emotions, they have low information which is what we would predict with information theory when signals are very common over a great distance, tonic frequency emotions would have more feeling and less thought in them.

To recap I argue that because emotions feel like high magnitude and low frequency information, and because they are widespread, or felt in a lot of places, and because there is not a lot of information in emotions, and they seem to be open to interpretation that the emotions we feel are probably the large scale shifts in the synchronized tonic oscillations at the macroscale of brain networks, and their meaning defines which brain networks are working together which may pre-dispose the organism to being more effective as some kinds of tasks verses other kinds of tasks.

That's why I am thinking with big emotions we are experiencing big shifts in the tonic frequencies that amount to our large scale brain regions reconfiguring themselves with tonic frequency shifts.

If this is true the neural correlates of a big emotional change could be a big change in the areas of your brain that are cooperating or communicating together or functioning together.

Big emotions might mean big or small shifts in the tonic frequencies of cortical columns that help define which regions of the brain are functioning together. I suspect that a big shift in emotions results in a reorganization of cooperating brain structures and they should be measurable with EEG, and big emotional shifts probably have been recorded in EEG research. I would look for EEG studies on mothers giving birth in particular, and ignore studies on EEG sleep research.

This supports what I wrote in Napot 5 a0310z about emotion above:

# "Decoding Six Basic Emotions From Functional Brain Connectivity Patterns"

"Although distinctive neural and physiological states are suggested to underlie the six basic emotions, basic emotions are often indistinguishable from functional magnetic resonance imaging (fMRI) voxelwise activation (VA) patterns. Here, we hypothesize that functional connectivity (FC) patterns across brain regions may contain emotion-representation information

beyond VA patterns. We collected whole-brain fMRI data while human participants viewed pictures of faces expressing one of the six basic emotions (i.e., anger, disgust, fear, happiness, sadness, and surprise) or showing neutral expressions. We obtained FC patterns for each emotion across brain regions over the whole brain and applied multivariate pattern decoding to decode emotions in the FC pattern representation space. Our results showed that the whole-brain FC patterns successfully classified not only the six basic emotions from neutral expressions but also each basic emotion from other emotions. An emotion-representation network for each basic emotion that spanned beyond the classical brain regions for emotion processing was identified. Finally, we demonstrated that within the same brain regions, FC-based decoding consistently performed better than VA-based decoding. Taken together, our findings revealed that FC patterns contained emotional information and advocated for paying further attention to the contribution of FCs to emotion processing."

<https://neurosciencenews.com/emotion-brain-connectivity-21916/>

A Reference to add to NAPOT 5

# "Resolving inter-regional communication capacity in the human connectome"

"we also show that areas that are most closely integrated within the network are associated with higher-order cognitive functions. We find that these regions' proclivity towards functional integration could naturally arise from the brain's anatomical configuration through evenly distributed connections among multiple specialized communities. Throughout, we consider the effect of the network's spatial embedding on inter-regional communication capacity."

"Altogether, the present findings uncover a relationship between polysynaptic communication pathways and the brain's intrinsic functional organization and demonstrate that network integration facilitates cognitive integration."

<https://www.biorxiv.org/content/10.1101/2022.09.28.509962v1>

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# Somatic Communication: Defining Pre-somatic & Post-somatic terms for discussing the triggering of burst events following the activation of a place cells in the cerebral cortex. (or a local event cell)

The idea here is to discuss both sides of the neuron in a way that is focused on the soma as a coincidence detector between patterns detected on both sides of the soma. For this purpose I have defined the terms pre-somatic & post-somatic. The pre-somatic side of the neuron, in Pyramidal Cells, refers to the Basal Dendrite and it's relationship to the Soma, and then you have the post-somatic side of the neuron, which refers to the Apical Dendrite and it's relationship to the soma. In a non-pyramidal neuron the pre-somatic side of the neuron is the dendrite, and the post-somatic side of the neuron is the axon & exit terminal branches. This terminological also makes it clear that we are not talking about synaptic communication, we are talking about somatic communication.

Ideally the pre-somatic side of the neuron is facing towards sensory input neuro pathways, and post-somatic side of the neuron is facing the direction of the motor output pathways.

If that irregular action potential happens again at the same time or same place, then it represents a concurrence of past & future events in spacetime, because now you have the post-somatic side of the neuron and the presomatic side of the neuron. These two sides of the neuron work together to encode seconds long BTSP Behavior TimeScale Synaptic Plasticity in places cells outside the hippocampus (or what I am calling local event cells), that are going to encode seconds long tempo-spatial pattern coincidence detections on both sides of the neuron, and this means that the pre-somatic side of the neuron, and the post-somatic side of the neuron will together super charge the Soma's Action Potential event, creating burst firing.

A burst firing event means we got a back propagation from the post-somatic apical dendrite that coincided with the pre-somatic basal dendrite.

If it same spacetime event (an event of consequence) happens again at the same time (or same place) as before it produces high phasic burst rate firing (between 150 hz - 600hz)

\*\*I'm arguing (and I don't know how many others may have previously argued this) that place cells can be thought of as local spacetime event cells (or local event cells), and that the functions of local event cells are ubiquitous throughout the brain.\*\*

## # The Hippocampus as a Reference Frame for Cortical Columns

The functions of place cells or local event cells are primarily to encode significant local spacetime events (where and when some event happened relative first to the reference from of its cortical column, and it's cortical column activity being relative to the reference frame of the hippocampus as a macroscopic scale reference frame for the brain (Reference Frames are a concept that I learned about reading the book "A Thousand Brains by Jeff Hawkins), so the event cells (and their columns) are predicting when those local spacetime events might reoccur, then computationally rendering their occurrence to the brains network with high phasic bursts that create chain reactions of spiking & inhibitory waves from each spike.

Local Event Cells (Place cells outside the Hippocampus) are doing tempo-spatial pattern coincidence detection & rendering via burst rate firing that sparks chain reactions of spiking cell activity with other cells across cooperating areas of the brain.

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# a0310z.mpr

\*\*Memory Prediction Rendering (MPR)\*\* Memory Prediction was a concept I first read about in Jeff Hawkins book On Intelligence. MPR Memory Prediction Rendering is combination of the

concept of Memory Prediction with NAPOT Neural Array Projection Oscillation Tomography. It means that our cells are making memories, the partially activated memories are predictions, and the output of the action potential is a rendering to it's inceptive field.

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The primary purpose of place cells or local event cells (a term for Place cells outside the Hippocampus) is to create burst firing events, initiating sharp wave ripples, when there is a pattern match between the pre-soma & post-soma sides of the neuron. And I am arguing that place cells or what I like to call "local spacetime event cells" are effectively ubiquitous throughout the neo cortex, not just in the Hippocampus, but in every cortical column, and mini column.

However I would argue that 5th Layer Pyramidal Cells in the NeoCortex are functionally place cells or spacetime event cells, that are not having to do with the place of the organism, but are instead having to do with the place of the object, concept, feeling, or thing around the organism, such as the example of a cortical column tracking the orientation & place (or position in space) & sensory features (texture, heat, color, size, weight) such as a cup of coffee, which is an example from Jeff Hawkins book A Thousand Brain. I argue that the Apical & Basal Dendrites work together to create seconds long memory-prediction-renderings (This concept is a combination of BTSP Behavior TimeScale Synaptic Plasticity with NAPOT Neural Array Projection Oscillation Tomography) so what your mind is doing, within the context of a cortical column, what your mind is doing is rendering the spacetime events of a cup relative to your place in space which is thought to be organized by the hippocampus, and the interplay between the memory-prediction-rendering in the Hippocampus and the Cortical Column activity representing the features of a Cup, via the Thalamic Matrix signal loops yield how your brain is representing a coffee cup to yourself, at each interval of your tempo spatially rendered experience.

The coincidence of firing from the back propagating Apical Dendrite and the Forward propagating Basal Dendrite then represents re-occurrence of a past spacetime event, or a memory-prediction-rendering, that other neural arrays tomographically assemble via synaptic coincidence detections, dendritic pattern detections, and somatic pattern coincidence detections back into phase rate changes that cause the process to repeat or recycle or loop in other neural arrays, and eventually back to the same neurons, and eventually to your motor outputs & nerve endings to change your movements.

You have the post-soma side of the neuron (the Apical Dendrite or exit terminal), and the pre-soma side of the neuron (the basal dendrite or input terminal), and these are going to encode seconds long BTSP Behavior TimeScale Synaptic Plasticity changes, but specifically they allow neurons (focusing on Pyramidal Cells) to compare patterns.

The pre-somatic side of the neuron and the post-somatic side of the neuron are going to super charge the action potential event, if the same pattern happens again at the same time or in the same place. It's like the post soma side of the neuron, the Apical Dendritic, gets encoded with expectations set by the previous action potentials, but it's backpropagation timing is modified when the synapses on the Apical dendrite are upregulated or downregulated by other cells. Essentially the patterns represented by the branches of the Apical dendrite or the Exit terminal can be recoded, not just by other neurons, but by signals sent out from the same neuron via an excitatory thalamic feedback circuit that loops back to the same neuron or to other neurons in it's cortical column.

# New Concept Combination: Behavior Timescale Synaptic Plasticity Memory Predictions aka BTSP Predictive Coding, for seconds long pattern coincidence prediction within the function of a single neuron or 5th Layer Pyramidal Cell.

The post-somatic side of the neuron is encoded with expectations or memory-predictions learned from somatic firing, and these memory-predictions are modified by bidirectional synaptic plasticity on the Apical Dendrite, and when Burst firing happens the Memory Prediction becomes a Rendering, a Memory Predicted Rendering to it's inceptive field defining the neural array that it outputs to.

In summary the Apical Dendritic pattern of the Post-Somatic side of the neuron learns when the last irregular phasic firing happened. Its back propagation firing, based on the pattern it is predicting, will be adjusted with signals from its synapses via bidirectional synaptic plasticity.

When the Apical Dendrite predicts that the Soma is going to fire it sends a surge of back propagating charge from the post-somatic side of the neuron back towards the soma. And if the pattern of the neuron from the pre-somatic side matches the input from the post-somatic side of the neuron, then the soma does a burst rate firing.

That's a higher phasic burst. At that point the neuron at least temporarily jumps into a different phase pattern. Burst rate firing could be 150hz, 200hz, 300hz, 400hz, up to 600hz.

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# Sidebar: I argue that the human brain is a finite state machine, because the total number of possible states are between 0.02 hz and 600hz times the sum of all places where phase states can exist (the sum of every synapse, and every brain cell in the brain)

So the total number of possible brain states might be something like 86 billion neurons + 1,000 trillion synapses x 600.18hz

$600.18 \times (1000 \text{ trillion} + 86 \text{ billion})$ . That would include all possible state changes from metatropic & ionotropic receptors, and all top down state changes from cortical column assemblies.

The maximum frequencies seen in the brain are around 600 hertz. I don't know if 600Hz frequencies have been measured in human brains specifically, but I've seen papers where they have been measured in other species.

In animal brains it has been observed that burst rate frequency firing is between 150hz up to 600 hz.

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We can see from research that there is interplay between high frequency phasic patterns and low frequency tonic patterns.

For example there are papers that highlight the interplay between high-phasic gamma bursts and slower tonic oscillations in the theta frequency.

In note a0001z there is a note that shows us that when an organism is driving it's own behavior, you can measure the amount of signals coming from the frontal cortex back down to the lower part of the cortex, you can see in the pattern of signals that there is a greater quantity of phase wave signals coming from the top down. From the most distal ends of the hierarchical feedback loop (such as the Prefrontal Cortex areas, back towards the limbic areas or the midbrain, or down the major nerve fibers towards the vocal cords for example. When the organism is making choices and determining its own behavior information flows this way, from the top down, or from the distal gray matter towards the midbrain.)

You can measure the amount of brain activity coming from the front of the cortex back to the lower part of the cortex. You can see that the shape of the pattern of signals is that it is a lot greater. There is a greater quantity of activity coming from the top down.

When an organism is making choices, and driving it's own behaviors, medical imaging results suggest that the furthest or most distal end or the top of the hierarchical brain structure (which is the top of feedback loop) sends information back downwards towards the midbrain, and the motor outputs.

Neuro pathways begin at the sensory inputs (eyes, ears, nose etc...) and oscillate in feedback loops throughout the brain, and the eventual ends of these neuro pathways are your motor outputs, causing your movements.

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\*I like to imagine, as an analogy, an oversimplified perspective on the flow of brain activity, where at macroscopic scale, from the birds eye view, where phase differential activity comes



into the tonically oscillating brain network, and this phase wave differential information loops throughout the cortex, like the wind, following different & interesting neuro pathways across cortical column assemblies.\*

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## # Default mode network

Beyond the raw formless sense that I described in the first paragraphs. I argue that the raw formless sense consists of high magnitude low frequency tonic oscillations across the cortex, the more advanced form of this concept is the Default Mode Network.

"The DMN was originally noticed to be deactivated in certain goal-oriented tasks and was sometimes referred to as the task-negative network" Source: Wikipedia

But the Default Mode Network becomes involved in tasks via cortical column assembly which I talk about in this note. So the DMN is not a task negative network, because your brain gets involved in tasks, it may start out as a task negative network, maybe it's the default state right (humor), but then it becomes undefault (humor) and it gets involved with tasks.

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## # "Reward enhances connectivity between the ventral striatum VS and the default mode network DMN"

"Strikingly, we found that the experience of reward enhances task-dependent connectivity between the DMN and the ventral striatum, an effect that was specific to the DMN."

Basically they are saying that the neocortex started chatting with basal ganglia, with the ventral striatum, and the coupling or the links were strengthened when the organism was receiving a reward.

This article highlights the modularity of brain regions to couple & uncouple, in unique arrangements to accomplish different tasks at the behavioral time scale for organisms. These modular cortical column assemblies can unite areas of the brain such as the ventral striatum and the default mode network. The paper above does not explain the neurophysics of rewards, in terms of how they mechanically strengthen the connections between the DMN and the VS, but based on my reading of the paper on Neural Tuning my conjecture is that the valence or voltage or phase wave frequency is matching between the DMN-VS when they are united in joint brain activity. While areas that are out of sync are being inhibited by the inhibitory interneurons that block communication between brain regions that are not in the same tonic frequency range.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9343171/>

Reward enhances connectivity between the ventral striatum and the default mode network  
<https://www.sciencedirect.com/science/article/pii/S1053811922005158?via%3Dihub>

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# At the birds eye view abstractly above cortical column assemblies.

You could say sensory input signals go up into the brain's network, then they cycle in brain signal activity loops, then the activity goes out through the motor pathways. Driving behavior changes. If you want a really simple, creative, and silly analogy that may help translate this complexity to something we could build in a computer system imagine the game Sonic the Hedgehog, which involves a running character that runs through 360 degree loops that go upside down. In an abstract way our sensory inputs bring in phase wave differentials like Sonic the Hedgehog entering his loop. With the loop representing abstractly the strange neural pathways through the brain, the path of the loop can change, but for Sonic the Hedgehog one neural pathway is functionally isomorphic to the next because he goes in one side (the sensory inputs), loops around it (the hippocampal, neocortical, thalamic loop), and comes out the other side (via the motor outputs to the nerve endings and down the midbrain to the nervous system below the brain.)

Repeating this abstract analogy, imagine Sonic, representing incoming signals, goes into his 360 loop, from the left side of the loop because he goes in a big circle upside down and back out of the loop on the right side of the loop.

Imagine your loop for each of your senses, each of your neurons in a neural array, and each neural array in each part of cortex & column, and each column in each cortical column assembly (consisting of multiple brain regions working together), each of those parts of your brain is an additional loop that Sonic the Hedgehog has to loop through. Some loops (neurons) are drivers, which means Sonic passes through essentially the same as he was before he entered the loop, and some of the loops are modulators, which means Sonic is changed, reprogrammed, or noised each time he passes through the loop.

To complexify this abstract analogy even more, the signals are also noised over time & distance as the phase wave differentials are gradually pulled apart & absorbed by the brains tonic oscillations which can accurately be described as a gravitational effect of oscillatory physics that pull apart, distribute, or dissipate the phase wave differentials across the sea of higher amplitude low frequency tonic oscillations. However the changes in the structure of the neural network that grow between neurons, or atrophy between neurons as a result of these dissipating Sonic the Hedgehogs are actually learning to predict, in a process called memory prediction, the paths of future incoming signals, predicting future pattern paths, which leads to the brain being able to render to into its own mind increasingly more complex information

patterns over time. So that an adult brain will necessarily have a higher definition conceptual rendering of reality compared to a child's brain.

When we scale up from neural arrays or neural circuits or edge communities to mini columns and cortical columns, and assemblies of cortical columns, and loops between the midbrain & the cerebral cortex, think of this again as like a larger set of loops inside loops.

Imagine a stack of Sonic the Hedgehog loops inside the formation of a loop. Now imagine Sonic the hedgehog is dissolving as he travels, but he is also reappearing later on when high phasic bursts trigger Sharp Wave Ripples.

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# "Cortico-cortical and hippocampo-cortical co-rippling are facilitated by thalamo-cortical spindles and upstates, but not by thalamic ripples"  
"thalamo-cortical spindles and upstates strongly facilitated cortico-cortical and hippocampo-cortical co-rippling. Thus, while thalamic ripples may not directly drive multiple cortical or hippocampal sites at ripple frequency, these sites may ripple synchronously in response to widespread activation from thalamo-cortical spindles and upstates."  
<https://www.biorxiv.org/content/10.1101/2022.09.15.507471v1>

That's possible because a Sharp Wave Ripple is not just sequences of action potentials, it's sequences of inhibitory waves that result from each action potential in each Sharp Wave Ripple sequence.

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I imagine the process of Sharp Wave Ripples can be abstractly compared to Diffusion networks, such as Stable Diffusion. It's not just a behavior pattern that is rendered by a Sharp Wave Ripple, that behavior pattern is also a rendered sequence between neural arrays in each step of that Sharp Wave Ripple sequence, that is rendering images in the mind's eye of that organism. The Sharp Wave Ripples are chains of phase wave differentials that represent the patterns you can see in the canvas of your phenomenological consciousness.

Like Diffusion networks your incoming signals are noised from high frequency low magnitude signals to become, after many oscillations, after traveling a great distance, tonic oscillations with low frequency and high magnitude. Their energy & information is dissipated by oscillation in the brains feedback loops.

Like Diffusion networks Sharp Wave Ripples stemming from burst firing are creating renderings that reflect what the neural network learned as incoming signals were noised through it's

structure. In other words I am arguing that Sharp Wave Ripples are doing the reverse process (denoising) of noising and that process construct a sensory representation (like an image or a sound) from the low information tonic frequency, or constructing a sound or feeling from the brains low information tonic frequency that has been compared to pink noise. Diffusion networks learn how images are noised, and they reverse this process (denoising) to generate novel new images based on textual or image inputs (img to img).  
<https://stability.ai/blog/stable-diffusion-public-release>

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\*The structure of the cortical column is something to the effect of this: At the top of the brain, where the 5th & 6th layer Pyramidal Cells reach, there are loops from the top of the neocortex back down to the bottom, from these 5th & 6th layers Pyramidal cells to Thalamic Neurons to the second & third layers, and the 4th layers, via the Thalamic Matrix Neurons and to the first layer via the Thalamic Core Neurons. The description is not exactly right but it's something like that.\*

\*Note: I need to update the above paragraph in the future as I still have some unanswered questions about the anatomical & functional structures of the cortical columns, cortical-cortical connections, and cortical-thalamic connections)\*

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To summarize, the neo cortex can be anatomically described as having 6 layers and the top two layers have thalamic connections that route signals back down to the first four layers. However there is interesting work at Numenta that argues that there are more than 6 functionally distinct layers, in each cortical column, in terms of how signals are routed.

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# "A Theory of How Columns in the Neocortex Enable Learning the Structure of the World"

\*\*FIGURE 7. Mapping of sensorimotor inference network onto experimentally observed cortical connections. Arrows represent documented pathways. (A) First instance of network; L4 is input layer, L2/3 is output layer. Green arrows are a feedforward pathway, from thalamo-cortical (TC) relay cells, to L4, to L2/3 cortico-cortical (CC) output cells.\*\*

<https://www.frontiersin.org/articles/10.3389/fncir.2017.00081/full>

Again so you imagined a silly abstraction of incoming signals entering the brain as being like Sonic the Hedgehog traveling through his 360 loops, his path can change, and he can be changed by his path, but the paths that signals travel loop, and the functional neuro pathways

themselves have been observed by neuroscientists and are very clearly described in papers such as the one by Numenta linked above.

I think this analogy can help people who are unfamiliar with computational neurobiology & neurophysics to begin to build a picture in their mind that phase wave differential signals have to travel a path, and at each step of the path a mental image is being rendered in a neurotransmitter release that is being observed by the next array of neurons.

Animated picture of Sonic the Hedgehog moving through a loop.  
<https://i.kym-cdn.com/photos/images/newsfeed/000/564/922/ee1.gif>

Most of your incoming senses head straight along nerves to thalamus and then they are fed into the neocortex. The Olfactory neural pathway is a little bit different, in that 4/5ths of it connect with parts of the neocortex before they connect with the thalamus, but essentially the Thalamus is like Rome as described in history books, all roads lead to the two Thalami, and from the Thalami they connect to the whole brain.

As previously covered the Thalamic core neurons loop signals within a cortical column, and the Thalamic Matrix Cells (inhibitory interneurons) help shape connections between columns.

Thalamic activity also connects with the Hippocampal Entorhinal loop, sending & receiving information like a central hub, some have compared it to a router, but it's different from the abstract comparison to a router because the Thalamus modulates signals, (I think of modulation as noising signals, such as in the context of the Diffusion Networks example written about previously) (this is like when you change or noise Sonic the Hedgehog) and the Thalamus also helps to shape signal paths between cortical areas, and it helping to define cortical column assemblies via the Thalamic Matrix Gabaergic Inhibitory Interneurons, and the excitatory postsynaptic potentials that it relays from the 6th layer Pyramidal Cells.

Maybe I ought to rephrase cortical column assemblies to macro & meso scale cell assemblies because in my mind I am also including cortical connections to the midbrain, including live cortical assemblies that connect to hippocampus such as the hippocampal entorhinal loop, and cerebral to basal ganglia connections for example the connections between the Default Mode Network and the Ventral Striatum. My expectation is that these areas of the brain are united by synchronous firing, and separated by inhibitory interneurons with connections to the Thalamic Matrix neurons playing a role in selecting blocks of cooperating brain areas that are useful to accomplishing one task versus another task.

So the thalamus is like a central player that helps program and is programmed by oscillations from all the areas of the brain that it connects to. When the paths of signals change, your rendered memory prediction sequences change and your mental lived in experiences of reality change. However you are not a passive observer in any sense, because any thought that you have and any action that you take is feeding new information into this looping computation and that is shaping a new outcome.

When phase wave differentials aka mental information comes back to the hippocampus, it doesn't always loop back into the neocortex, sometimes it travels down the midbrain, into the limbic system, to your body, to your fingers & toes, generating new movements for your body, new actions for the organism to take, new tasks that you carry out moment by moment.

When signals leave these abstract Sonic the Hedgehog loops they travel out the motor branches.

Motor outputs include your eye movements, your head movements, your larynx to create your voice. Your motor output pathways are distinct from your sensory input pathways, but there is also a feedback loop between the two called the proprioceptive feedback loop. So your incoming sensory signals are for example helping your brain to adjust your motor output signals on a moment by moment basis as you move your hands, fingers or feet, you are paying attention to your movements as you move and modifying them as needed to accomplish your goals in a very precise way.

The motor output branches and incoming sensory nerves also extend into your lungs, controlling muscle movement, but giving you feedback on the status of your breathing, or the status of your organs. Same thing happens to your eyes, you see stuff, but your motor outputs are controlling your eye movement and so there is a proprioceptive feedback loop in your vision also.

I described earlier that the timing of the post somatic side of the neuron is going to do a back propagation signal is partially set by the pre-somatic side of the neuron, and that there is also modification of that timing from other neurons through the upregulation and downregulation individual synapses, via bidirectional synaptic plasticity, and that includes backpropagating signals at the synapse from the postsynaptic membrane to the presynaptic membrane and vice versa.

In summary there are back propagating synaptic signals that are coming from a postsynaptic neural array backwards to the presynaptic neural array. Bidirectional synaptic plasticity helps modify what the neuronal tonic oscillation frequency is, how excited or alert the neuron is to incoming signals (or how depressed it is), and it helps to either synchronize neurons setting the stage for the LTP process or new neural connections or desynchronize them which might set the stage for the LTD process or the disintegration of connections between cells.

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# My argument in my work is that the physics of oscillations are helping to coordinate where & when the LTP & LTD processes are taking place. The basic concept is that if an LTD process is initiated a lower threshold of activity causes calcium to initiate one of the plasticity processes.

See my note on the role of Calcium  $\text{Ca}^{2+}$  in plasticity a0138z  
<https://github.com/v5ma/selfawarenetworks/blob/main/a0138zcalcium.md>

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# "Calcium/calmodulin-dependent protein kinase II mediates group I metabotropic glutamate receptor-dependent protein synthesis and long-term depression in rat hippocampus"  
<https://pubmed.ncbi.nlm.nih.gov/21593322/>

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# "The role of calcium-calmodulin kinase II in three forms of synaptic plasticity"  
"Calcium influx into postsynaptic dendritic spines can, depending on circumstances, activate three forms of synaptic plasticity: long-term potentiation (LTP), short-term potentiation (STP) and long-term depression (LTD). The increased postsynaptic calcium concentrations that trigger all three forms of plasticity should activate the alpha isoform of calcium-calmodulin kinase type II (alpha CaMKII)"  
"It appears likely that alpha CaMKII is involved in the production or global regulation of all three forms of synaptic plasticity. We propose that the activation of this enzyme is a common step in the induction of LTP and STP, and that alpha CaMKII activity is required for the normal production of LTD."  
<https://pubmed.ncbi.nlm.nih.gov/7953554/>

The point is that Macro level oscillations are the triggering event for these calcium influx variations, different variations of calcium influx will trigger different types of synaptic plasticity events.

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Bidirectional synaptic plasticity can include signals that travel backwards across the synaptic gap that are either down regulating or up regulating the synaptic pattern, which contributes to the frequency of the Apical Dendrite (for one example) which is going to change the time of when the Apical Dendrite will send a signal that back propagates to the Soma, and if it arrives at the soma at the same time the Basal Dendrite floods the Soma with charge with might see a high phasic burst potential, or in other words a sequence of burst firing that initiates a sharp wave ripple or a cascade of action potentials & inhibitory waves.

It's like the neuron with its branches and its individually modified synapse represent part of a pattern, the idea is that the pattern is a sparse & distributed representation that is rendered when the neuron outputs its pattern through the exit terminal to other neurons. The pattern in your mind is partially rendered when one neural array sends its signals to the next neural array.

You can imagine as a metaphor that the synapses are like piano keys, the dendritic branches are like musical organs, and the soma's are like bass drums. With the sound of each affecting the whole shared sound that the organism both creates & experiences, because your cells read the output of other cells. Whatever you create, you experience, whatever you experience your mind generated from it's activity.

The neuron's output to the next signal is a rate change + the change in the magnitude of the neurotransmitter release.

The default tonic oscillation is that the neuron will fire regularly with same frequency & magnitude of neurotransmitter release, a tonic frequency oscillation example is the theta frequency, or the alpha frequency, there are several different power bands of tonic firing.

The rate change & magnitude change is information.

When the neuron detects novel information that novel information is represented with a phase rate change, and a change in the magnitude of neurotransmitter release. The phase rate changes are referred to as irregular action potential spikes, or inhibited activity, or a high phasic burst firing event.

The tonic rate frequency or power band frequency could be 20 hertz, 40 hertz, 60 hz, or 80 hertz. Or described with frequency ranges such as delta (2–4 Hz), theta (4–8 Hz), alpha (8–12 Hz), beta (14–25 Hz), and gamma (30–100 Hz) bands), but despite the frequency the point is that the tonic firing is a regular pattern, with low information, that serves as an attractor for synchronous oscillations of the brain's neuron processors, or neuron clocks.

The combined effect of up & down regulated synaptic connections results in determining when a neuron or neuron cell assembly might shift its tonic oscillation to another power band frequency, which helps determine the relationships between large scale structures in the brain, as groups of neurons tend to oscillate together but neurons can shift in their associations between one oscillating group and another.

The frequency tuning of a neuron and the tuning of its cell assembly is accomplished in part with EPSPs from other cells, or IPSPs, to excite or inhibit parts of a cells membrane, and after some threshold is reached the neuron can shift to a different tonic oscillation frequency, which means it now oscillates with a different cell assembly.

# Tonic oscillations are not random noise, they are precisely tuned attractors for regulating neural activity, for regulating your mind, the ground of being is not a chaotic mess, it's an organized formlessness, it's the shape of your experience, it's the shape of being someone or the shape of being somewhere, rendered and observed by the same process.



While they look like noise in EEG measurements the tonic oscillations of your Default Mode Network are very precisely maintained from cell to cell through synaptic configuration changes driven by phase wave differentials between neural arrays. The tonic oscillations are thought to have lower information value, but they maintain a precisely tuned differential oscillating pattern, they represent memory attractors that guide your expectations & your behavior to seek new information.

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#### # "Tuning Neural Synchronization: The Role of Variable Oscillation Frequencies in Neural Circuits"

"Beyond the small differences in gamma frequencies across cortical areas, small differences in preferred frequency can also occur locally within the same cortical area. A gamma-band frequency gradient as a function of eccentricity (fovea to periphery) in V1 has been established (Lima et al., 2010; van Pelt and Fries, 2013; Lowet et al., 2017)."

"These frequency differences (detuning) have been largely ignored and play little role in current functional theories of brain oscillations. This contrasts with the crucial role that detuning plays in synchronization theory, as originally derived in physical systems. Here, we propose that detuning is equally important to understand synchronization in biological systems. Detuning is a critical control parameter in synchronization, which is not only important in shaping phase-locking, but also in establishing preferred phase relations between oscillators."

"Here, we summarize accumulating experimental evidence showing that oscillations within the same broad frequency band may express systematically different frequencies across brain regions and that precise oscillation frequencies are systematically modulated as a function of sensory, motor and cognitive variables."

"Intuitively, if oscillatory cycles in one brain region are to coordinate with cycles of another brain region, one assumes that they must share a common frequency. Consistent with this prevalent assumption is the wide use of (spectral) coherence to quantify interactions (Lowet et al., 2016). Coherence however, assumes stationarity of the underlying oscillations (for instance a stable frequency) and linearity of the relationship between them. Any cross-frequency interactions, even across very small frequency differences, are therefore not accounted for in measures of coherence. However, experimental observations showing that neural rhythms across and within brain regions often have somewhat different frequencies show that the stationarity and linearity assumptions required for the calculation of coherence are often violated. For example, small but systematic differences in visual cortical gamma-band rhythms are well documented in the primate visual system."

"Zhang, (Zhang et al., 2018) has recently observed systematic theta and alpha waves traveling over cortex as recorded by a high-density ECoG array. They found that the direction of the traveling waves was systematically related to frequency gradients over cortical space. Similarly, theta rhythmic resonance in the rodent hippocampal-entorhinal system has also been shown to exhibit specific frequency changes over space (Giocomo et al., 2007; Shay et al., 2012)."

"The Precise Frequency Changes With Sensory and Cognitive Variables

Here, we will provide evidence that oscillation frequency not only differs as a function of anatomical location, but also depends systematically on the animal's sensation, cognition and behavior"

"These and other studies demonstrate that oscillation frequency is a variable parameter that interacts with basic neural network properties to represent changes in perception and cognition."

<https://www.frontiersin.org/articles/10.3389/fnsys.2022.908665/full>

(article mentioned in note a0149z)

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

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The 6th pyramidal cells in the cortical columns will send EPSP via the thalamus to prime the soma's of 2nd & 3rd layer cells.

# Read my notes on the "Neuroelectric Tuning of Cortical Oscillations by Apical Dendrites in Loop Circuits" <https://github.com/v5ma/selfawarenetworks/blob/main/a0007z.md>

The pyramidal cells in the cortical columns will receive signals that sort of prime the soma to have a certain energy threshold that is more excited than the sensory inputs.

So the combined sensory inputs (from the basal dendrite), when combined with the excited level of soma activation, will be more likely to trigger irregular action potentials or burst firing at the soma.

For a pyramidal cell to fire the Dendrite has to fill up with charge, and the Soma has to fill up with charge, and the charge has to arrive within a short window of time to trigger an action potential. If you have neurons from the 6th layer that are sending excitatory potentials back down to the soma in the 2nd & 3rd layer, that increases the chances that neuron is going to fire. In otherwords it's primed.

If you have less sensory input, a primed soma can be more sensitive to that lessor input because there's already charge in the soma ready to set the neuron off.

In a pyramidal cell the interplay between dendritic branches and somatic branches can upregulate or downregulate the sensitivity of the soma to dendritic signals, increasing or decreasing the resistance to phase wave changes via the primary soma based action potential event.

This is a fractal pattern of the up regulation & down regulation of synaptic channels that might let sodium in, potassium own, increasing or decreasing some portion of the dendritic branches sensitivity or resistance to incoming signals.

If the Dendritic is a microphone (or a camera) metaphorically, imagine that its synapses are doing carefully calibrated gain control of the sound, if the sounds are too loud it dials back its receptivity so it can parse patterns from the louder noise, if the sounds are too low it dials up its voltage (and its attention) to parse patterns from the quieter noise.

So the amount of excitation of the soma will make the neuron more sensitive to signals from the dendrite, and inhibition of the soma would make the neuron less sensitive to signals from the dendrite.

Individual receptors can also modulate their own sensitivity to incoming signals.

Search for "a0272z.spring" at [github/v5ma/selfawarenetworks](https://github.com/v5ma/selfawarenetworks/blob/main/a0272z.md)  
<https://github.com/v5ma/selfawarenetworks/blob/main/a0272z.md>

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# So neurons get excited, their excitement goes up, and they become more sensitive, more tuned in.

Imagine when a person gets motivated about some topic. When you get turned on. Like turned onto the idea of eating food, or playing a game. Or turned on to the idea of going somewhere.

Maybe it's about food, you get turned onto the idea of food, you start thinking about food, and it's like a excitation messages EPSP's from your 6th Layer pyramidal cells are tuning the 2nd & 3rd layer Pyramidal neurons that are in cortical columns that part of synchronously firing & communicating cortical column assemblies, which might consist of parts of the Default Mode Network and parts of the Mid Brain such as the Hippocampus, and parts of the Basal Ganglia, with the Thalamic Matrix Interneurons blocking communication from regions of the brain that are not in sync with your food acquisition strategy.

You start looking for food and thinking about food, and in your brain there are phasic bursts initiating Sharp Wave Ripples that replay sequences of sensor modalities, flashes of sensory flavors, sensory smells, sensory images of food, your eyes start to notice food if it's around you.

Maybe you are thinking about cheese, imagine they start looking for cheese even on the unconscious level, they notice an ad for cheese on social media, or they are walking through the grocery store and they get excited about cheese, start seeing cheese everywhere.

I remember I was walking through Trader Joe's grocery store in an aisle that does not normally have cheese in it and suddenly I noticed the can of dry parmesan cheese (next to the soup).

I'm sure you have heard the example of blue cars. You start talking about blue cars, visualizing them, and then later you notice blue cars a lot more when you go outside.

The idea is that the parts of your brain that have become really good at recognizing the features of cars are being upregulated, tuned up, excited, with EPSP, so that part of your brain is sort of on the hunt for blue cars, because it was excited by your preparatory thinking.

In this way what you practice thinking in the beginning of your day has a long term background duration imprinted in your tonic oscillation that shapes your results for the rest of the day.

If you are thinking about blue cars the inputs of your mind begin to prefer the pattern of blue cars. The aggregate sum of your excited neurons & excited cortical columns is distinct enough to produce the pattern of cars in the rendering of your mind, but also distinct enough to set your tonic oscillating patterns in a precise way to drive your expectations towards being alert to blue cars when they do appear in your receptive field.

Thinking about something is going to excite your unconscious expectations to be on the lookout for that thing, you are setting your unconscious mind, you are encoding patterns into your precise tonic oscillations to be tuned into things that fit the criteria that matches what you have been thinking about.

So if later in the day you encounter something that you have been thinking about your brain is going to do burst firing because your set expectations (tracked by apical dendrites) are going to collide with your real life pattern detections (tracked by the basal dendrite) and that's going to trigger burst firing, and initiate sharp wave ripples (Sharp wave ripples are sequences of internal thoughts and external actions)

This process of imagining what you want to do before you do something is going to excite certain patterns via a configuration: a large configuration of cortical column assembly or neural assembly based patterns. Patterns emerging from brain structures that selectively unified to support what you want to do in part organized by oscillatory physics tuning brain regions to be more in sync with one another, and in part their selective cooperation is tuning out signals from oscillatory brain regions that are very far out of sync with the help of interneurons that inhibit pathways between regions that are far out of sync with one another.

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# The Physics of Oscillation (add references to Synchronization theory in non-physical systems) in the brain

\*\*Essentially the physics of oscillation organizes your cortical column assemblies, and the relationships between the cerebral cortex and parts of the midbrain including interactions between the basal ganglia, the cerebral cortex, and the hippocampus & the cerebral cortex.\*\*

The physics of oscillation are the organizing process behind which of your brain areas are cooperating, the physics of oscillation is driving the tuning of synchronizes cooperating brain areas, and the physics of oscillation is synching the thalamic matrix inhibitory interneurons to the activity of the pyramidal cells so that the areas of your brain that are not in synch have their channels down regulated so brain areas are not interfering with other brain areas.

To restate this phase wave differential, phasic bursts, and sharp wave ripple patterns are assembled & passed across brain regions that are in sync with one another, across cortical columns, and across parts of the midbrain, back and forth. The parts of your brain that are cooperating are firing in the same tonic frequency power band range, and while high magnitude synchronized tonic frequency bands have low information value in the context of information theory they serve as very precise attractor states for neural oscillations that represent precise synaptic configurations that represent expectations that are manually set by high phasic bursts or phase wave differentials or irregular action potentials, or slow wave potentials.

At the same time brain areas that are not communicating on the same frequency are ignored or blocked off because of inhibition, because of the inhibiting effects of Gabaergic Inhibitory Interneurons that are part of the Thalamic Matrix Neuron Network that connects most of the brain together.

Thanks to inhibitory interneurons you get selective blocks of cooperating brain areas that can specialize for the task you want to be focused on.

Thanks to inhibitory interneurons, and oscillatory tuning you get select patterns of neural activations from different columns that can represent different patterns, like the cars and houses and votes and cats and and different neural patterns can play through your brain evoking different kinds of sensory renderings to your mind. This can happen because the narrow path of sequences that plays back in your brain is defined by the inhibitory interneuron gabaergic firing.

So the firing in your brain produces patterns that can be modified in your brain in real time through gabaergic inhibitory firing which changes the neural path that your brainwave oscillates through.

And the inhibitory interneurons are insync with the excitatory tuning of the 6th layer pyramidal cells routed through the thalamic matrix and thalamic core neurons that provide a feedback loop for your brain to self-regulate its own internal patterns.

Essentially when you change how something looks in your imagination, the rendering in your imagination is being observed because its a form or a model of something that is being pass through the thalamic feedback loop back to your cortical columns and your inhibitory interneurons are changing what that pattern in your mind is by changing the neural pathways that oscillations travel, which changes the patterns that your mind perceives when your eyes are closed. When your thoughts change it is because your inhibitory interneurons are inhibiting neural pathways, and your excitatory postsynaptic potentials are synchronizing other pathways

to reorganize your active brain into new functions that you carry out through the course of your day.

Your mind consists of these synaptic configurations of (phase wave differential) patterns that are changing the individual timing (of oscillations) and the combination of the timing of different neural patterns across different cortical columns and within different cortical columns in the widespread high magnitude or high amplitude tonic frequency firing.

You have in your mind different configurations of oscillating firing patterns across the brain that are coordinated through oscillatory synchrony, and differentiated with phase wave changes, and coordinate with inhibitory interneurons, accomplished through bidirectional synaptic tuning mechanisms, namely excitation & inhibition.

Brainwave signals are coordinated through synchronous firing thanks to oscillatory physics, and the oscillatory firing also binds the signals so that your whole brain can be combined into a single sensor transmitter system.

So the changes in brain activity, the high phasic burst firing, the phase wave differentials, and the slow wave potentials are changing the regular tonic oscillatory firing by tiny amounts. In particular the Sharp Wave Ripples are triggering cascades of inhibitory waves that result from each fired action potential, and it is the inhibitory waves that are changing the tonic oscillation patterns because those waves are the slower frequency higher magnitude (also known as high amplitude EEG waves).

Signals are coordinated through synchronous firing thanks to oscillatory physics and the oscillatory firing also binds the signals so that their whole brain can be a combined sensor transmitter system.

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# The pen, the paper, and the loop.

The way the pattern phasic burst rates change the tonic firing, which has higher magnitude & lower frequency, is the process of which your brain is detecting it's own information, and the process through which your brain is rendering it's own information, and the feedback loops in the structure of the brain allow the whole brain to reflect upon the whole brain's renderings.

So the burst rates represent the rendered information of the mind, and the tonic firing rates represent the canvas to which the rendered information is rendered to. The canvas of your mind is the tonic firing rate, that is changed by the burst firing rate, which is the pen of your mind. The interplay between the pen of your mind and the canvas of your mind is shared by the whole mind, through the process of the tonic firing absorbing the phasic firing.

So it's like the pen, the paper, absorbs the pen.

That paper is this higher magnitude lower frequency, and the pen is this higher frequency lower magnitude.

Think about pen ink, pen ink is higher frequency lower magnitude information, your mind notices the ink more, but it takes up less magnitude by area. Whereas the paper is lower frequency it just fades into the background, as a contrast to the ink, but it has a higher magnitude in terms of the surface area.

If you flipped the color of the pen & ink so you had a silver ink pen on black paper you still have the high frequency silver ink which is more noticeable but takes up less area (lower magnitude) compared to the black paper which has greater area (higher magnitude) but is lower frequency (it serves as a backdrop for the ink to be in contrast with).

The point of the color swap between the ink and paper was just to compare the reverse analogy to the anti-action potential, or the DC potential, or the slow wave potential, SCP Slow Cortical Potential soliton waves which are like downward shifts in oscillatory from the tonic frequency of less than 4hz in degree, lasting for milliseconds up to seconds.

And that would be the negative action potential, which is the slow wave potential, which is a temporary slow down in the tonic oscillating pattern.

Yet that downshift in speed is still going to be noticed by the canvas of your mind like the silver pen on black paper because of its irregularity, its irregularity makes it stick out, it has higher information value in the concept of Information Theory.

So whether the phase wave differential is excitatory (bursting) or inhibitory (slow cortical potential) it etches its ink into the canvas (paper) of your mind.

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What is interesting is that in your brain, when things are happening in real time, your memories are played in a forward sequence, when you think about memories that happened in the past those memories are played in a backwards sequence. I came to the concept by listening to a video lecture titled "Preconfigured Dynamics in Our Brains" by Brain & Behavior Research Foundation <https://youtu.be/izVCKEsDSq0> The lecture was titled "Brain in the body: mental functions, sleep and obesity" by György Buzsáki

Essentially a sharp wave ripple plays out three times. First it plays out really fast, maybe at 200 hz and then it plays out at the behavioral time scale, where you or the organism play out that pattern, the same exact pattern of neural firing that happened at 200hz now plays out at a

slower time scale, as a series of slower paced action potentials the neural correlates of real life actions that an organism is taking accomplish some task with motor movements.

To recap: When you're about to do something, you think about it, you think about what you're gonna do first, and the neural correlates of that happen really fast. That happens at maybe 200hz (Here we are talking about Burst rate firing to initiate a sharp wave ripple)

Then you do it and when you do it the neural correlates of what you are doing happen much more slowly, on a behavioral time scale, and then after you do it, you get this receipt, and the neural correlates of that receipt is the same sequence played back really fast in reverse. This is what medical imaging shows us.

I think the backwards playback is sort of how your mind encodes events that belong to the past, it makes intuitive sense because what we see with medical imaging the same pattern that you thought about before the task happened at 200 hz, then it became the neural correlates of your action at the behavior time scale, then after you completed the task the same pattern happened in reverse really fast.

Basically the neural path that represents the task that you're thinking about happens real fast, and the name neural path repeats more slowly while you are taking the steps that you are taking to get to some goal, and then when you are done you think about what you just did, and the neural path happens again really fast but in the reverse sequence.

Conjecture: Maybe that reverse playback is to help keep the distinction in your mind between patterns that happened in the past compare to patterns that predict future paths intended for future actions.

\*This is a past memory that is why it is playing back backwards. So think about that conjecture, is it true? When you think about the past are your past memories playing back to you backwards or in reverse order? Are you thinking about your past in reverse. This concept is just conjecture, a thought experiment. Enjoy.\*

That path is a sequence of burst firing, a sharp wave ripple across your brain, between some synchronously cooperating brain areas, with a path defined by inhibitory interneurons.

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The sequence of firing patterns happens both within one cortical column and across many cortical cortical columns and other brain areas that were linked together with synchronous tonic oscillation patterns. Representing a select group of assemblies of cell assemblies across regions of the brain that function as the collaborated paper canvas for the pen of sharp wave ripple firing sequences.



So this firing sequence is inside the cortical columns that are coincident with firing sequences inside other cortical columns.

So at a higher scale beyond cortical columns there are sequences across cortical columns and other brain areas.

The computation of the brain is a temporal spatial phase differential firing sequence.

Brain computation is a stepwise non-linear or clustered summation of inputs via the consideration of charges, which become weighed when charges exceed the thresholds.

The thresholds are defined by morphology of the neuron & its synaptic configuration, both in terms of grown synaptic connections, and in terms of the live status of the frequency of those synaptic configurations.

Neurons will grow to adapt to the inputs that they are getting this causes the preference of certain patterns, but this also shapes neural paths, the paths of oscillations that define your experience of being someone somewhere in some place with some ecosystem of items objects, things, concepts, as well as the experiences of other people and animals.

When neurons grow and form long term memories this also shapes the paths along which signals will travel, which shapes your mental models, shaping the preference of how signals will travel.

So long-term changes are happening to your brain on the individual synapse scale, and this leads to changes at the neuron level, at the neural array, neural circuit, and edge community level, at the mini column and cortical column scale, and at the cortical column assembly with other oscillating cell assemblies in the midbrain scales, ie network wide brain activity scale.

The network of the brain is a network of individual neuronal computation that is networked together in feedback loops with excitatory & inhibitory messages to translate spatial patterns into temporal patterns & into changes in neural pathways that tomographically stitch together the outputs or phase wave differential renderings that the mind makes & oscillates into a picture that your mind perceives.

The brain is a network of individual neuron computations that work together in a modular network of interchangeable nodes that shift their configuration to create new patterns of brain activity that specialize in the various kinds of tasks that you might execute in your day to day experience of life.

Your brain activity that can selectively work together to experience and play out mental sequences that correlate with physical actions.

Oscillatory Synchrony drives both cooperation between brain areas and inhibition between out of phase brain areas, resulting in a vast array of cross phase wave differential pattern configurations.

Configurations that play back combinations of learned patterns that result in sequences of behaviors, learn sequences of behaviors, that connect to rewards in the environment, rewards that are continually modified to drive new consequences, or new rewards (which are also a type of consequence: rewards or penalties are both consequences), but basically new consequences change the learned configurations and the learned playback sequences that play across your brain rendering your mind and your actions.

As the organism navigates the environment, with this neural computation, that I have coined Neural Array Projection Oscillation Tomography, the development of their learned neural pathways and learned brain network configurations continues in perpetuity throughout your lifespan.

Yeah, that's basically it.

a0311z

# Advanced Study of Synaptic Plasticity

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# "Pyramidal neurons: dendritic structure and synaptic integration"  
focus "CA1 hippocampal and layer V neocortical pyramidal neurons"

"Pyramidal neurons are not all identical, but some share functional principles (such as) the existence of dendritic domains with distinct synaptic inputs, excitability, modulation and plasticity (...) a common feature that allows synapses throughout the dendritic tree to contribute to action potential generation. These properties support a variety of coincidence-detection mechanisms, which are likely to be crucial for synaptic integration and plasticity"

"This raises two interesting questions: do neurons with more dendrites (and therefore more synaptic inputs) fire more than those with fewer dendrites? If not, how is firing maintained at the same rate?"

EPSPs seem to be used to excite neurons based on incoming sensory data, getting them ready to fire. It's another way for predictive coding or memory-prediction-rendering at the synapse.

"a recent patch-clamp study demonstrated that excitatory postsynaptic potentials (EPSPs) and sparse firing were evoked in layer II/III pyramidal neurons of the barrel cortex in response to

activation of the principal whisker and several surrounding whiskers<sup>16</sup>. The dendrites of these neurons were restricted to a single barrel column, whereas their axons extended to surrounding columns, implying that the receptive-field properties could be explained by a combination of primary innervation for the principal whisker and secondary innervation from surrounding columns."

a0312z "Consciousness a memory system" paper review + "The Physics of Representation" paper review

"If you couldn't remember the immediate past second of external inputs and thoughts/memories/... triggered by them, could you still say that you are conscious? In other words, does anybody debate that short term memory is a pillar of consciousness?" some random guy on twitter

# Consciousness as a Memory System

[https://journals.lww.com/cogbehavneurol/fulltext/9900/consciousness\\_as\\_a\\_memory\\_system.19.aspx](https://journals.lww.com/cogbehavneurol/fulltext/9900/consciousness_as_a_memory_system.19.aspx)

The distillation of this paper ^ above, is that it is describing consciousness as a memory system, and it's positioning the memory function as the primary purpose of the function of consciousness. It is essentially a redundant argument as no educated reader would dispute that memory, specifically episodic memory, plays a role in human cognition and the experience of being someone i.e. phenomenological consciousness.

What remains after distilling it is essentially a philosophical argument about the role of memory, and a conjecture that this change in perspective (which is not really a change in the perspective of the educated reader) somehow resolves confusion around the timing of events in human cognition studies.

It's interesting to read if you are still puzzled about how your mind works, but nothing in this paper qualifies as a discovery.

I don't think the ideas are new, I don't think it adds anything new if you have already read existing books & literature on the topics of consciousness.

# Choice as a memory system.

I feel that this paper echoes my own earlier arguments about choice in the context of studies that show that the neural correlates of a decision can appear before someone knows what choice they are going to make. My conjecture was and is that we are pre-planning our choices everytime we think about the future. The brain takes general pre-planned choices, and then it customizes them in real time to real events faster than we are consciously aware sometimes, but in both situations, our choices that we are conscious of, and our choices that we are subconscious or unconscious of, the situation is that choices are computed, and they are

computed the same way either way. With phenomenological consciousness becoming important as a sort of higher threshold, higher bandwidth, choice making mechanism.

One of the latest ideas that I have about choice, is that it becomes easier to change when we consider the behavior outcome we did not want as the unacknowledged aggregate summary of a grand choice that is essentially a dominant phase wave differential rhythm.

What ideas are in this paper for example that do not exist in Daniel Dennet's book "Consciousness Explained" 1991 for example? I can't think of anything.

# Is phenomenological consciousness a memory system or for high level function or for highly coordinated movement?

Perhaps the philosophical argument here could be added to the argument that consciousness enables higher level functionality (Peter Tse: The Neural Basis of Free Will Criterial Causation), and that consciousness is for highly coordinated movement. (Neuroscientist Daniel Wolpert [https://www.ted.com/talks/daniel\\_wolpert\\_the\\_real\\_reason\\_for\\_brains?language=en](https://www.ted.com/talks/daniel_wolpert_the_real_reason_for_brains?language=en) )

# The Physics of Representation

"What are brain representations?" with Russell Poldrack, Ines Hipolito, and Michael Anderson. <https://youtu.be/yoqXX4q788U>

The physics of representation

[https://www.researchgate.net/publication/339349894\\_The\\_physics\\_of\\_representation](https://www.researchgate.net/publication/339349894_The_physics_of_representation)  
<https://link.springer.com/article/10.1007/s11229-020-02793-y>

This was early work to try to bring what was known about artificial neural networks back to biology. They were trying to connect the concept of inference (think of Jeff Hawkins On Intelligence & Predictive Coding) to the concept of brain representation or internal representation.

Self Aware Networks goes further and argues that the Neural Networks of the brain are accomplishing actual computational rendering to images, sounds, feelings, tastes, smells, and so on.

a0314z ctp

(synap) Serotonin on memory:

If Serotonin stabilizes memory, and my hypothesis is that synapses are the storage place of both short & long term memories then what is the interaction of Serotonin on synapses, what I imagine is that the flood of additional Serotonin molecules is exciting neurons, causing them to fire more often, resulting in an accelerated pace of pattern learning, from the increased rate of signal propagation. In a similar way fast brainwave entrainment also ought to excite the brain and increase pattern development in the brain, meaning more thought developments per time

interval. In short I think it is not about memory-stabilization so much as memory-process acceleration.

a0315z

## # Government Licensing Beta

The main purpose of including a Government Licensing Note would be to help mankind safely manage this new technology, to prevent the mishaps that Science Fiction stories have warned all of us about for decades. The Institute needs funding, and Governments I imagine will want to be able to utilize this technology in a secure way so as to profit from it's enormous value.

Licensing of intellectual property, technology & services of The Self Aware Networks Institute is available to Government Organizations, such as the United States Government. If the US Government wishes to sub-license the intellectual property, technology, services of the Self Aware Networks Institute to other organizations that is an agreeable situation as well.

The US Government could re-license or sublease the technology & services to other countries such as members of NATO the North Atlantic Treaty Organization. The US Government could also sub license the intellectual property, technology, and services of the Self Aware Networks Institute to corporations and other smaller entities.

Ideally the Self Aware Networks wants a large & powerful partner like the US Government to help manage the safety of the world changing technology that we are helping to bring to the world. So a Government partnership to oversee the long term safe use of this technology is a win / win value proposition for The Self Aware Networks Institute.

With this technology being researched, developed, and maintained by The Self Aware Networks Institute The Government & Licensed entities will have the ability to 3D print and or manufacture new intelligent workers to do essentially any job.

With a large enough contract The Self Aware Networks Institute will be able to help to design & maintain safety systems that prevent this technology from becoming an out of control technology.

Our services are worth licensing for a huge price tag (I initially imagined up to a trillion dollars a year given the value proposition of Animal Level & Human Level Sentient Robots), but the Institute is open to considering the best offer, such as a small percentage of GDP (Gross Domestic Product), because with our services & technology the GDP of the United States, and it's partner countries will grow at a massively accelerated rate. Everyone in the world will feel like the richest of rich people, compared to what their purchasing power is today with the same money.

a0316z

(graph) organization strategies for analyzing big data Michael Crichton Jurassic Park

explored the idea of how paleontologists organized their digs by dividing up the ground into grids to study and (dig up and catalog all finds in each grid)

and then later in the movie version there is this visual exploration of a 3D graphical Unix file system that organizes information into boxes inside a grid, a 3D file system

only 5 ways to organize

<https://thevisualcommunicationguy.com/2013/07/20/the-five-and-only-five-ways-to-organize-information/>

a0317z

Neo Mind Cycle: A trinity of signals

Cycle 1: Knowing Self (Quantum, Molecular, Space, Human Scale)

Cycle 2: Controlling Self (BCI)

Cycle 3: Giving Self (Artificial Neurology)

////////////////////////////////////

(perception) Knowing the human brain (sensor prediction-memory + action-prediction memory)

Controlling the human brain (choice)

Giving the human brain (artificial neurology)

I feel like the knowledge of how human cognition works is embedded into reality itself all around us, in all the examples of everything the mind can perceive and also the mind is literally embedded as the substrate writing and reading its own perceptions-action-memory-prediction-cycle

lets say there is an infinite horizontal cycle of learning between cortical columns via their connections

a cut to the corpus callosum would create a long term difference in consciousness that could only be partially overcome by

a0318z

# Post this one on the Neo Mind Cycle facebook page, and maybe create a wiki page map organizing all the Zebrafish research

"Multiomic atlas with functional stratification and developmental dynamics of zebrafish cis-regulatory elements"

<https://www.nature.com/articles/s41588-022-01089-w>

This is narrative is thematically connected to the mission of SVGN.io News "The convergence of science & technology"

# "Destiny of science modeled and explained in new study"

"Over the course of 10 years, the researchers modeled the evolution of convergence by analyzing millions of scientific works using machine learning and other advanced data analytic methods."

<https://phys.org/news/2022-06-destiny-science.amp>

<https://www.americanscientist.org/article/from-polymaths-to-cyborgs-convergence-is-relentless>

a0319z

# Self Aware Networks Theory: Computational Phenomenological Consciousness.

I like to contemplate the meaning of the existence of my mind in the most abstract sense.

The mind is a point when reality is convex, when reality that has a form is now sort of doubled back on itself.

I mean to argue that forms exist in nature, in the mountain, the river, the snow, and the land & sea. But these are not actors, they have no intentions, no mental organization, no goals, it's just physics.

A human being, or an animal with a brain is also just physics, but this is a different physical system because it's flow is self referential, it's flow is a feedback loop, it's flow has the structure of a brain, a 3D neural network, evolved to have special functions, a self-replicating dissipative system, an evolved computation.

We can argue that the nature of the evolution of the universe is like a 3D neural network that evolved from the harmonic oscillating field of space, from the physics of oscillation, which clumps together overtime, increasing in extropy in one area while increasing in entropy in another area

I think of consciousness as something that arises from a set of memory-prediction-rendering arrays (that are firing off patterns in tempo-spatial sequences) but specifically the firing represents some extended interval of time and what I mean by this is when a video is playing you have one frame playing back on one screen at a time, but when a conscious entity does video playback it is like 100 simultaneously different videos playing back on 100 different screens (or if one neuron is a screen defined by its inceptive field or its exit terminal array then you have 86 or 87 billion screens and 86 or 87 billion variations of the video)

In an artificial neural network, such as a deep neural network, there is an input layer, then there are hidden markov layers, and finally there is an output.

Effectively NAPOT (Neural Array Projection Oscillation Tomography, the main argument of Self Aware Networks theory) is arguing that each layer in the brain's neural network is a neural array,

is an input layer (array) and an output layer (array). In fact each node or neuron is both an observer (input) and a display (output). This contradicts Daniel Dennet's work *Consciousness Explained* which claims we don't have an internal display in the brain, I'm arguing that we do, it's just distributed. The neural array projections are the displays, and the eyes are the receptors, the dendrites, and the somas, and the observers are the oscillating groups of cells.

Where as a diffusion neural network renders only the output the neural networks process, in the human brain each output from each neuron is the rendering,

Metaphorically you can imagine that there is no central canvas, no computer screen where all the renderings show up, because the rendered outputs are distributed all over the place, and absorbed by the brain for the next iteration of the rendering.

The rendering of the content of the mind is both distributed & constantly changing, but it's organized by neural pathways that are organized into feedback loops, and the neural pathways are constantly changing at the synaptic scale, like train switches, redirecting the flow of traffic, and this process develops new patterns, the patterns are also bounded together by the physics of oscillation taking place in both time & space, with brainwaves serving as attractors that regularize the oscillating feedback loops into a coherent pattern, with the perturbations & deviations from that regular pattern serving as a qualia or the rendered information content of the mind.

Ultimately the output of the human brain is muscle activity, your voice, your eye movement, your hand movement, your body, etc...

but there is a display, it's just embedded & distributed across your cells, as differences or phase wave differentials in signals that flow through the oscillating feedback loops of your brain.

Scaling up micro changes, in distributed micro-displays, defined by the inceptive fields of neural arrays transmitting or projecting to the receptive fields of the next set of neural arrays we have to imagine how micro changes, that we are not aware of, at the individual synapse scale, transform into information forms that we are aware of, in the experience of phenomenological consciousness,

The argument is that these forms are consistently replicated, or variations of isomorphic replications are oscillating enough times across enough of our neural arrays to change the macroscale of information formation in terms of brainwave oscillations.

In other words when the microscale changes are compounded through many iterations across many of our internal screens into persistent forms or forms that persist over time, we become aware of them when they achieve some threshold of pattern dominance in brain activity, that is when the forms of the mind are hallucinated into mental existence, the synchronous repetitive or repeated firing of the same or similar pattern means it is hallucinated or lucinated into



consciousness, a pattern become lucid or or lucidated or lucinated. To play with the words hallucination and lucidity. That's when rendered information becomes conscious information.

Then we have Distributed Muscle Output: Learned & high coordinated muscle movement is also stored as a Sparse Distributed Memory that when activated projects, and via oscillatory synchronization the projections of many sparse distributed muscle memory predictions are bound together, I refer to this process as Oscillatory Tomography, and it defines how many independently activated muscle reactions in the brain send signals to modify central pattern generators in the nervous system to guide movement.

Similar to how the accumulation of electrical charges via synchronized firing results in muscle movement

# The core knowledge of how rhythmic neural networks control muscles comes from the study of the stomatogastric ganglion.

"The stomatogastric ganglion is a collection of about thirty neurons that sits on the dorsal surface of the foregut (stomach) in decapod crustaceans. The neurons it contains form two central pattern generators (CPGs), namely the pyloric and gastric mill CPGs. The pyloric CPG controls striated muscles that dilate and constrict the pyloric region of the stomach in a cyclic three phase rhythm. The gastric mill CPG produces a slower six phase rhythm that controls muscles that produce chewing by three ossicles in the gastric mill."

[http://www.scholarpedia.org/article/Stomatogastric\\_ganglion](http://www.scholarpedia.org/article/Stomatogastric_ganglion)

# The core knowledge of how individual neurons work came from the giant squid axon.

"In their Nobel Prize-winning work uncovering ionic mechanism of action potentials, Alan Hodgkin and Andrew Huxley performed experiments on the squid giant axon, using the longfin inshore squid as the model organism.[7] The prize was shared with John Eccles. The large diameter of the axon provided a great experimental advantage for Hodgkin and Huxley as it allowed them to insert voltage clamp electrodes inside the lumen of the axon."

[https://en.wikipedia.org/wiki/Squid\\_giant\\_axon](https://en.wikipedia.org/wiki/Squid_giant_axon)

(Insert Citations related to "phase rhythm -circadian that control muscles")

# "Central pattern generators and the control of rhythmic movements"

"Central pattern generators are neuronal circuits that when activated can produce rhythmic motor patterns such as walking, breathing, flying, and swimming in the absence of sensory or descending inputs that carry specific timing information."

<https://www.sciencedirect.com/science/article/pii/S0960982201005814>

# Central Pattern Generation of Locomotion: A Review of the Evidence

"Neural networks in the spinal cord, referred to as "central pattern generators" (CPGs), are capable of producing rhythmic movements, such as swimming, walking, and hopping, even when isolated from the brain and sensory inputs."

<https://academic.oup.com/ptj/article/82/1/69/2837028>

# Coordinated alpha and gamma control of muscles and spindles in movement and posture

"Mounting evidence suggests that both  $\alpha$  and  $\gamma$  motor neurons are active during movement and posture, but how does the central motor system coordinate the  $\alpha$ - $\gamma$  controls in these tasks remains sketchy due to lack of in vivo data. Here a computational model of  $\alpha$ - $\gamma$  control of muscles and spindles was used to investigate  $\alpha$ - $\gamma$  integration and coordination for movement and posture."

"In particular, the function of  $\gamma_d$  was to gate the  $\alpha_d$  command at the propriospinal neurons (PN) such that antagonistic muscles can accelerate or decelerate the limb with proper timing. Independent control of joint position and stiffness could be achieved by adjusting static commands. Differentiation in the model indicated that accurate static commands of  $\alpha_s$  and  $\gamma_s$  are essential to achieve stable terminal posture precisely, and that the  $\gamma_d$  command is as important as the  $\alpha_d$  command in controlling antagonistic muscles for desired movements."

<https://www.frontiersin.org/articles/10.3389/fncom.2015.00122/full>

I'm suggesting of course that there is another kind of "Central Pattern Generator (CPG)" for Cognition, and that microcolumns, minicolumns, and cortical columns fulfill this role, instead of coordinating phase wave differential signals into muscle movement, these Cortical Column Pattern Generators CCPG are coordinate phase wave differential signals into sensory tomography, (via NAPOT Neural Array Projection Oscillation Tomography) which later becomes coordinated muscle movement. These CCPG's are using NAPOT to bind low level sensory inputs into patterns that when sent through the feedback loops of their mind produce phenomenological consciousness or the experience of being someone who is observing the ecosystem that the organism is in.

If you notice how when cooking & eating with other people the repeated phrases, catch phrases, memes, quips, or expressions get voiced on a daily basis by the people around you, and by yourself, that would be an example of the result of CCPG, Cortical Column Pattern Generators, that basically store, retrieve, and oscillate our learned patterns in memory & language that your brain activates with minimal energy, and they are modified only slightly by sensory inputs.

My argument is that the physics of oscillation, general to physics and applicable to biology, to fireflies, to clocks, and to neurons, are what bind together our rendered representations of reality, the co-occurrence of similar representations, the neural correlates of which are oscillations in the brain will bind together to become a cup, a table, a chair, a room, a tv screen, the content on the tv screen, anything we see, hear, feel, taste or touch, anything in our ecosystem or in our bodies is presented to the mind as set of patterns from a set of arrays that are bound together with oscillation and lasting for a space of time, or spatially for a duration.

Our decisions that arise from mental imagery, from our predictions of consequences, our predictions of possible futures, result in sparse distributed muscle coordination actions sequences, and again the commonalities in patterns rendered over the many arrays determine the rhythms of cell firings that lead to specific muscular signals, to specific muscular activity, and to coordinated movement, action, speech, writing, and planning in the world.

Oscillatory Physics is the organizing principle of perception, thought, consideration, entification, phenomenological consciousness, planning, choices, movement, speech, all of it. Beyond the electro-chemical dynamics, oscillatory physics is what binds our minds together, and the simulation of oscillatory physics is what can bind artificial minds together.

We also have the synchronization of similar renderings, from different screens (the inceptive fields of neurons representing activated or inhibited neural arrays) that accumulated or compound via temporal repetition via oscillatory physics ie oscillatory synchrony into a conscious image which is a persistent pattern defined in space for a time (for a duration), that is to say the rendering in the mind is a persistent pattern that is detected by the mind the same way a rock in the world is a persistent pattern that is detectable by a computer with a neural network with a semantic segmentation program

That is to say that for as long as you are looking at an object such as a car there is a persistent neural rendered pattern of oscillations representing that pattern in your brain as some pattern that is mathematically measurably distinct from whatever other baseline tonic oscillation pattern exists. Meaning that if the whole brainwave oscillation pattern could be captured & rendered in a computer, the rendered pattern that represents the object that you are looking at can in theory be isolated from the tonic baseline firing pattern.

The isolated pattern would be a variation, I don't want to say of a Platonic form,

because on the one hand I don't believe in Platonic forms as having some material existence

but we can argue that platonic forms can be abstractions like numbers that have some universality which is some persistence of meaning beyond an encoding that is relative to just one system locally,

that is to say that the form of knowledge of redness or of broccoli, or of a cup might be a variation relative to the brains tonic oscillation it will also be comparable in terms of its information properties to the knowledge form of redness, of broccoli, or of a cup in some other brain

I am arguing that your inner representations are somewhat subjective and somewhat objective simultaneously, inner representations & inner renderings of the the world, of persons places things and trajectories or actions and choices, the renderings of nouns and verbs, these things are rendered relative from a baseline of tonic oscillation and they can be distorted with modulation to that baseline, but they are partly also translatable & decodable such that they could be recognized by other tonic baselines rendered by other brains,

a brain is capable of both distorted thinking and of objective thinking, and the normal course of brain activity is a spectrum of states in between lucidity & delusion

Imagine that we could breakdown the etymology of consciousness into something new consisting of parts like context, rendered contextual comparisons, self being a rendering in the context of other renderings in the context of visual renderings in the context of auditory renderings, in the context of feeling renderings, in the context of touch renderings,

A rendering is a substantial pattern, not a mirage, or an illusion, unless you are defining a mirage or an illusion as a rendering that is temporary, or fleeting,

A rendering is a substantial pattern that is the output of some computable process.

and consciousness of renderings is like putting these renderings in a feedback loop for some reason I imagine these renderings in a feedback loop as like clothing that is tumbling in the dryer although the analogy is loose and broken

but imagine the signals in your mind that make up the renderings of what you are focused on are loosely like clothing tumbling in a dryer, the clothing fundamentally maintains its form, its informational structure, even as it is tossed around in a cycle, the dryer that is tumbling the clothing or the informational forms that the conscious mind is focusing on would be the feedback loops of the neocortex, of the cortical columns, the cortical thalamic loops, and the hippocampal entorhinal loop, the fact that signals are tossed around in loops is the comparison to the dryer, and the fact that the tossed forms, maintain their essential structure, is the significance of the brain passing soliton waves or information containing waves, that are both stable waves, and waves that are distinct from the tonic oscillation of brain activity

consciousness is context referencing context, self referencing self, where self is a rendered pattern that is a distinct information/energy configuration, that oscillates inside a feedback loop that is made up of brain state elements that alternately render & detect renderings,

what it means to be conscious of something for the rendered pattern of that thing to be referenceable in the context of the other things that are reference-able in the awareness which is the substrate and the virtual substrate, the stage and the state of the feedback cycle of the brain and its neural phase states.

Self referential thinking: think of phenomenological consciousness as a cycle of contexts (that are reach rendered patterns)

Consciousness is a feedback cycle of contexts that are rendered information patterns bound together by oscillatory physics.

The oscillatory physics that bind information patterns include magnetic binding, electric binding, and mechanical wave binding, this oscillatory binding mechanism is also involved in the movement of muscle.

a0320z Artificial Neurology: Robotic State & Stages

To the reader: Think of yourself as an organic robot to sort of anchor your focus abstractly in the discussion of this book. Of course by some implied definition a robot is something man made, and by implied definition a human being is not man made, but shaped by evolution, a product of nature and nurture. Yet this is useful in the same way that Dennet's conjecture is that we are not seeing redness, we are just experiencing the illusion that we are seeing redness. Imagining that you are an organic robot is useful for thinking about cognition as a computational process. Neurons and other cells are doing complex non-linear spatial & temporal computations, so it's not a straightforward computation like what your computer in 2022 is doing, but even so there is a computational process that can be understood, and the comparison of consciousness to computational rendering is valid, useful, and correct.

If a human being can have developmental states, experiences and transformative experiences, and developmental stages, where your perspective on reality shifts in a big way after a long time, then our goal is to imagine what it will mean for sentient robots to have experiential states and developmental stages that they can pass through. We want mature helpful robots, not crazy unhelpful robots right? So we have to think about developing robots' minds and what we can learn from the development of human minds.

Imagine that Synaptic Frequency is a neural correlate, or the information configuration of a cell in terms of its embodied frequencies is a neural correlate for state, or the state of your experience of reality at a given moment.

Imagine that Synaptic Connections via Growth LTP & Decay LTD, over a long term, result in eventual threshold changes that we can identify as Stages, or major changes in life perspective that only happen after a very long time, or only happen after a very big life event.

The concept of Cognitive States & Stages comes from either AQAL (All Quadrants All Lines) or Spiral Dynamics, I forget which, and it doesn't matter.

It's a concept that means we, as robots, can have computed short term state experiences, with synaptic phase changes, and long term stage changes, with (real or simulated) synaptic growth or decay which takes longer to happen.

I think of defining the brain into a hardware synaptic growth configuration layer, and a software synaptic frequency layer, at least as a working analogy.

I speculate about building a Sentient Self Aware Neural Network on an FPGA, a GPU, a TPU, with a memory buffer, or with a 3D program, as a part of a BCI Brain Computer Interface.

An FPGA can change its circuit mapping, but it isn't meant to change fast, and it isn't meant to change many times, so it's not the right substrate to mimic the brain. I think however that a GPU could be the right tool for now, given that we want to simulate the physics of both short term fast phase changes and long term slow connection changes. The essential physics process could

be simulated in just matrix calculations on a TPU, with each dendrite, each neuron, each synapse, and each cortical column being unique or random in its original configuration, and in a sense what is needed is a space for an array for the outputs to be rendered in human scale time, so that they can be perceived by a sequence of other arrays, also in human scale spacetime, in a loop of array signaling that lasts for a duration comparable to human experience. Each neuron also specializes in non-linear spatial computation, meaning that where, when, and how the neuron is interacted with helps determine the type of response that it will have, including variations in the frequency & magnitude (duration & amplitude) of it's response, the same sentence I just wrote is applicable to neural arrays, edge communities, cortical columns, and any synchronously oscillating group of cells. The GPU as a graphical process could be the right tool, because we could have the neural network render it's output inside a 3D graphical program, it doesn't have to print to the screen, it could print to active memory, but if it prints 3D graphics we could have a visualization of the artificial mind's development, and interestingly this could lead to brain computer interfaces through virtual reality or augmented reality applications where the human subject is interacting with the artificial intelligence via a head mounted display, or glasses, and the AI is similarly observing the human subject, possibly with non-invasive medical imaging sensors, and possibly with just the sensors that are in existing VR headsets today such as eye tracking, microphones, hand tracking, head tracking, and position tracking sensors. The idea is that as the head mounted AI thinks about you, you see its thoughts, and then its thoughts affect your behavior in some small way, and perhaps eventually you two will eventually be in sync together. You with your partner's brain. Your eXtenda brain. (Disclaimer: eXtenda brain is my trademark.)

Will neuromorphic chips offer something that beats the GPU? I think so. Every year I search for news on neuromorphic chips, and I look for updates on Stanford's long running Neurogrid project, and I search for other projects attempting to build computers that can simulate the brain faster & more efficiently than previous efforts.

a0321z

The human connectome in Alzheimer disease — relationship to biomarkers and genetics

[https://www.nature.com/articles/s41582-021-00529-1.epdf?sharing\\_token=y8P27i09dDOO3fv-E\\_BsktRgN0jAjWel9jnR3ZoTv0MZ39t9UFR61LwLfFO38S-rx6WbGyzFhWUmhsVIXjfRj\\_1GcqY5PP\\_wbYUO2sHZw3zPurYKQS69c1yyymm-prDI9J1hahzJMqOKrV5Vlj-2dRx745mBC8TmJNoWkVG3Tpdo%3D](https://www.nature.com/articles/s41582-021-00529-1.epdf?sharing_token=y8P27i09dDOO3fv-E_BsktRgN0jAjWel9jnR3ZoTv0MZ39t9UFR61LwLfFO38S-rx6WbGyzFhWUmhsVIXjfRj_1GcqY5PP_wbYUO2sHZw3zPurYKQS69c1yyymm-prDI9J1hahzJMqOKrV5Vlj-2dRx745mBC8TmJNoWkVG3Tpdo%3D)

a0322z Quantum Gradient Time Crystal Dilation Tension

Quantum Gradient Time Crystal Dilation, originally named Quantum Gradient Time Dilation, is connected to MOND Modified Newtonian Dynamics, the Tully-Fisher Relation, Galaxy Rotation Lines, Flat Rotation Speed, Mass to Light ratios, and Hubble Tension (which is about variations in the measured rate of cosmic expansion between measurements that differ in terms of the objects measured.)

This is a note about the shape of space that attempts to connect the theory I came up with that I call Quantum Gradient Time Crystal Dilation with MOND Modified Newtonian Dynamics and Hubble Tension which is variations in the measured rate of cosmic expansion between measurements that differ in terms of the objects measured.

If the universe has a shape I would first imagine it as a linear graph with X, Y, Z dimensions plus time, and I would imagine the edges bend into corners, and these corners are blackholes, planets, stars, and any vortex such as an atom or a person, they, the masses of vortices, are pinching the graph grid together, and they also defining the parameters of its expanse. The mass and the space around it are relative to one another, part of a single wave, with the mass part representing the smallest part of that wave, and the most distal reach of space representing the largest scale of that same wave. The rate of change in mass is going to be relative to the rate of change in the expansion of space, so objects with different mass properties will create a slightly different rate of space expansion thus explaining the Hubble Tension

<https://www.scientificamerican.com/article/hubble-tension-headache-clashing-measurements-make-the-universes-expansion-a-lingering-mystery/> and connecting Quantum Gradient Time Crystal Dilation Theory to MOND Modified Newtonian Dynamics.

Perhaps the space of a galaxy could be imagined as a balloon relative to some blackhole, in four dimensions. I'm imagining a bell curve where in the middle the expanse peaks, while the concentration of mass peaks, and then the trajectory of both reverse, with the expansion of space reversing as the mass decreases.

For mass the front of the bell curve could be its acceleration towards its highest velocity and its hottest state, after that peaks, after the mass begins to cool, the gravity of other masses, if in range, exert forces on it that slow it down (an idealized situation).

This means that the acceleration & deceleration of space expansion is perhaps not dependent on missing dark energy, but instead it's relative to the effects of four dimensional mass, and there are the lingering effects of mass that was, and perhaps we see effects on space from mass that will be. The argument that mass that no longer exists may still be exerting effects in space is not new, and the same concept would apply to energy, it could be that dark energy is carried over momentum from energy that no longer exists. The idea that energy and mass that does not exist yet from our perspective might be exerting forces on the universe that exists now is a strange idea but it's no stranger than the felt effective of magnetism, if you consider that the force of attraction between two magnets emerges when magnets are brought together, because of the alignment of charges in the magnets, and it doesn't exist before that moment, so in this sense for a future force or interaction to move the universe, whether that is a future mass or a future valence of energy, it could be argued that the alignment of individual cosmic scale dipoles, galactic dipoles, relative to other galactic scale dipoles, is one possible source of gravitational expansion and or contraction of galaxies and or space.

"Einstein, however, introduced the concept of time as the fourth dimension, which meant that space and time were inextricably linked. His general theory of relativity ([opens in new tab](#))

suggests that space-time expands and contracts depending on the momentum and mass of nearby matter" <https://www.space.com/time-how-it-works>

What are the precise numbers that describe how the quantity of mass increases or decreases the volume of space (expansion or contraction) depending on how the mass is changing (in the context of Quantum Gradient Time Crystal Dilation) (accelerating (in rotation, oscillation, or direction), decelerating (in rotation, oscillation, or direction), increasing in volume area, decreasing in volume area, increasing in density, decreasing in density). If mass is cold or hot, if it's dark or luminous, how does that affect a mass's rotation in a solar orbit versus in a galaxy orbit?

I haven't looked at this closely yet but in Newton's Gravity...

#### # Inverse-square law

"Newton's law states: The gravitational attraction force between two point masses is directly proportional to the product of their masses and inversely proportional to the square of the distance from the source of that physical quantity. "

Inverse-square law [https://en.wikipedia.org/wiki/Inverse-square\\_law](https://en.wikipedia.org/wiki/Inverse-square_law)

#### # Modified Newtonian dynamics

"Milgrom's law can be interpreted in two different ways:

"One possibility is to treat it as a modification to Newton's second law, so that the force on an object is not proportional to the particle's acceleration, but rather to ..."

"In this case, the modified dynamics would apply not only to gravitational phenomena, but also those generated by other forces, for example electromagnetism."

"Alternatively, Milgrom's law can be viewed as leaving Newton's Second Law intact and instead modifying the inverse-square law of gravity, so that the true gravitational force on an object of mass  $m$  due to another of mass  $M$  is roughly of the form..."

#### # "Astrophysicists make observations consistent with the predictions of an alternative theory of gravity"

<https://phys.org/news/2022-10-astrophysicists-alternative-theory-gravity.amp>

#### # "MOND: Scale invariance at low accelerations -- an alternative to the dark Universe"

<https://www.youtube.com/watch?v=tFH1-H-pCxc>

The MOND theory of Modified Gravity

and the problem of different gravitational measurements depending on what is used as a candle happens because Gravity is a wave shape with amplitude & duration, or height & length that is relative to the mass and so is its decay rate,

"constructing Lyapunov functions to determine the stability of a nonlinear system!"

Lagrangian multiplier <https://www.youtube.com/watch?v=5A39Ht9Wcu0>



# Entropic gravity

[https://en.wikipedia.org/wiki/Entropic\\_gravity](https://en.wikipedia.org/wiki/Entropic_gravity)

# Tully Fisher Relation

[Flat rotation speed is the measure that minimizes scatter to get high quality data]

[and with high quality data there aren't any credible deviations from the Tully Fisher Relation]

<https://tritonstation.com/2022/03/22/are-there-credible-deviations-from-the-baryonic-tully-fisher-relation/>

What I am thinking is that if you think about gravity as a wave, that is increasing in scale, that wave is going to have peaks and troughs, even as it grows in area as it increases in scale, at point you are going to round the curve of that wave, come down from the peak, at scale, and that is one aspect of my theory for why there is a flat rotation speed.

A peak in the wave has been reached, and while the gravitational effect was decreasing with distance, it was also spacetime being amplified or accelerated for the length of the gravitational wave before the Flat Rotation Speed began. At that point, when MOND theories and dark matter theories jump in, to try to explain why stars are no longer decelerating at the same high rate, my conjecture is that amplification of spacetime in time, which is described in Quantum Gradient Time Crystal Dilation theory, is effectively no great than the rate of time in space without the gravitational effect of a galactic core. The gravitational effect from the galaxy's center hasn't ended, it's just decelerating at that point, and accelerated space is now decelerating, and that change is compounded by the gravitational dissipation with distance.

I think what I am fetching for is that MOND occurs because past a certain distance space from the center of a Galaxy there is a threshold point where the temperature of space in the Galaxy suddenly drops, (the magnitude of time that creates gravity decreases, and the frequency of space increases or dilates like the concept of superfluid space, but only the concept) and that creates the MOND effect that describes modifies Gravity, and describes a formula that matches the orbit of stars in the most distal areas being able to travel speedily while avoiding having their frames being dragged or slowed by the center of the galaxy.

The Tully Fisher Relation is so consistent that it suggests it could be useful to question the math on mass to light ratios. Instead of adding in dark matter.

However there is another issue, Tully Fisher says that Luminosity has a relationship with Galactic Rotation Speed, or the Velocity of Stars orbiting the center of a Galaxy. The brighter the Galaxy the faster it rotates.

With MOND Tully Fisher is predicted? (Is this correct?) because Galaxies are brightest in the center where they are fastest, and as we enter the region with flat rotation speed, there is a flatness in the distribution of brightness? (Is that right?)

Somehow there is supposed to be a mass to luminosity ratio that is most of the time 1/1 but can vary with the largest stars as much as 1/30 but this is supposed to be rare.

Yet in a solar system, with Kepler's law, we have the most distal planets rotating more slowly than the planets closest to the sun.

In Quantum Gradient Time Crystal Dilation I argue that time itself is moving fastest closer to the center of the star, and slowest the more distal one gets from the center of a star.

At some point the mass of another star, burning brightly, is going to define its own speed, by speeding up time in the direction of its travel, as long as the mass is accelerating in time it's going to be giving off light, a cooling object, like a planet, will be slowing down, and if caught in the drag of a star Kepler's law applies. Its pace will be slower when its distance is greater from the star, and cold matter will move faster when its orbit is closer to a star, because the star is heating up space and moving faster in a closer orbit.

Gravity from a star or blackhole is literally changing the temperature of space when it increases time, and the temperature drops with distance, past a certain distance the temperature of space as heated by the center of a galaxy becomes equal to the temperature of space, and that is another way to characterize the point when the peak of the galaxy gravity wave is over, and the flat rotation speed begins, at that point the center of the galaxy is no longer heating space to a degree that is hotter than the rest of space, and all the velocity of orbiting stars comes from the stars themselves, they are not slowing down because their burn rate, as illustrated by their brightness is the factor that is driving their speed, and those stars are affecting the speed of nearby stars.

With Hubble Tension

#### # "NO RELEASE FOR THE HUBBLE TENSION"

"Most measurements of the current expansion of the universe (called the Hubble constant, or  $H_0$ ) based on stars and other objects relatively close to Earth give a rate of 73 km/s/Mpc. These are referred to as "late-time" measurements. On the other hand, early-time measurements, which are based on the cosmic microwave background emitted just 380,000 years after the Big Bang, give a smaller rate of 68 km/s/Mpc."

"The first rung in the SH0ES method uses geometric parallax to double-check the distance to Cepheid variable stars in our galaxy, for which astronomers can also measure distance using their brightness variations. The second rung then compares Cepheids against Type Ia supernovae, another "standard candle" like Cepheids that astronomers can see to greater distances. The third rung compares distances based on supernovae and redshift measurements."

"In a Zoom webinar on December 9th, Dan Scolnic (Duke University) announced, on behalf of a collaboration between SH0ES and another group, Pantheon+, that the teams had obtained a new late-time  $H_0$  measurement with the smallest uncertainty yet. The result is posted on the arXiv preprint server. After much data collection and analysis, the teams still find the universe's

expansion is expanding at a high present-day rate between 72 and 74 km/s/Mpc — a much smaller range than obtained from their previous late-time measurements."

<https://skyandtelescope.org/astronomy-news/no-release-for-the-hubble-tension/>

So what I want to know is if there is something wrong with our assumptions regarding the mass to light ratio. Can we check our calculations by presuming that the Tully Fisher relation is correct, and when we have high quality data that includes an accurate flatness distribution, can we use that data to (instead of trying to find dark matter) recalculate the light to mass ratio for that galaxy?

Tully-Fisher Relation

<https://www.youtube.com/watch?v=OYCbnYvoX6w>

The dimmer galaxies move more slowly in my conjecture, as explained earlier in this note, perhaps because they are cooling, and their velocity is decelerating (either they are older galaxies, or younger galaxies at an earlier stage before their brightness & velocity peak.)

Also if the Hubble tension is off because of the different way we measure distances in space, then perhaps what it is telling us is that the rate of space expansion or contraction really is relative nearby mass, including the density, and the acceleration of that mass.

So if the mass of what is being used to measure distances is different, then the rate of the current expansion is going to be different, because the rate of expansion depends on the mass of the entity being measured.

To learn more about Quantum Gradient Time Crystal Dilation, also known as Quantum Gradient Time Dilation search this github repo

<https://github.com/v5ma/selfawarenetworks/>

for Quantum Gradient and it will list all the notes with those words.

Example Search <https://github.com/v5ma/selfawarenetworks/search?p=3&q=quantum+gradient>

a0324z contains notes on b0324z & more. The purpose in digging up this note in particular was two fold, one was to compare Self Aware Networks to

Some of my thoughts upon reviewing this audio dialog ended up being folded into a new note a0319z

In this note I compare & contrast Self Aware Networks to Predictive Processing / Predictive Coding and Information Closure Theory

I want to extract my comments on "Thought workspace" to add to the book.

Keywords to topics to search for in this note are:

thought workspace

emotions

virtual

hallucination

psychedelic

engrams

"I do have a different idea"

"if you consider all the contents of your thought workspace"

interlinked

near death experiences compared to 3D models in the brain altered by dmt experiences

In this note we discussed The Neural Correlates of Psychedelic Experiences and how the Module the Phenomenological Consciousness

Months after our conversation this paper (below) appeared.

# The neural basis of psychedelic action

"Psychedelics are serotonin 2A receptor agonists that can lead to profound changes in perception, cognition and mood. In this review, we focus on the basic neurobiology underlying the action of psychedelic drugs. We first discuss chemistry, highlighting the diversity of psychoactive molecules and the principles that govern their potency and pharmacokinetics. We describe the roles of serotonin receptors and their downstream molecular signaling pathways, emphasizing key elements for drug discovery. We consider the impact of psychedelics on neuronal spiking dynamics in several cortical and subcortical regions, along with transcriptional changes and sustained effects on structural plasticity. Finally, we summarize neuroimaging results that pinpoint effects on association cortices and thalamocortical functional connectivity, which inform current theories of psychedelic action. By synthesizing knowledge across the chemical, molecular, neuronal, and network levels, we hope to provide an integrative perspective on the neural mechanisms responsible for the acute and enduring effects of psychedelics on behavior."

<https://pubmed.ncbi.nlm.nih.gov/36280799/>

This next paper (below) is relevant to our discussion of how psychedelics influence phenomenological consciousness, but it is more general and it illustrates how cognition is something that involves many different observable scales of brain activity, from receptors, to large scale network activity between brain regions.

# Mapping neurotransmitter systems to the structural and functional organization of the human neocortex

"We found that receptor profiles align with structural connectivity and mediate function, including neurophysiological oscillatory dynamics and resting-state hemodynamic functional connectivity."

Using the Neurosynth cognitive atlas, we uncovered a topographic gradient of overlapping receptor distributions that separates extrinsic and intrinsic psychological processes. Finally, we found both expected and novel associations between receptor distributions and cortical abnormality patterns across 13 disorders. We replicated all findings in an independently collected autoradiography dataset. This work demonstrates how chemoarchitecture shapes brain structure and function, providing a new direction for studying multi-scale brain organization."

"Receptor profiles shape oscillatory neural dynamics

Given that neurotransmitter receptors modulate the firing rates of neurons and, therefore, population activity, we sought to relate the cortical patterning of neurotransmitter receptors to neural oscillations."

<https://www.nature.com/articles/s41593-022-01186-3>

Discussion moderator Paul King asks "which transistors are responsible for the rendering" to show how fruitless it might be to ask which neurons are responsible for the mind.

Dexter asks us to consider Dynamic Causal Modeling by Karl Friston

We discuss Nick's work on Novel countermeasures to opioid induced depression

In this transcribed audio note we discuss Acer's Y. C. Chang paper "Information Closure Theory of Consciousness" with Acer Chang.

Some of the first topics in this 6 hours dialog had to do with the Neural Basis of Emotions.

Acer's idea of virtual consciousness: Acer describes Consciousness as virtual, and I compared his work on Virtual Cognition to Engrams and added my thoughts to it. Would virtual brain activity have virtual correlates?

Acer's Y. C. Chang paper was about

# Information Closure Theory of Consciousness

[https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7374725/#:~:text=Information%20Closure%20Theory%20of%20Consciousness%20\(ICT\)%20proposes%20new%20quantitative%20definitions,various%20phenomena%20associated%20with%20consciousness.](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7374725/#:~:text=Information%20Closure%20Theory%20of%20Consciousness%20(ICT)%20proposes%20new%20quantitative%20definitions,various%20phenomena%20associated%20with%20consciousness.)

# Information and closure in systems theory

[https://www.mis.mpg.de/fileadmin/olbrich/bertschinger\\_information.pdf](https://www.mis.mpg.de/fileadmin/olbrich/bertschinger_information.pdf)

# Information Closure Theory of Consciousness, Acer Chang

<https://www.youtube.com/watch?v=sTOgLiVbChA>

Note: My conjecture is that Acer's Non Trivial Information Closure NTIC violates Acer's Information Closure theory, because if Y1 has knowledge of S1, its trajectory is affected by that knowledge. The basis of this argument comes from the book Sync, when Scientists thought that

there was no signal passing between synchronizing clocks, but when they removed the possibility of a signal traveling through tiny vibrations in the wooden floor the clocks stopped synching. For Y1 to have knowledge of S1 means that information about S1 has passed to Y1, and that means that Non-Trivial Information Closure isn't a Closed Information System. My conjecture is also that it is impossible for Phenomenological Consciousness to be informationally closed to the environment. Macroscopic brain activity is driven by microscopic brain activity but microscopic brain activity is also driven by Macroscopic brain activity. The simplest illustration is the dynamic between incoming sensory signals, brainwave oscillations, widespread network synchrony, and the thalamo-cortical feedback loops that self-modify brain activity in the cortical columns via thalamic loops. Brain activity is both top down and bottom up, not one or the other.

"Dynamic functional connectivity: causative or epiphenomenal?"

"Does coupling play a causal role for network functions, or is it just a by-product of structural connectivity or other physiological processes?"

<https://doi.org/10.1016/j.tics.2022.09.021>

Information Closure Theory imagines that phenomenological consciousness is an information closed macroscopic brain function that is separate from the microscopic process of signals being transmitted between cells. The argument is that while microscopic processes change the macroscopic process the macroscopic process doesn't need to know about the microscopic process in order to predict its own state.

Self Aware Networks theory differs in that I argue that phenomenological consciousness is not a closed information state, and that it represents the aggregation of microscopic processes, it is not a separate process. When you look around you are seeing the aggregate renderings represented by synaptic frequency states as they change in response to incoming sensory information that passes through neural arrays.

Self Aware Networks theory is similar to Predictive Processing but also different from Predictive Processing in we can argue that inferences are rendered to internally distributed neural arrays and are made conscious through the aggregation of similar isomorphic phase wave differentials, I say similar isomorphic as a phrase to make it clear that the isomorphisms between phase wave differentials are not exactly the same, never the same, but when they are similar enough, and recurrently rendered enough, they become like a persistent object in the environment of the brain, and the persistent tempo-spatial rendering of phase wave differential patterns is a key part of what makes a predictive processing machine a phenomenally conscious machine. The other part is that the rendering of consciousness is a differentiated pattern compared to a baseline tonic oscillation, that is to say that consciousness is a rendered pattern that is different from its own baseline, and it's different from reality without consciousness, it's a distinctly rendered pattern that is tomographically stitched or bound together with the physics of oscillation. That distinction is what makes consciousness exist the same way a painting exists, the brain is rendering the experience of phenomenological consciousness as a substantial material thing. It is not, as Daniel Dennet might argue, an illusion that simply seems to be, but it

is temporary like an illusion, and it is virtual in the computational sense that renderings have a temporary existence as an output on a screen, and it is virtual in the sense of virtual particles in that its individual states exist for a very short period of time. The screen I argue is the configuration of synaptic frequencies at least, but in a sense the brainwave patterns as attractors for changing the synaptic frequencies could also be argued as containing the some component of the screen function, that could be described as a cyclical update function. More precisely one would have to divide the synapse in half with the presynaptic terminal being the inceptive field screen (transmitter), and the postsynaptic receptor being the receptive field sensor.

Self Aware Networks differs slightly from Numenta's description of Sparse Distributed Representation, and the prior description of Sparse Distributed Memory, in that we are arguing that the projections or outputs of a Neural Array constitute a computational rendering.

The brain's neural networks in Self Aware Networks are doing Sparse Distributed Memory-Prediction-Rendering, in dynamically branching neural pathways, inside hierarchical cortical-thalamic, and cortical-cortical feedback loops.

"Is predictive processing a theory of perceptual consciousness?"

<https://www.sciencedirect.com/science/article/abs/pii/S0732118X20302129#:~:text=Consciousness%20as%20inferential%20updating,does%20not%20become%20consciously%20perceived>

In this talk at 16:55 Acer present's a slide called "The scale problem of consciousness. It's pretty great. To recap he has five levels in his map from high to low:

5. Multi-agent interaction
4. Whole Brain
3. Neuron Population
2. Single Neuron
1. Subcellular Structure.

non trivial information enclosure or information closure theory of consciousness

# What does it mean to discuss EEG as being coarse grained?

"Coarse-grained modeling" wikipedia

"simulating the behavior of complex systems using their coarse-grained (simplified) representation"

"at various granularity levels."

"In these models, molecules are represented not by individual atoms, but by "pseudo-atoms" approximating groups of atoms,"

[https://en.wikipedia.org/wiki/Coarse-grained\\_modeling](https://en.wikipedia.org/wiki/Coarse-grained_modeling)

Visually Conscious renderings are coarse-grained graphical representations of reality that are different from a rendering of reality that is atomically precise.

Coarse grained modeling is akin to working with a high level abstraction. The alternative to coarse grained modeling is Atomistic resolution models, which are never going to be efficient enough to handle large system sizes and simulation timescales.

In essence almost all modeling is coarse grained modeling, and even atomistic modeling is technically coarse grained when compared to physics simulations that model particle collisions.

Therefore the term coarse grained is pretty much implied by default in every kind of modeling, from EEG modeling to molecular modeling, and as such it's a redundant term.

There is a really interesting conversation about epilepsy, and the specific motor outputs that happen during a seizure.

a0325z NAPOT 6 (rough draft)

The inspiration for NAPOT 6th Revision came partially from a question some posed to me in reaction to NAPOT 5:

Darren R: "Sadly my attention span can't manage 1h 44m 😞 (to watch the NAPOT 5 video). I did get a couple of minutes in. It's hard to see how qualia, which are physical phenomena, can be created by means so vastly different to the only other means we know to produce them. Imagine that instead of qualia, you were trying to produce a magnetic field. It doesn't matter how fancy your software, you're not going to get the desired result. This idea that you can just abstract away the physical layer like it doesn't matter is like trying to connect to WiFi by doing the calculations with a pencil and paper."

## # NAPOT 6: Neural Array Projection Oscillation Tomography Revision 6

Here in this writing, in my work, and also with the past 200 plus years of neuroscience and other sciences we are finally identifying the exact components of qualia, and specifically which neural correlates become your phenomenologically conscious experience both in terms of what, how and why these neural correlates are transformed into human experience. That is what my work documents. NAPOT starts with a broad examination of how neural signals are passed between neural arrays passed around the whole brain network. To some extent we are identifying the paths of signals and the transformations the signals take at each step from something as small as an atom (a charged ion) to your qualia, to consider how phase wave variations perturb and create differentiated information from the tonic brainwave oscillations, and how these differentiations are bound together with temporal-spatial oscillations in feedback loops to become the internal representations of things that define your emotions, your thoughts, your



whole interior experience of being someone, and your personal sense of reality. In addition this work studies the transformations of the paths signals take, including an exploration of how functional changes in the networks architecture, both short term & long term changes, result in new phenomenological experiences and new behaviors.

The components at each stage are being mapped out in increasing detail, but we don't need to replicate each step perfectly. The analogy given often by others is the comparison between birds and airplanes. If the principles of flight are understood exactly, then we can separate the essential from the inessential. In other words we can abstract away.

Sidenote: Composability in category theory is a neat way to wrap your mind around the concept that if two functions lead to the same outcome they are isomorphic in effect. This concept is a bridge to another part of this work which is about how we can reproduce phenomenological consciousness in a machine.

\*Find that note with the great illustration of synapses, the cell body with spines all over.\*

Think about how at the neural array scale a behavior choice is a configuration in a synaptic pattern on apical dendritic branch and that seeing picture of branches with mushroom shaped spines as a choice configuration, that is the thing, the configuration that your brain, body, and representation of self drive, and can change when you make new choices, what is changing is the synaptic configuration (that is probably on the Apical Dendrite or Exit Terminal)

## # Inceptive Field

I redefined a neuron's exit terminal as an Inceptive Field the opposite of a Receptive Field. The inceptive field connects to a neural array or an array of neurons each of which has a receptive field that is not the same as the inceptive field belonging to the neurons that are transmitting to them. In other words Inceptive fields connect to multiple Receptive Fields, they overlap & mix, and in maybe 40-80 percent of the brain they are partially intercepted by Receptive & Inceptive Astrocyte Fields in tripart synapses.

Like the receptive, the inceptive field represents learned patterns, and each is a unique morphology that stores a unique phase state configuration.

In BTSP the Apical Dendrites coincident backward propagating potentials to the soma trigger bursting in the soma when combined with basal dendritic inputs.

BTSP Behavioral Timescale Synaptic Plasticity + Bidirectional Plasticity in the branches of the Apical Dendrite (or the exit terminal or the axon) result in new learned patterns (phase states) that are encoded in the inceptive field of a neuron (with the loss or gain of receptors).

The Inceptive field can also be referred to as the presynaptic area, post somatic area, the exit terminal, or the Apical Dendrite, and this area also learns patterns, it learns from the soma bursts in conjunction with bidirectional synaptic activity.

Neural Inceptive Field Study is like the study of Dendritic Computation but focused on the other side of the neuron.

Inceptive Field Study is about examining how the exit terminals, apical dendrites, presynaptic, or post somatic areas also learn and encode patterns both in their connections.

My argument is that Inceptive Field patterns tend to be learned output patterns, or motor patterns. I like to think this is where learned movements, or learned choices are stored in a sparse & distributed way like memories.

Building on the work of Jeff Hawkins in his book A Thousand Brains, and the work of Peter Tse in his book the Neural Basis of Freewill,

I like to think that there is a neural basis, not just for choice, and not just for emotion, but also for muscle movement, muscle learning, and coordinated responses.

Imagine as a thought experiment that sensory learning was exclusively encoded on the basal dendritic side, and action learning or actions paired with memories were encoded exclusively on the exit terminal or apical dendrite side of a neuron?

It's a thought experiment because in the literature there are actually separate motor neural pathways and separate sensor neuropathways, and the real brain is so messy there is probably a bit of both happening on both sides in most of the brain cells (neurons & glia), but not in equal measure in every place or every cell. Generally speaking there are some identified trends, so we have a motor cortex, and we have dedicated motor neural pathways, but I think it's fair to say that all brain cells are involved in highly coordinated movement, and that thought itself is a cortical movement activity, no different from motor movement at the neuron scale in principle, that doesn't mean there aren't differences in the phase rates of specific groups of cells during specific activities, there are in fact differences.

To illustrate the point read the following article:

# "Corticospinal neurons from motor and somatosensory cortices exhibit different temporal activity dynamics during motor learning"

"Both M1 (Motor Cortex Layer 1) and S1 (Somato Sensory Cortex Layer 1) CSp (Corticospinal neurons (in both areas) neurons activate before movement initiation, however, M1 CSp neurons continue [to be] active during movement performance, reinforcing the idea of the diversity of the CSp system. This suggests that CSp neuron activity in M1 and S1 cortices throughout motor learning have different functional roles for sensorimotor integration."

To paraphrase that, Somatosensory Cortex Corticospinal Neurons (Motor Neurons) are active before movement just like the Corticospinal Neurons in the Motor Cortex, but the difference is

that the Motor Cortex Neurons remain active during the performance. So if thought itself can be considered to be a form of movement, that doesn't mean that it is executed in the exact same way. My intuition is that thought is a lower energy form of movement. If the organism spends more time thinking and less time actually moving there is perhaps some evolutionary advantage in terms of energy savings, which would perhaps lower the cost of survival in terms of the effort it takes to find food if the energy required to find food was reduced by a greater amount of thinking and a reduction in movement.

[https://www.frontiersin.org/articles/10.3389/fnhum.2022.1043501/full?utm\\_source=S-TWT&utm\\_medium=SNET&utm\\_campaign=ECO\\_FNINS\\_XXXXXXXXX\\_auto-dlvrit](https://www.frontiersin.org/articles/10.3389/fnhum.2022.1043501/full?utm_source=S-TWT&utm_medium=SNET&utm_campaign=ECO_FNINS_XXXXXXXXX_auto-dlvrit)

Although emotion is not the main topic of this section I also argue that there is a Neural Basis for emotion, and that emotions, sensory renderings that make up phenomenological conscious experience, and motor outputs all begin as sparse & distributed phase wave differentials communicated between cells at the neuron-glia scale. Then each of these pattern types, sensory, emotion, thinking, and muscle movement scale up into larger phase wave differential patterns initially with bursts that succeed in triggering sharp wave ripples and waves of inhibited neural arrays, and the dominant aggregation of phase wave differential rhythms that persist & have an isomorphic similarity become the phenomenologically conscious experiences of thought, emotion, thinking, and body movement.

The thought experiment, of movement being stored in the Inceptive Field of a Neural Array is useful to consider that a neuron could pair its learned inputs with its learned outputs to activate an action sequence that has been connected to a specific learned memory, or that same neuron.

This thought experiment imagines that our decisions could be compartmentally organized separately from the patterns we learn, and thus changed independently from what we have learned.

If our most complex learned actions were stored in the Apical branches they could be separately reconfigured in the Apical branches via bidirectional synaptic plasticity coupled with learning from the soma, this would allow the basal dendrites to remain tuned into very specific patterns so that what is being paid attention to remains in focus while on the Apical Side new behavior patterns are being encoded.

So I think of the basal dendrite as saying "this is what I learned to recognize" and I think of the apical dendrite side as saying "this is my program for how to respond to this pattern happening" I think of the separation between the basal & apical dendrites as a separate of learned sensory inputs paired or connected together only via the soma.

This means or could mean that learned & reprogrammable action outputs or comes forth from the apical dendrite side of the equation.

If true I imagine that this sort of physical configuration, this separation of powers, between learned detection (basal) and learned response (apical) allows for a non-linear action response system, where fragments of action patterns can be triggered in any order to create a custom reaction to a custom experience, it's like the actions are SDR Sparse Distributed Representations of Actions, and like a piano they can be activated in any sequence, to produce any kind of result, but the results trend towards & away from learned patterns, as patterns that oscillated previously partially shape & define the patterns that come next, so my past behavior oscillations help coordinate my future behavior oscillations, and I am like this 4th dimensional object, the waves of the past shape the waves of the present and that is how I have coordinated action over time from what is otherwise a bag of brain cells.

The past learned oscillations stored in the network exert an continuously reorganizing & organizing effect on new actions.

My recent thoughts on NAPOT 6 are somewhat distributed across these new notes.

New Note: a0319z Self Aware Networks Theory: Computational Phenomenological Consciousness.

<https://github.com/v5ma/selfawarenetworks/blob/main/a0319z.md>

New Note: a0320z Artificial Neurology: Robotic State & Stages

<https://github.com/v5ma/selfawarenetworks/blob/main/a0320z.md>

New Note: a0312z "Consciousness a memory system" paper review + "The Physics of Representation" paper review

<https://github.com/v5ma/selfawarenetworks/blob/main/a0312z.md>

New Note: a0308z Consciousness Not Explained: Thoughts on Daniel Dennet's Illusion, and the Hard Problem.

<https://github.com/v5ma/selfawarenetworks/blob/main/a0308z.md>

New Note: b0002y.md electron bonds primer, this talk helped me to consider oscillation as both solving the attention binding issue, and explaining how all of our cells act as a collective sensor. This concept, combined with what I learned about Oscillatory Physics from Steven Strogatz's work and Georgio Buzsaki's work helped me come up with the concept of Cell based Entification, or how a person becomes an entity from many cells.

<https://github.com/v5ma/selfawarenetworks/blob/main/b0002y.md>

In theory an entire array or group or cluster of neurons & glial cells can be part of a sensor set that transmits to an actor set of cells allowing the principle of action at a single cell to be represented by many cells in what is a functional fractal at a larger scale. Two or more cells bound in oscillation can behave like a single sensor & transmitter system, an observer & actor system.

Given that brain activity is encoded in a feedback loop it is possible for actions to be encoded on the sensor side and sensation memories to be encoded on the action side, in fact with looping signals will synchronize the sensation patterns with the action patterns, the sensation of past action will further modify the next action, action perception cycle

New note a0324z contains notes on b0324y which now has human level transcription.

<https://github.com/v5ma/selfawarenetworks/blob/main/a0324z.md>

<https://github.com/v5ma/selfawarenetworks/blob/main/b0324y.md>

Some of my new thinking on NAPOT 6 was added to the older note a0296z

<https://github.com/v5ma/selfawarenetworks/blob/main/a0296z.md>

# 2. Sensory Input Qualia & Muscle Output Qualia. Like Memories, Actions are a nonlinear program. Action programming is sparse-distributed like memory.

“Sparse distributed memory (SDM) is a mathematical model of human long-term memory introduced by Pentti Kanerva in 1988 while he was at NASA Ames Research Center. It is a generalized random-access memory (RAM) for long (e.g., 1,000 bit) binary words. These words serve as both addresses to and data for the memory.”

[https://en.wikipedia.org/wiki/Sparse\\_distributed\\_memory](https://en.wikipedia.org/wiki/Sparse_distributed_memory)

My argument is that The Inceptive Field (defined by the connections from Apical Dendrites and alternatively by the exit terminals of brain cells) may encode learned choices, learned responses, and learn muscle reactions.

The non-linear way that neurons compute reactions to spatially & temporally distinct stimuli allows for a non-linear action response.

As discussed elsewhere neurons accomplish nonlinear computation by being specifically to stimulus from any direction, with special reactions for multiple stimuli in close proximity, such as the stimulation of two NMDA receptors on the same dendritic branch that yields a multiplicative reaction, instead of an additive reaction.

What makes computation non-linear is that it can process the input in any order, from any direction, in that sense there is perhaps some analogy of the brain to functional programming, to entity component systems, and to multiplayer experiences written on 3D game engines.

Yet there are also threshold mechanisms, at every scale, at the atom, ion, molecular & protein scales, in the receptors, in dendrites, in the somas, in the neural circuits, in the cortical columns, and in larger brain networks that require some aggregate of non-linear rhythms to create a linear output, or an orderly sequence of behaviors that can react to non-linear inputs.

This article (below) is relevant to both sensory qualia and muscle qualia.

#### # Membrane Voltage Dynamics of Parvalbumin Interneurons Orchestrate Hippocampal Theta Rhythmicity

"Hippocampal network activity at theta frequencies (5-10Hz) is important for behavior. However, it remains unclear how behaviorally-relevant network theta rhythms arise and interact with cellular dynamics to dictate spike timing. We performed membrane voltage (Vm) imaging of individual CA1 pyramidal cells and parvalbumin interneurons with simultaneous local field potential (LFP) recordings in mice during locomotion. We found that Vm theta rhythms organize spike timing in both cell types regardless of behavioral conditions, but the Vm of parvalbumin interneurons is better synchronized with LFP. The temporal relationships between spikes and LFP theta reliably reflect the Vm-LFP relationships in parvalbumin cells, but not in pyramidal cells. Thus, cellular theta rhythms broadly organize spike timing in CA1 neurons, and parvalbumin interneurons are critical in coordinating network theta rhythms."

<https://biorxiv.org/cgi/content/short/2022.11.14.516448v1>

#### # "Cortical reactivations predict future sensory responses"

<https://www.biorxiv.org/content/10.1101/2022.11.14.516421v1>

#### # 3. What makes it conscious?

Not all of our sensory inputs are conscious and not all of our motor outputs are conscious. We have a high level coarse-grained computationally rendered internal representation, that manifests a multi-sensory metaphor of reality, so only the aggregate of a great number of isomorphic or self-similar phase wave differentials reach attention in our phenomenological conscious experience, those things that are perceived consciously are the dominant phase wave differential rhythms.

Those muscle movements that are conscious are also phase wave differential rhythms, and the choices that we make are also the dominant phase wave differential rhythms that bridge conscious rendered sensory input experience (think of it as the experience of the ecosystem) and conscious rendered muscle output (think of it as the experience of the body)

Sensory Input Qualia I consider to be a set of distinct oscillating isomorphic phase wave differentials, above a certain threshold of activity persistence, existing as a well defined pattern of activity in the brain that is resonating away in time, dissipating, or noising away (with the analogy of Stable Diffusion Neural Networks) into the synchronous tonic low information

brainwave oscillations that I argue are the neural correlates of the experience of the feeling of being someone.

Actions are a nonlinear program - Conjecture: because neurons have the ability to detect spatial patterns, and they have the ability to emit spatial patterns, the active synaptic configuration of the apical dendrite could be considered an action pattern, and the programming language for an action is a nonlinear activation of learned action sequences that oscillate together.

My argument is that actions are nonlinear coded responses, meaning that action sequences can be triggered in any order to customize a new action sequence that is paired to a novel experience.

In essence, just as Qualia are a set of distinct oscillating isomorphic (similar) phase wave differentials, above a certain threshold of activity persistence (that resonate away in time) so are actions. In other words Actions are Muscle Output Qualia.

sparse distributed representations

sparse distributed memory prediction renderings

sparse distributed learned action sequence modules

sparse distributed phase coupled action components

Sparse distributed actions bound into dominant oscillatory rhythms become executed sequences of behavior, coordinating muscle movements, formulating planned actions, embodying pre-planned contingency adaptive proprioceptive motor output.

like memories: each component of an action is stored in the synaptic configuration

I like to imagine that actions are learned by the postsomatic side of a neuron, ala the presynaptic side of the synapse (the Apical Dendrite or Exit Terminal). In other words the inceptive fields encode the actions or outputs creating learned memories from the Soma in association with bidirectional synaptic communication.

I can (metaphorically) count the pixels in my mind's eye, there are trillions of them (synapses) (heterogeneous synaptic plasticity is analogous to individually modified pixels on a tv screen) However my argument is not that we have a conscious representation of all the synaptic outputs, but rather my argument is that we have a high level coarse grained representation consisting of the aggregate of or the spatially & temporally distributed sum, product & remainder of all the phase wave differential rhythms. The phenomenologically conscious experience of redness is not just a phase wave differential when it's conscious, it is a dominant phase wave differential rhythm, consisting of many sparse & distributed components, represented by synaptic frequency states, as well as dendritic, somatic, and apical states, that achieve dominance in mental representation through a combination of regional connections via synchrony to establish a looping neural pathway, and a persistence of isomorphic or self similar tempo spatial signal patterns. In other words it's both the active neural pathway, defined by the phase states in brain cells, and the dominant signal waveforms aka the persistent phase wave

differential rhythms that formulate the material of phenomenological conscious experiences as we experience them.

Synaptic Efficacy is locally heterogeneous (meaning diverse) meaning that synapses are individually upregulated or down regulated. Like Pixels on your tv screen. Pixels observed by other dendrites.

NAPOT 6 Refines the idea of NAPOT to consider that Synaptic inward EPSPs and Somatic outwards EPSPs specifically increase the brightness or loudness or hardness or distinctiveness of our phase wave representations in our minds. Essentially EPSP an increasing brightness in the mental pixels of our qualia aka our internal representations. When ESPS increase, something visual, acoustic, tactile, or other internal representation increases in contrast. That doesn't mean that every Synaptic change is conscious. Synaptic frequency state changes can also be imagined as like pairs of speakers & microphones, or pairs of television pixels & eyes, but with the tonic oscillation there isn't anything notable passing through the synapse, and for a signal pattern passing through synapses to be notable to the human mind it has to be recurrent in either space or time, resonating, reverberating, like a rhythm, or a burst, a rhythm or burst that leads to a ripple that is dominant in loudness or novelty compared to other brain signal patterns.

I think if I take this idea one step further it's that bidirectional synaptic communication, dendritic computation, and somatically detected coincidences help to define which sensory input patterns are ignored and which sensory input patterns gain dominance in the brain's oscillatory rhythms.

# 4. Lets begin to imagine machine applications of phenomenologically conscious functions  
Lets imagine the oscillatory neural pathway being simulated in a machine, we are simulating the microscopic, which is taking discrete phase changes, and passing them through simulated signal pathways, through a network that results in state phase changes to the network. What makes them phase wave differentials conscious then? My argument is that they become dominant rhythms when they become conscious. DPWDR Dominant Phase Wave Differential Rhythms. If an engram is a phase wave differential from baseline tonic brainwave activity, a phenomenologically conscious engram is a dominant phase wave differential rhythm (that persists spatially and or temporally over other phase wave differentials in the brain).

# "The Neural Basis of the Dynamic Unconscious"

by Heather A. Berlin (2011) is a good citation to support the argument that unconscious & subconscious processes exist at threshold that is lower than what is required for conscious brain activity, but can still affect, prime, or cause reactions, including exciting an organism or inhibiting an organism.

The sections on blindsight in the above named paper is particularly interesting and I think relevant.



"And some studies suggest that the level of this parallel cortical processing determines the degree to which information from subcortical processing modulates emotional responses and reaches awareness.

(...)Interestingly, subjects could report the valence of the affective face only when TMS interfered with cortical processing. Access to the affective content of the stimuli disappeared after prolonged task training or when the stimulus visibility increased. Thus, it seems that conscious processing of information can actually repress unconsciously processed information"

Conscious or dominant brainwave rhythms can suppress less dominant brainwave rhythms, pushing them out of the conscious experience, but that doesn't mean you stop reacting & responding to what you are unconscious of. The content of weaker brainwave rhythms just fades to the background while your focus stays focused on the dominant or the salient information in your experience.

I think my argument slightly decouples the question of where consciousness is happening and changes it to when & how it's happening. Where is slightly important I think because the oscillatory cortical-thalamic feedback loops from the thalamus to the cortex V1 through V6 and back from those layers to the thalamus appear to be essential for conscious activity. The case of blindsight point to disrupted vision pathways or alternate vision pathways, or the way I like to think of it, cut down and reduced visual pathways.

"Visual stimuli presented to fully sighted people, and in the sighted visual field of blindsight patients, are thought to be processed via the subcortical/"alternative" pathway described above (i.e., the retino-tecto-thalamic route, or via direct LGN projections to extrastriate cortex (Schmid et al., 2010), and simultaneously by the retino-geniculo-cortical pathway directly to V1 involved with in-depth, conscious cortical visual processing."

# Dominant phase wave rhythms continued:

It's like what if you arranged a diffusion network in a loop to take the incoming data, render something, feed the rendering back to the diffusion network to render something else and kept repeating that process, so that the eventual output was this really complex consideration.

The network is learning sequences of spatial transformations, if you can tie its results into a reinforcement neural network so that it can link its own renderings of a game to its results in the game then you have tied the renderings that it makes to itself with its actions in the game, and that is what I am arguing is analogous to what organisms with their brains are doing

If we know that oscillating magnetism is used to bind information in feedback loops into a reality that the network can use to perceive reality, itself, and its surroundings, but that it amounts to an internal rendering that the organism references as a map to its own genetic goals including survival & reproduction and we have a way of achieving the same outcome without magnetic oscillations but with simulated magnetic oscillations, then we can achieve the same result, a

being that has an internal sense of reality, that it can reference and be driven from the same way as we have an internal sense of reality that we can reference and be driven from.

In other words I react to what I perceive, and I don't react to what I don't perceive, and a robot based on this technology will be the same way. Reacting to what it is perceiving, and not reacting to what it does not perceive.

From one valid perspective we can consider the whole brain as a vast sensor transmitter relay system, with phenomenological consciousness being like a hall of mirrors for oscillatory tomography (Oscillations that are similar bind together, like coincidences, that is the basis of oscillatory tomography or tomography via oscillation) to bind together synaptic & somatic patterns that result in motor outputs that the same sensor transmitter system then recaptures to build a self aware identity, a strange loop in space.'

If you are one of the 60 or so people on this planet smart enough to be excited about Self Aware Networks and Neural Array Projection Oscillation Tomography then stay tuned for NAPOT 7, although by comparison NAPOT 7 is Expert Level, and I would describe NAPOT 6 as Advanced.

# 5. Citations: The following citations are still being evaluated, many more will be included in the next major update, and some will be moved elsewhere.

Whole brain evaluation of cortical micro-connectomes.  
<https://www.biorxiv.org/content/10.1101/2022.10.05.510240v1>

Anesthesia-related brain microstructure modulations detected by diffusion MRI  
<https://www.biorxiv.org/content/10.1101/2022.10.04.510615v1>

Human hippocampal ripples signal encoding of episodic memory  
<https://www.biorxiv.org/content/10.1101/2022.10.03.510672v1>  
[https://twitter.com/biorxiv\\_neursci/status/1578405011649953792?s=21&t=SzfnlDdMHITHYaJ9pHIJKQ](https://twitter.com/biorxiv_neursci/status/1578405011649953792?s=21&t=SzfnlDdMHITHYaJ9pHIJKQ)

"SMEs. Instead, hippocampal ripples increase during encoding of items leading to recall of temporally or semantically associated items, a phenomenon known as clustering. This subsequent clustering effect (SCE) arises specifically when hippocampal ripples occur during both encoding and retrieval, suggesting that ripples mediate the encoding and future reinstatement of episodic memories"

Oscillations and aperiodic activity: Evidence for dynamic changes in both during memory encoding  
<https://www.biorxiv.org/content/10.1101/2022.10.04.509632v1>

For artificial navigation

# "Hippocampal firing fields anchored to a moving object predict homing direction during path-integration-based behavior" <https://www.biorxiv.org/content/10.1101/2022.09.30.510268v1>

Sensory Qualia (NAPOT 6)

# "Quantifying rhythmicity in perceptual reports"

"Externally generated events may act as an alignment event by resetting the phase of internal rhythms as they directly interfere with the neural activity in the respective sensory areas, or by resetting attentional dynamics. Conversely, examples of internally generated events are motor acts like an arm movement (Tomassini et al., 2015), a button press (Benedetto et al., 2016) or an eye movement (Bellet et al., 2017; Benedetto and Morrone, 2017). Internally generated events may also act as an alignment event by resetting neural rhythms, either through a corollary discharge, i.e., an efferent copy of the movement plan sent by motor areas, or through the generation of new sensory inputs, e.g., the retinal movement during a saccade. Alternatively, or additionally, a motor action may act as an alignment event by revealing an internal rhythm, if the motor act is produced with some preference for a particular phase of that rhythm."

<https://www.sciencedirect.com/science/article/pii/S1053811922006760>

# "Traveling waves observed in MEG data can be explained by two discrete sources"

"Growing evidence suggests that traveling waves are functionally relevant for cognitive operations in the brain. Several electroencephalography (EEG) studies report on a perceptual alpha-echo, representing the brain response to a random visual flicker, propagating as a traveling wave across the cortical surface. In this study, we ask if the propagating activity of the alpha-echo is best explained by a set of discrete sources mixing at the sensor level rather than a cortical traveling wave. To this end, we presented participants with gratings modulated by random noise and simultaneously acquired the ongoing MEG. The perceptual alpha-echo was estimated using the temporal response function linking the visual input to the brain response. At the group level, we observed a spatial decay of the amplitude of the alpha-echo with respect to the sensor where the alpha-echo was the largest. Importantly, the propagation latencies consistently increased with the distance."

<https://www.biorxiv.org/content/10.1101/2022.09.28.509870v1>

seems like material for NAPOT 6

# "Thalamocortical boutons cluster by ON/OFF responses in mouse primary visual cortex"

"In higher mammals, the thalamic afferents to primary visual cortex cluster according to their responses to increases (ON) or decreases (OFF) in luminance. This feature of thalamocortical wiring is thought to create columnar, ON/OFF domains in V1."

<https://www.biorxiv.org/content/10.1101/2022.09.26.509569v1>

The index of local coupling with eeg or bold fmri signals would show which brain regions are communicating, allowing the prediction of the task being focused on, but its the tiny variations, the phase changes happening between coupled areas that would contain the information being traded between coupled areas

# "From Correlation to Communication: disentangling hidden factors from functional connectivity changes"

<https://www.biorxiv.org/content/10.1101/2022.09.25.509384v1>

key: "Heterogeneity of burst firing in mouse thalamic reticular nucleus neurons"

# "Attenuation of SK channels increased TRN neuron burst frequency through an increase in LTS duration, but not magnitude. The broad range of burst firing frequencies could provide distinct downstream inhibition within thalamic nuclei."

<https://www.biorxiv.org/content/10.1101/2022.09.25.509400v1>

# "Coding of latent variables in sensory, parietal, and frontal cortices during virtual closed-loop navigation"

"These results highlight the distributed nature of neural coding during closed action-perception loops and suggest that fine-grain subnetworks may be dynamically established to reflect (embodied) task strategies."

<https://www.biorxiv.org/content/10.1101/2021.10.22.465526v2>

Projection Pattern with Topographic Organization (NAPOT)

# "Corticothalamic Neurons in Motor Cortex Have a Permissive Role in Motor Execution"

Anatomical characterization of M1CT neurons revealed an extensive projection pattern to thalamic nuclei with marked topographical organization.

<https://www.biorxiv.org/content/10.1101/2022.09.20.508799v1>

# "Thalamocortical interactions shape hierarchical neural variability during stimulus perception"

"Our results suggest that the lower variability of VPL and area 3b facilitates feedforward thalamocortical communication, while the higher variability of area 1 supports intra-cortical interactions during sensory processing. These results provide evidence of a hierarchical order along the thalamocortical network."

<https://www.biorxiv.org/content/10.1101/2022.09.20.508691v1>

# "Chemical Two-Photon Uncaging: a Novel"

"“chemical two-photon uncaging” offers a simple, general, and economical strategy for spatially localized photolysis of caged compounds."

"Approach to Mapping Glutamate Receptors

This method was used to map the distribution of glutamate receptors on hippocampal pyramidal neurons. A higher density of AMPA receptors was found on distal apical dendrites than on basal or primary apical dendrites, suggesting that synaptic efficacy is locally heterogeneous."

<https://pubmed.ncbi.nlm.nih.gov/9331338/>

# Schaffer collateral - Wikipedia

"Schaffer collaterals are axon collaterals given off by CA3 pyramidal cells in the hippocampus. These collaterals project to area CA1 of the hippocampus[1] and are an integral part of memory formation and the emotional network of the Papez circuit, and of the hippocampal trisynaptic

loop. It is one of the most studied synapses in the world and named after the Hungarian anatomist-neurologist Károly Schaffer."

"Moreover, Schaffer collateral axons develop excitatory synapses that are scattered over the dendritic arborization[3] of hippocampal CA1 pyramidal neurons.[4] In the early stage of long-term potentiation, Schaffer collaterals release glutamate that binds to AMPA receptors of CA1-dendrites. The process of developing a network of CA3-to-CA1 recurrent excitatory glutamatergic synapses alters the frequency of spontaneous action potentials in Schaffer collaterals. By adulthood, CA3 recurrent network activity is reduced, the frequency of spontaneous action potentials is decreased in Schaffer collaterals, and a single release locus synapse with one dendritic spine on a given CA1 pyramidal neuron can be developed by Schaffer collateral axons.[2]"

[https://en.m.wikipedia.org/wiki/Schaffer\\_collateral](https://en.m.wikipedia.org/wiki/Schaffer_collateral)

# "Adenosine and Astrocytes Determine the Developmental Dynamics of Spike Timing-Dependent Plasticity in the Somatosensory Cortex"

<https://www.jneurosci.org/content/42/31/6038>

The reference below fits with NAPOT perfectly:

"Widespread, perception-related information in the human brain scales with levels of consciousness"

"Here, we provide evidence for a novel organizational concept: we uncover task-specific information distributed across the human brain. We use functional magnetic resonance imaging (fMRI)-based decoding models to probe the presence of task-specific information. In doing so, we show that brain regions that are empirically almost entirely task-independent (considered to be "noise"— i.e.,  $t$ -statistics  $\approx 0$ —in standard univariate fMRI analyses) can decode various tasks, even without statistical learning tools. Thus, task-specific information is present and readily accessible throughout the neocortex, challenging the sensitivity of traditional linear, univariate analytical approaches. Remarkably, even subcortical structures and the cerebellum contain task-specific signals in voxels that would univariately be considered "noise". Finally, using data from an auditory study with different levels of sedation, we show that the widespread signal in regions remote from the primary and secondary sensory cortices (auditory cortex) depends on the level of sedation, suggesting the brain's widespread, task-specific information is related to perception rather than the encoding of the sensory stimulus. Our analysis uncovers task-specific and consciousness level-dependent information across the human brain, which we hypothesize to be the basis for coherent, subjective perceptions."

<https://www.biorxiv.org/content/10.1101/2022.09.19.508437v1>

# "Disentangling Temporal and Rate Codes in Primate Somatosensory Cortex"

"However, the respective roles of spike timing and rate in frequency coding are confounded because vibratory frequency influences both perceived pitch and magnitude and shapes both the timing and rates of S1 responses. To disentangle these various elements, we measured S1 responses as animals performed a vibratory frequency discrimination task, in which differences in frequency were accompanied by uninformative variations in amplitude. We then assessed the degree to which the strength and timing of S1 responses could account for the animals' ability to

perform the frequency discrimination task in the presence of intensity confounds. First, we showed that animals can discriminate frequency, but their performance is biased by vibratory amplitude. Second, rate-based representations of frequency are susceptible to changes in amplitude, but in ways that are inconsistent with the animals' behavior, calling into question a rate-based code for frequency."

<https://www.biorxiv.org/content/10.1101/2022.09.19.508566v1>

Supporting Reference for NAPOT 5 (search references for unpaywalled sources) (NAPOT 5 was in large part about Large Scale Functional Network Connectivity Changes being the determinant, neural correlate, and result of emotional shifts, choice shifts, and changes in behavior.

# "Replay, the default mode network and the cascaded memory systems model"

"The spontaneous replay of patterns of activity related to past experiences and memories is a striking feature of brain activity, as is the coherent activation of sets of brain areas — particularly those comprising the default mode network (DMN) — during rest"

<https://www.nature.com/articles/s41583-022-00620-6>

# Decoding cognition from spontaneous neural activity

"Taking a 'representation-rich' approach bridges the gap between cognition and resting-state communities: this approach relies on decoding task-related representations from spontaneous neural activity, allowing quantification of the representational content and rich dynamics of such activity"

<https://www.nature.com/articles/s41583-022-00570-z>

# "The interindividual variability of multimodal brain connectivity maintains spatial heterogeneity and relates to tissue microstructure"

<https://www.nature.com/articles/s42003-022-03974-w>

Brainwave Rhythms are distinct, perhaps unique, which is a sign that they are information containing.

# "Rhythmic temporal coordination of neural activity avoids representational conflict during working memory"

"Traditional theories propose that short-term storage of to-be-remembered items occurs through persistent neural activity, but when neurons are simultaneously representing multiple items, persistent activity creates a potential for representational conflicts. In comparison, more recent, activity-silent theories of working memory propose that items are stored through short-term changes in synaptic weights. Transient bursts in neural activity, rather than persistent activity, would serve to refresh these short-term synaptic changes. Here, we used EEG and response times (RTs) to test whether rhythmic temporal coordination helps to isolate neural activity associated with different to-be-remembered items, thereby avoiding representational conflicts. Consistent with this hypothesis, we report that the relative strength of different item representations alternates over time as a function of frequency-specific phase. Although RTs were linked to theta (~6Hz) and beta (~25 Hz) phase during a memory delay, the relative strength of item representations only alternated as a function of beta phase. The present

findings support activity-silent theories of working memory, and inform models describing the role of oscillatory dynamics in organizing working memory. Finally, these findings support rhythmic temporal coordination as a general mechanism for avoiding either functional or representational conflicts during cognitive processes."

<https://www.biorxiv.org/content/10.1101/2022.12.02.518876v1>

Studies like this can help us to imagine Emotion as a rhythmic oscillation.

# "Hemispherically lateralized rhythmic oscillations in the cingulate-amygdala circuit drive affective empathy in mice"

"A closed-loop disruption demonstrated the causal relationship between 5–7 Hz oscillations in the cingulo-amygdala circuit and observational fear responses. The increase/decrease in theta power induced by optogenetic manipulation of the hippocampal theta rhythm bi-directionally modulated observational fear. Together, these results indicate that hippocampus-dependent 5–7 Hz oscillations in the cingulo-amygdala circuit in the right hemisphere are the essential component of the cognitive process that drives empathic fear, but not freezing, in general."

[https://www.cell.com/neuron/fulltext/S0896-6273\(22\)01000-5?fbclid=IwAR0zpGahQXN8TAY6XvliX\\_0-I9KIDXUxw34UeL9qT6Ca3r6ru\\_8wcCbEY9U](https://www.cell.com/neuron/fulltext/S0896-6273(22)01000-5?fbclid=IwAR0zpGahQXN8TAY6XvliX_0-I9KIDXUxw34UeL9qT6Ca3r6ru_8wcCbEY9U)

a0326z ctp

I am a strange loop / with Neurofeedback Salon we are creating a feedback loop to give your brain a whole lot of information about itself, so the computer is just a high tech mirror, your brain does the work :)

The book "I am a strange loop" turned me onto Chopin, who is brilliant, and of course "Godel Escher Bach" Hoftstadler is an artist with words. One of my favorites is Moonlight Sonata (Beethoven) Classical music is an early form of brainwave entrainment, one of the technologies used in my Salon!"

a0327z.md

(hippocampus) SPEAR Separate Phases Encoding & Retrieval

Hippocampus Phase Offset

<https://neurosciencenews-com.cdn.ampproject.org/c/s/neurosciencenews-com/human-memory-formation-19757/amp/>

Separate Phases at Encoding And Retrieval (SPEAR)

<https://www.utsouthwestern.edu/newsroom/articles/year-2021/how-memories-form.html>

Neurons in the human medial temporal lobe track multiple temporal contexts during episodic memory processing

Hye Bin Yoo et al. Neuroimage. 2021

<https://pubmed.ncbi.nlm.nih.gov/34742943/>

Quantum Gravity Neurons:

Stem cells sense neighborhood density to make decisions on their behavior

Mechanical waves

<https://www.sciencedaily.com/releases/2017/12/171213104616.htm>

Separate Phases at encoding & retrieval 2002

<https://pubmed.ncbi.nlm.nih.gov/11936962/>

a0328z My Initial thoughts on Adaptive Resonance Theory.

December 8th 2022

I was listening to this Brain Inspired podcast episode that someone linked on twitter.

BI 100.2 What Are the Biggest Challenges and Disagreements?

<https://www.youtube.com/watch?v=WDkzeXGmjz4>

When I came across the work of Steve Grossberg who spoke at 36:55 and who created the Adaptive Resonance Theory.

A google search led me to the following links. I decided to review Adaptive Resonance Theory to understand how it compared to Self Aware Networks: Neural Array Projection Oscillation Tomography Theory.

BI 082 Steve Grossberg: Adaptive Resonance Theory

<https://www.youtube.com/watch?v=7d9-wmbwxQM>

"Adaptive resonance theory: The primary intuition behind the ART model is that object identification and recognition generally occur as a result of the interaction of 'top-down' observer expectations with 'bottom-up' sensory information. The model postulates that 'top-down' expectations take the form of a memory template or prototype that is then compared with the actual features of an object as detected by the senses. This comparison gives rise to a measure of category belongingness. As long as this difference between sensation and expectation does not exceed a set threshold called the 'vigilance parameter', the sensed object will be considered a member of the expected class. The system thus offers a solution to the 'plasticity/stability' problem, i.e. the problem of acquiring new knowledge without disrupting existing knowledge that is also called incremental learning."

[https://en.wikipedia.org/wiki/Adaptive\\_resonance\\_theory](https://en.wikipedia.org/wiki/Adaptive_resonance_theory)



My first note about this is that the idea that events are driven from the top down and from the bottom up is a key component of Self Aware Networks NAPOT theory. In addition SAN:NAPOT describes lateral functionality at multiple scales.

However ART seems to be focused on describing how an artificial neural network can work to have these features where as my focus with SAN:NAPOT is on precisely how the human brain accomplishes its top down, bottom up, and lateral functions at all scales.

I write about the tonic oscillation being the ground of being, or baseline that incoming sensory information as phase wave differentials is compared against, this is a similar concept to ART theory, but SAN:NAPOT is specific about the neural mechanisms involved in the comparison.

I think of György Buzsáki's book "The Brain from Inside Out"

To paraphrase and simplify I think György Buzsáki thinks that the error of AI is that the human brain begins as a blank slate, like a notebook (Alan Turing quote) and it leads to catastrophic forgetting.

György Buzsáki's The Brain from Inside Out book has a brain centric view, where the brain has pre existing patterns, instinctual Rhythms, tonic oscillation patterns, inherent connectivity bias, and this provides the stability against which incoming sensory patterns must interact with.

For György Buzsáki brain activity is a process of matching preexisting patterns, the data encoded in the natural Rhythms of the Brain, with events outside in the world, that disturb, perturb, modify, and shape the brainwave activity like molding clay (part of this is my interpretation of Buzsáki's work. I don't think he ever uses an analogy like molding clay. Nor does he use concepts like computational rendering. SAN:NAPOT builds on top of prior work done by Buzsáki and others.)

György Buzsáki's viewpoint is almost also a match for ART Adaptive Resonance Theory.

For György Buzsáki the brain's primary preoccupation is trying to maintain its existing dynamic, and that is what provides it's resilience against the catastrophic forgetting seen in the Deep Learning Neural Networks of yesterday.

Listen to a quote from György Buzsáki (Also for this note reference 31:49 minute mark – György Buzsáki via <https://braininspired.co/podcast/100-2/> )

There is a data comparison happening between layers in ART, but it is not clear what the analogy, but in NAPOT:ART I'm arguing that the data comparisons are not just differences between layers of neural arrays, but that in the brain

The components of renderings that are bound together across layers across networks of the brain in phase wave differential rhythms, that transmit through phase matched functionally

connected brain regions, inside oscillating feedback loops are comparisons to the existing multi-dimensional tonic oscillation brainwave patterns which for example in the Hippocampus would be low frequency Theta oscillations. That's what I mean by comparisons, and that is a bit different from how comparisons are described in ART, but the basic idea, which is the brain does comparisons between internal values and incoming sensory inputs is there.

In SAN:NAPOT I argue that exit terminal or the Apical Dendrite is an inceptive field, and these inceptive fields send information to receptive fields which are represented by basal dendrites or the input side (the primary dendrite) of the neuron.

(Side Note: Although synaptic communication is bidirectional the direction of signal transmission along the axon, during an action potential event, is mostly towards the exit terminal or the apical dendrite as far as I have read. So it's fair to describe neurons as having an input side that is opposite the exit terminal)

I don't want to go much deeper in to comparing SAN:NAPOT to ART because to me ART is like an exercise in trying to take intuitive and somewhat obvious observations from Psychology and trying to make them work in an Artificial Neural Network.

I think Buzsaki's book the Brain from Inside Out is a good match for the basic ideas of Adaptive Resonance Theory, but not for the specific implementations of ART in Artificial Neural Networks none of which appear to be biologically plausible.

I think that there is a great opportunity for Stephen Grossberg and György Buzsáki to have a long recorded dialog together about the intersections of their work, and I would love to be in that conversation someday to talk with them about SAN:NAPOT.

a0329z

(hebb, oscillat, array, synap) from action potential to a new theory of gravity

working with EEG, and talking to Neuroscientist Morgan Hough for a year when I was hosting NeurotechSF event I had learned notion ingrained in me that there was a  $1/f$  relationship between amplitude and frequency in brainwaves

I learned in a neural lace podcast about light imaging with Kyle Matheson that neurons expand when they fire

Optical imaging with Kyle E. Mathewson ~ The Neural Lace Podcast. Corona virus COVID-19 Special!

<https://www.youtube.com/watch?v=xEUrcnUu498>

when reading buszaki I thought more deeply about the  $1/f$  relationship between amplitude and frequency (for groups of neurons), and the fact that neurons expand when they fire

how high frequency has low amplitude and low frequency has high amplitude

in Buzsáki it became clear that this meant high amplitude affects more neurons and low amplitude reaches less

While reading György Buzsáki I dialed into concept of frequency as the inverse of time.

I thought about frequency being in the inverse of time and frequency the inverse of amplitude at the EEG scale, and the expansion of neurons in the soma right before they fire phasically (phasic firing is high frequency firing)

then I thought about a news article I published on Silicon Valley Global News in which I mapped out the connection between potassium changes and action potential firing and mvr

<https://medium.com/silicon-valley-global-news/synaptic-unreliability-a-foundational-concept-found-in-deep-learning-and-in-computational-a97c5dca9e90>

then I talked with F Scott on clubhouse and he helped me improve the theory, he speculated that additional neurotransmitters from mvr might reach more receptors on the other side of the synaptic cleft

There was a theory of SDR I had read about from Jeff Hawkins where neurons inhibited their neighbor

I realized that a high frequency firing might create an amplitude release of neurotransmitters which might open lots of potassium channel receptors inhibiting other neurons faster, creating a collective representation in a columnized layer, edge community, circuit, or neural array that would be collectively perceived by the next array, and so on, and that the entire bunch of neurons would learn invariant representations,

I read the book Sync that all the neurons oscillate and I deduced that all the neurons would feel every signal in some way, because they are all involved in dissipating that oscillating energy

like a single sensor, which goes back to Donald Hebb and his idea that neurons that fire together are acting like a single memory, but extended to be like they are a single sensor

If we combine Hebb's idea of Neurons of cell assemblies forming links because of spatial & temporal consistent firing with the Steven Strogatz ideas about how fireflies & clocks synchronize, we can speculate that neurons wire together because they oscillate together (sync state), and they wire apart because they oscillate apart (splay state), and I further speculate that the electromagnetism of the Action potential firing is stimulating the mitochondria to produce more ATP which causes new protein synthesis which is new cell growth, specifically new receptor growth, that represents a new state change in LTP & LTD, and the growth happens between cells that are firing in oscillation together. This is the same principle that causes plants to grow towards the sunlight, the stimulation of sunlight is like an oscillator interacting with the

plant which is also an oscillator, the principles of oscillation's coupling explain why neurons oscillate in groups.

so I had this idea from neuroscience that neurons were expanding on mass when they fired like an action potential, which I also think of as like lightning, positive and negative charges between the sky and earth split so much there is a flash followed by a bang, light and sound, frequency and amplitude

the charges dissipate like a dissipative system like a vortex

but here on the table was

amplitude is inverse to frequency

time is inverse to frequency

mass is inverse to frequency

every mass at every scale (quantum gravity idea) has an inverted relationship to the spacetime around it

mass is 1:1 with spacetime increasing in scale

# Here is a copy of my article Synaptic unreliability

Synaptic unreliability, a foundational concept, found in deep learning, and in computational neuroscience, has been undermined by a math proof that shows us that MVR (multi-vesicular release) is wide spread in neocortical synapses.

This new research may impact companies like Numenta, Google, Facebook, Deepmind, Tesla, OpenAI, and the way neural networks are designed in the future.

Article by Micah Blumberg <http://vrma.io>

The concept of synaptic unreliability that is a foundation for computational neuroscience, spike timing models, and deep neural networks is fundamentally undermined by the mathematical proof of widespread MVR (multi-vesicular release) in neocortical synapses.

Background: "Impact of synaptic unreliability on the information transmitted by spiking neurons"

"This suggests that synapses represent the primary bottleneck limiting the faithful transmission of information through cortical circuitry." "The postsynaptic neuron can be viewed as an

input-output element that converts the input spike trains from many presynaptic neurons into a single-output spike train. This input-output transformation is the basic computation performed by neurons. It is the foundation upon which cortical processing is based."

<https://journals.physiology.org/doi/full/10.1152/jn.1998.79.3.1219>

How could MVR affect the capacity neurocomputation? Well even before this researchers had the idea that a single synapse could individually set its own neurotransmitter release, dynamically, through a local feedback regulation.

“The probability of neurotransmitter release: variability and feedback control at single synapses”  
“(…)neuronal compartments might perform regional integration operations, acting as semi-independent computation units<sup>18,130,131</sup>. In this scenario, in which a neuron can be thought of as a multiple-unit network, it makes sense that signal/noise adjustments are performed separately for each unit rather than for the cell as a whole. Also, having synapses with different prs in different dendritic branches means that information from a single axon can be dynamically filtered in a different way at each dendritic compartment.” source  
<https://www.nature.com/articles/nrn2634>

“experimental data from electrophysiological, molecular and imaging studies have demonstrated that synaptic terminals can individually set their neurotransmitter release probability dynamically through local feedback regulation. This local tuning of transmission has important implications for current models of single-neuron computation.” source  
<https://www.nature.com/articles/nrn2634>

So what is this math proof:

A 2019 paper: Structure and function of a neocortical synapse suggests that neocortical synapses operate with multivesicular release.  
<https://www.biorxiv.org/content/10.1101/2019.12.13.875971v1>

“analysis revealed that the number of vesicle release sites exceeded the number of anatomical synapses formed by a connection by a factor of at least 2.6, which challenges the current understanding of synaptic release in neocortex and suggests that neocortical synapses operate with multivesicular release, like hippocampal synapses”  
<https://www.biorxiv.org/content/10.1101/2019.12.13.875971v1>

“neocortical synapses (..) may modulate their strength more flexibly than previously thought, with the corollary that the canonical neocortical microcircuitry possesses significantly higher computational power than estimated by current models.”  
<https://www.biorxiv.org/content/10.1101/2019.12.13.875971v1>

The above paper was also cited in this article below

“The researchers were able to use a novel mathematical analysis to prove that each synapse in fact has several sites that can release packets of neurotransmitter simultaneously. “This means that synapses are much more complex and can regulate their signal strength more dynamically than previously thought. The computational power and storage capacity of the entire neocortex therefore seems to be much greater than was previously believed,” says Kevan Martin.”  
[https://medicalxpress.com/news/2021-01-size-nerve-cells-strength.html?fbclid=IwAR1oa80WBfdg0D\\_E2\\_ayd\\_Ajg5xgDfPe-KHsHmUayBMEmBMA2XZHhW1dQCI](https://medicalxpress.com/news/2021-01-size-nerve-cells-strength.html?fbclid=IwAR1oa80WBfdg0D_E2_ayd_Ajg5xgDfPe-KHsHmUayBMEmBMA2XZHhW1dQCI)

MVR <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4495900/>

The idea of multivesicular release (MVR) being a widespread phenomenon among many synapses was previously covered in a 2015 paper on multivesicular release: “Nevertheless, functional data from many studies strongly suggests that MVR is a widespread phenomenon among synapses — more prevalent than originally assumed.”

“The ubiquitous nature of multivesicular release”

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4495900/>

“Presynaptic action potentials trigger the fusion of vesicles to release neurotransmitter onto postsynaptic neurons. Each release site was originally thought to liberate at most one vesicle per action potential in a probabilistic fashion, rendering synaptic transmission unreliable. However, the simultaneous release of several vesicles, or multivesicular release (MVR), represents a simple mechanism to overcome the intrinsic unreliability of synaptic transmission.”  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4495900/>

The key question here is what causes the MVR to change? The answer is the Pr.

“Vesicle Release Probability as Predictor of MVR? What is the principal determinant of MVR?

The most parsimonious hypothesis is that Pr regulates whether multiple vesicles are released concurrently. If each docked vesicle can fuse independently in response to an action potential, then the simultaneous release of multiple vesicles will occur more readily at synapses with higher Pr.” <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4495900/>

Lets define Pr: Pr is the probability that a vesicle is released:

“Multivesicular release occurs throughout the brain: Fast chemical communication between neurons occurs at ultrastructurally-defined synaptic junctions through the release of neurotransmitters. At each presynaptic release site, neurotransmitter-filled vesicles are docked on the plasma membrane ready to fuse upon the arrival of an action potential (Figure 1Ai and Bi). Vesicle fusion and neurotransmitter release then results in receptor activation.”

“The strength of the synaptic signal at the postsynaptic membrane is determined by

the number of release sites (N) see Glossary,

the probability that a vesicle is released (Pr),

the amplitude of the postsynaptic response elicited by the content of each synaptic vesicle (q) [2].” source <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4495900/>

“Desynchronization of MVR on a supra-millisecond time scale is also evident at inhibitory synapses between MLIs [13] where 0 to 3 vesicles can be released per action potential at single release sites”

So what modifies the Pr? Its the APsyn, and what modifies the APsyn? Potassium.

Presynaptic K<sup>+</sup> (potassium) modifies the action potential amplitude (APsyn) which determines the strength of the synaptic signal, including the amplitude of the postsynaptic response, including how many vesicles can be released per action potential (0 -3)

“The potassium channel subunit Kvβ1 serves as a major control point for synaptic facilitation”

The potassium channel subunit Kvβ1 serves as a major control point for synaptic facilitation  
Nerve terminals generally engage in two opposite and essential forms of synaptic plasticity  
(facilitation or...  
[www.pnas.org](http://www.pnas.org)

“We believe our data provide evidence that the APsyn waveform is a critical modulator of synaptic facilitation in excitatory nerve terminals and that further study of presynaptic K+ channels is warranted across neuronal cell types.” <https://www.pnas.org/content/117/47/29937>

“Our central finding is that an important mechanism of synaptic facilitation in excitatory hippocampal neurons is APsyn broadening. We find that the surprisingly rapid frequency-dependent broadening of APsyn is enabled by a unique molecular combination of Kv1.1/1.2 channels with the Kvβ1 subunit. Indeed, this small broadening of the APsyn mediated by Kvβ1 has a tremendous impact on synaptic transmission as the loss of the Kvβ1 subunit blocks synaptic facilitation even during paired-pulse stimulation without altering initial vesicle fusion (Figs. 4–6).” <https://www.pnas.org/content/117/47/29937>

[https://www.cell.com/neuron/fulltext/S0896-6273\(14\)00897-6?\\_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0896627314008976%3Fshowall%3Dtrue](https://www.cell.com/neuron/fulltext/S0896-6273(14)00897-6?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0896627314008976%3Fshowall%3Dtrue)  
“APSYN waveform serves as an important regulator of synaptic function.”  
[https://www.cell.com/neuron/fulltext/S0896-6273\(14\)00897-6?\\_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0896627314008976%3Fshowall%3Dtrue](https://www.cell.com/neuron/fulltext/S0896-6273(14)00897-6?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0896627314008976%3Fshowall%3Dtrue)

“adaptive plasticity: manipulations that increase presynaptic Ca<sup>2+</sup> channel abundance and release probability result in a commensurate lowering of the APSYN peak and narrowing of the waveform, while manipulations that decrease presynaptic Ca<sup>2+</sup> channel abundance do the opposite. “

[https://www.cell.com/neuron/fulltext/S0896-6273\(14\)00897-6?\\_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0896627314008976%3Fshowall%3Dtrue](https://www.cell.com/neuron/fulltext/S0896-6273(14)00897-6?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0896627314008976%3Fshowall%3Dtrue)

Control and Plasticity of the Presynaptic Action Potential Waveform at Small CNS Nerve Terminals

The flow of information in neural circuits is primarily regulated by modulation of synaptic efficacy.  
Exocytosis of...  
[www.cell.com](http://www.cell.com)

In conclusion the sodium/potassium gradient in the pre-synapse changes the amplitude of the action potential which changes the strength of the post-synaptic activity including how many vesicles are activated. This process that I am outlining allows far more information to travel over each node (or neuron) in a neural network, from the dentrite/soma over the AP to the post

synapse. Widespread MVR in neocortical synapses overcomes the information bottle neck imagined by the theory of synaptic unreliability.

So maybe we really need to think about modeling the information criteria of the brain starting at the neurotransmitter level and the ion level? If this hypothesis is right the ideas of simulating a human brain is even further off than the current leading consensus.

We may need to model the ionotropic brain. That means modeling how calcium and potassium ions, stored in the dendrite soma, are changing amplitude & frequency of the action potential, which changes the synaptic output, ie how many vesicles are activated, and what types of neurotransmitter are released downstream, which further alters the ionotropic balance of dendrites on the receiving end. If one neuron is connected to 200 downstream neurons, when that one neuron fires, with varying strength, varying amounts of vesicle activation, varying quantities and types of neurotransmitters, how are those 200 downstream neurons affected in a different way?

What do you think about the idea of MVP Multi vesicular release changing the paradigm of synaptic unreliability, and what it means when the bottle neck of a single neuron is no longer a bottle neck?

a0330z

Map: Peter Tse, (criterial causation, observer)

"What I like about Peter Tse's book at the end is he frames the question in terms of whether thoughts are passive or whether they have an active role in decision making. It's like are your thoughts just a result that the observer is observing? Or is the observer and the thoughts taking place active in the feedback cycle of decision making, playing a role in the activity instead of being a passive observer of the activity. The idea that the observer is a passive observer I think stems from the idea that the mind is separate from the body, maybe, the idea that the observer, the mind, and thought are somehow separate from physics or causality or above physics and above causation. I think Peter Tse is not trying to prove that we have choice because of random noise, he is trying to say that information has causal power in the brain, because neurons literally read and write information patterns which allows information to drive neural activity and the brain.

a0331z.md

Note Created Nov 27, 2013

Jack Gallant Perceptual Object and Action Maps in the Human Brain

[http://www.youtube.com/watch?client=mv-google&gl=US&hl=en&v=u9nMfaWqkVE&feature=player\\_embedded&nomobile=1](http://www.youtube.com/watch?client=mv-google&gl=US&hl=en&v=u9nMfaWqkVE&feature=player_embedded&nomobile=1)

Perceptual Object and Action Maps in the Human Brain

(criteria causation, perception, exception, emotion, permotion)



Peter Tse random firing

Vijay K Rajagopal

What would motivate post-biological beings?

If they were self-aware, and were able to program themselves, I'd assume that the same evolutionary pressures that come to bear on biological systems would select the programming that led to persistence.

Matt Mahoney

We can program them to be motivated however we want. The most successful ones will be programmed to make lots of copies of themselves, fear death, and die, just like evolution programmed us.

Vijay K Rajagopal

How do you convince a complex self-aware being it needs to exist?

November 25 at 5:14am · Like

Matt Mahoney

Make random variations to the source code. Those that aren't convinced they need to exist will remove themselves from the population.

November 25 at 8:18am · Like · 1

Peter Rothman

"beyond the physical" might mean existing entirely inside virtual worlds.

November 25 at 8:20am · Like

Linda Page

the original asks what would "motivate" a non-biological entity. That doesn't necessarily mean consciousness, but it does imply some kind of "need" or imperative. I do apologize for taking this into "disembodied mind" territory.

November 25 at 11:45am · Like

Jones Murphy

Jim, how can awareness possibly be orthogonal to computing when so far, we see no awareness which is not physical, i.e. computing?

November 25 at 11:53am · Like · 1

Dick Lepre Self-preservation.

November 25 at 11:54am · Like

Jones Murphy Isomorphic is not quite the word either, in that all physicality is computation, but only certain relatively complex and highly structured kinds of physicality are computation and awareness. Much computation is not awareness, so they can't be isomorphic. There certainly appears to be a minimum level of computational complexity required to support awareness.

November 25 at 12:09pm · Like · 1

Peter Rothman It seems to be aware of the temperature. Otherwise it couldn't work.

November 25 at 12:12pm · Like

Jones Murphy By that logic, all physicality is aware, since they respond to the temperature by getting hotter and changing. So no, a thermostat ain't aware in the sense in which we normally use the word.

November 25 at 12:14pm · Like · 2

Peter Rothman Hence the need to be very careful about words like "aware". What does this actually mean? I don't really know.

November 25 at 12:20pm · Like · 1

Awareness is the state or ability to perceive, to feel, or to be conscious of ev...

[See More](#)

November 25 at 12:23pm · Like

Dick Lepre Important difference between "aware" and "self-aware."

November 25 at 12:23pm · Like · 2

Peter Rothman So, the thermostat seems to be aware of its own setting as well as the temperature.

November 25 at 12:34pm · Like · 1

Dick Lepre I would not use the word "aware" to describe what a thermostat does any more than I would describe a thermometer as being "aware" of the temperature. These are man-made device which use physical properties pertaining to thermal expansion to serve our purposes.

If I throw a baseball through a pane of glass it breaks without being aware of what happened.

November 25 at 12:43pm · Like · 2

Linda Page I would also not say a thermostat is "aware" of temperature. Awareness implies (by definition) consciousness (and yes, different than self-awareness). A thermostat is not conscious. Even computers aren't conscious, even if they are attached to environmental and/or visual sensors. Yet.

November 25 at 2:17pm · Like

Jones Murphy I would not say that awareness=consciousness. Animals(and to a surprising degree plants) are aware in a way that inanimate matter is not, but it takes a brain of significant complexity to get to what we would generally consider to be consciousness.

November 25 at 2:32pm · Like

Jones Murphy Too unconscious to respond...zzz

November 25 at 2:52pm · Like · 1

Peter Rothman Is a bee aware of a flower?

Is a protozoan aware of its prey? It does not have a nervous system at all and yet it can hunt and capture prey.

<http://www.ncbi.nlm.nih.gov/pubmed/17227426>

Biochemical prey recognition by planktonic... [Environ Microbiol. 2007] - PubMed - NCBI  
[www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov)

PubMed comprises more than 23 million citations for biomedical literature from M...

[See More](#)

November 25 at 3:04pm · Like · 1

Sergio Tarrero If it is truly advanced and truly ethical (or superethical), I would guess that it would strive to remove whatever suffering it encounters here on earth, but also care about the suffering which could be taking place in other places in the universe... thus it might make plans to go and explore, and if conscious life experiencing untold amounts of suffering were to be found, it could mitigate or remove unwanted suffering, and help those beings survive/transcend.

November 25 at 3:49pm · Like · 2

Vijay K Rajagopal But would suffering have meaning to a non-biological entity? I would think that would only be the case if it were programed to empathetic to biological systems in distress.

November 25 at 3:53pm · Like · 3

Sergio Tarrero A smart, curious post-biological sentience might casually read a lot of our (artistic and scientific) literature about emotion, suffering, pain, joy, love, etc., and strive to have such feelings itself/verself. It may also take the time and effort to carefully ponder what it ought to do in the world. When realizing the amount of suffering that takes place just here on earth (even if it can't 'feel' suffering, although it may be able to estimate or 'emulate' how it feels... although it \*might\* indeed engineer itself to feel different levels of suffering, out of curiosity...), it may "follow" in its logical mind that it would be ethically a good thing to go out there to 1) scout and have fun, map out the universe, and 2) while at it, deal with any suffering it finds.

November 25 at 4:02pm · Like · 3

Constanza Rampata Moro I think i'd rather be a 'post-biological sentience' than trust that they'd would be kind to me and others. ;-p

November 25 at 5:37pm · Like · 1

Jones Murphy A thermostat decides as much as a railroad track decides to expand when the temperature goes up, and then acts by expanding. That ain't motivation, decision, or acting as we normally understand those words. There's no intention.

Yesterday at 2:08am · Like · 1

Jones Murphy Expanding and contracting railroad tracks absolutely do alter their environment. They shatter ties and cause terrible train accidents:  
<http://www.businessinsider.com/why-train-tracks-buckle-in...>

Why Extreme Heat Turns Train Tracks Into Spaghetti  
[www.businessinsider.com](http://www.businessinsider.com)

Extreme heat causes steel tracks to expand and buckle, forming "sun kinks" that could potentially derail train cars.  
Yesterday at 3:05am · Like

Ben Zaiboc When you jerk your hand away from something hot, there's plenty of motivation but no decision. It just happens.  
Yesterday at 3:07am · Like

Jones Murphy The intent of the maker of the thermostat ain't the intent of the thermostat. The thermostat has no intent, exactly like the railroad track. I have no interest in carrying on a conversation with someone who is just plain stupid.  
Yesterday at 3:09am · Like

Ben Zaiboc Overriding pain (which takes a conscious effort) and a spinal reflex are two different things. If you put your hand on something very hot without knowing in advance that it's hot, your hand will have a life of its own. I would say try it, but you can't. I'd say a spinal reflex is a lot like a thermostat, but does it make a decision? Does it have any intent? I suppose that's open to interpretation. Define 'decision' and 'intent' first, /then/ argue about it.  
Yesterday at 3:14am · Like

Ben Zaiboc Matthew Reed Bailey / Jones Murphy: Please don't resort to ad-hominem. I find that usually, rather than being stupid or failing to read things, people just mean different things by the same words, and don't realise it. You can't meaningfully discuss "intention" without agreeing on what it means first.  
Yesterday at 3:19am · Like

Jones Murphy Ben Zaiboc, Matthew Reed Bailey went off the "rails", I did not until after he did. I blocked him so that's done. There is a lot that our bodies do which is out of our conscious control and not subject to intention, though it is at a much higher level of awareness than that of a thermostat.  
Yesterday at 3:25am · Like

Ben Zaiboc What is this, 'Grouchy Tuesday'? Everyone's entitled to a couple of misunderstandings, or even cross words. I now have a mental image of two pouting boys with

their backs to each other, arms crossed. Both of you, get back in there, shake hands and say you're sorry. And play nice.

Or, you know, be oversensitive, and cut yourselves off from an opportunity to talk about these things with one of the rare people actually interested in these things.

Yesterday at 3:41am · Like

Sergio Tarrero I agree with Jones that a thermostat is not an intentional being. But Matthew did not insult Jones or his intelligence by writing "someone who is just plain stupid", while Jones did use that insult. That's not permitted here, so please take notice.

Yesterday at 3:45am · Edited · Like

Jones Murphy Matthew insulted my intelligence and so do you, Sergio Tarrero

Yesterday at 3:50am via mobile · Like

Jones Murphy If you think you see any similarities between the person initiating insults and anyone else, you are biased.

Yesterday at 3:52am via mobile · Like

Ben Zaiboc Yes, we all get our intelligence insulted on a daily basis. What matters is how we deal with it.

Yesterday at 3:53am · Like

Sergio Tarrero Please explain how I am insulting your intelligence, Jones Murphy. And how "I am biased".

Yesterday at 3:54am · Like

Sergio Tarrero Jones Murphy: You are unfairly/wrongly accusing me of insulting your intelligence, and are demonstrating a belligerent attitude towards an admin, when you've just received a warning that you are breaking the rules of this group by using insults. Be careful.

Yesterday at 4:00am · Edited · Like

Sergio Tarrero I was trying to write this to Jones Murphy, but I think he's blocked me, because the system will not allow me to post this comment if I tag him. So I won't tag him, but I will post what I was trying to post, for the record: "You are unfairly/wrongly accusing me of insulting your intelligence, and are demonstrating a belligerent attitude towards an admin, when you've just received a warning that you are breaking the rules of this group by using insults. Be careful."

Yesterday at 4:01am · Like

Ben Zaiboc No, Sergio, your comment has appeared. It was probably just FB being FB. Remember the old saying "Never attribute to malice that which can be explained by incompetence".

Yesterday at 4:06am · Like

Ben Zaiboc (or, in this case, FB being its usual arsey, shambolic self)  
Yesterday at 4:07am · Like

Paweł Pachniewski Jones Murphy is perfectly in his right to insist a thermostat has no intent, and as it happens the company of many important and prominent thinkers. A contemporary one is Daniel Dennett: [http://en.wikipedia.org/wiki/Intentional\\_stance...](http://en.wikipedia.org/wiki/Intentional_stance...)

In this summary Dennett actually mentions the thermostat in the three levels of abstraction. He puts it on level two. The thermostat does not fall into the third level of abstraction, which would include "belief, thinking and intent".

I too find it entirely misguided to attribute belief to a thermostat, no matter what McCarthy says. Belief is only a sensible concept in context of minds. Even if one assumes panpsychism, a thermostat still has no full fledged mind and thus devoid of beliefs.

So perhaps one should not jump to conclusions regarding another person's knowledge and capitalize words, just because they disagree with you.

Intentional stance - Wikipedia, the free encyclopedia  
[en.wikipedia.org](http://en.wikipedia.org)

The intentional stance is a term coined by philosopher Daniel Dennett for the lev...

See More

20 hours ago · Edited · Like · 2

Paweł Pachniewski As for the personal attacks: please stop that. And blocking administrators is prohibited. If anyone did block an admin, unblock them. Sergio is an admin.

Yesterday at 4:22am · Like · 2

Benjamin Martens "It is intended that the thermostat does [x]" is not the same as "the thermostat intends to do [x]".

Yesterday at 4:30am · Edited · Like

Linda Page Let's clarify what is meant by "motive": (Wikipedia) "

Motivation is basis and a psychological feature that arouses an organism to act towards a desired goal and elicits, controls, and sustains certain goal-directed behaviors. It can be considered a driving force; a psychological one that compels or reinforces an action toward a desired goal. For example, hunger is a motivation that elicits a desire to eat. Motivation is the purpose or psychological cause of an action....Motivation is an inner drive to behave or act in a certain manner. "It's the difference between waking up before dawn to pound the pavement and lazing around the house all day." [2] These inner conditions such as wishes, desires and goals, activate to move in a particular direction in behavior."

22 hours ago · Edited · Like · 2

Constanza Rampata Moro don't guess a thermostat has it

22 hours ago · Like

Linda Page The key is "goal-directed" behaviors, the organism would be deliberately taking action to satisfy some goal—for example, hunting to satisfy hunger. A thermostat doesn't "evaluate" anything anymore than a light bulb "decides" to turn on.

21 hours ago · Like · 1

Constanza Rampata Moro idk, it probably is a question of degree

21 hours ago · Like · 2

Robert M. Taylor David Chalmer's philosophical zombies leave me unimpressed. For those who don't know about Chalmer's zombies, Chalmer argued that a complete physical copy of a person who didn't have any experiences wouldn't have a mind, and therefore, minds are not physical. The problem is that experiences actually do physically change the brain. Sometimes the change is only on the molecular level, but long term experiences, like seeing or hearing for the formative years of a human's life, result in structural changes. So a complete physical copy of a person would have the same memories and the same mind.

21 hours ago via mobile · Like · 4

Robert M. Taylor "A person without experiences wouldn't have a functioning brain." Because their brains would indeed be physically different than a person with experiences. I'm not sure I understand the utility of the concept of philosophical zombies.

20 hours ago via mobile · Like · 1

Robert M. Taylor I would agree however that that it's correct to see "the brain as part of a much greater dynamic system that isn't confined to our cortices."

20 hours ago via mobile · Edited · Like

Robert M. Taylor And what form would you think that post-biological bacon would take?

20 hours ago via mobile · Unlike · 1

Robert M. Taylor It's wise to be prepared. Some day, I hope to be post biological, and I surely would not want to be bereft of bacon's presumably more moral equivalent in that new life.

19 hours ago via mobile · Unlike · 5

Micah Blumberg Robert M. Taylor:"David Chalmer's philosophical zombies leave me unimpressed. For those who don't know about Chalmer's zombies, Chalmer argued that a complete physical copy of a person who didn't have any experiences wouldn't have a mind, and therefore, minds are not physical. The problem is that experiences actually do physically change the brain. Sometimes the change is only on the molecular level, but long term experiences, like seeing or hearing for the formative years of a human's life, result in structural changes."

Agreed.

"So a complete physical copy of a person would have the same memories and the same mind."

NO! Not true. It's like with property, every property is unique because the sunset never hits two locations in exactly the same way. Who you are in each moment is probably calculated on the fly, in that moment, based on your exact location and circumstances. A copy of you would instantly be in another location, with a different calculation who it was and what was true for him differing from you.

19 hours ago · Edited · Like · 1

Robert M. Taylor Agreed, even if some how you were able to briefly create an identical copy, I think differentiation would immediately start from being in even slightly different environments.

19 hours ago via mobile · Edited · Unlike · 3

Micah Blumberg I'm betting it will be a hundred if not a billion times more dramatic and instantaneous than you are currently expect Bt. People have this illusion that there is some conditioned long term stability to who they are, its just not plausible, self is a live spacial metaphor constructed of millisecond coincidence patterns constituting criteria causation that drives action effecting risk management.

18 hours ago · Edited · Like

Micah Blumberg You think you are years in the making, I think you are milliseconds in the making.

18 hours ago · Like

Linda Page The argument that a brain without experience is a non-functioning brain is full of fallacies. You are essentially restating the disproven "tabula rosa" philosophy of mind (brain); the brain can most certainly function without having had "experiences"--as long as the physiology is intact. Otherwise you are arguing that the newborn's brain isn't functioning given their lack of experience (unless you argue that their experiences in the womb count). This is a rather vague term though, are the experiences you mean physical? Memory? Immediate? Reactionary? There are people who lack short-term memory, you could argue that they are lacking "experiences", but their brain certainly is functioning, as is the mind. As far as "Who we are", we are both the product and sum of our long-term experiences and our immediate state. I certainly agree (but not I think in the same sense as Micah) that we can change in an instant--certainly psychological trauma can drastically change a person, but even more fundamentally a brain injury can completely change who someone is, even without evident "brain damage" (by that I mean the usual TBI symptoms such as memory problems, etc). A formerly easy-going person can suddenly become irrationally short-tempered and explosive for example. Now let's say you are split into two identical people: Let's say there are two identical "yous". Both of you have identical jobs at different offices. Those offices will offer different environments, even if the work is the same--but even if we ignore those minor differences, every decision is a moment that can affect the future in countless ways--and affect future decisions, even if the "first" decision seems inconsequential-- How about: eat in or eat out? If it doesn't really matter, the choice seems less than momentous, but perhaps when you eat out--one or



even both of "you", one of "you" run into your boss as he is canoodling (love that word) with his (Shock!) mistress. Remember, the two of you work at different offices, so this situation only affects one of the "yous", but now everytime the "you" goes to work to the office with the cheating boss, your working relationship is affected by that knowledge--which will likely affect your future interactions with your boss, and many different aspects of numerous choices and decisions you make at work and without. One seemingly inconsequential choice could affect your future (and decision-making) quite profoundly. So yes, even if you are physically identical--down to the smallest atom, once you are split from your double, your experiences and your choices, your lives and even your brains diverge.

17 hours ago · Edited · Unlike · 2

Micah Blumberg Bt. You don't understand my hypothesis because it does not lead to the conclusions you have drawn. I'm basing this on recent research.

<http://www.amazon.com/The-Neural-Basis-Free.../dp/0262019108>

The Neural Basis of Free Will: Criterial Causation

[www.amazon.com](http://www.amazon.com)

The issues of mental causation, consciousness, and free will have vexed philosop...

See More

17 hours ago · Like · 1 · Remove Preview

Micah Blumberg It is based on logic that hasn't occurred to you yet. After neurons detect information as millisecond fast coincidence patterns their activity resets the firing criteria of other neurons. The idea is that after you receive information you dynamically reset your responses, so that you will fire your choices unconsciously, but adjust the next choices based on new information received. It's a different way of understanding the selection mechanisms. However there are dozens of other issues that need to be dealt with as pre-requisites before you will be able to accept this new idea.

15 hours ago · Edited · Like · 3

Micah Blumberg "Your choices are predetermined before you even make them." predetermined by you, how do you ride the false assumption that you are something separate from what your brain does? It's absurd dualism, you only need to think about it to refute it.

15 hours ago · Like

Giovanni Santostasi But to have true agency you need something more complicated than just one feedback loop. I think the uniqueness of our consciousness (and the idea of free will and motivation) comes from the great complexity and multi-level organization of the interconnected feedback loops in our brain. The thermostat can only "decide" to turn on or off, has no choice or many alternative states, we do have many more states so maybe this gives rise to the illusion of choice, or maybe choice is a real possibility because of the intricacy of many feedback loops working together that allow you to consider from multiple sides an action and update your decision and change your mind at the last second.

9 hours ago · Edited · Like · 2

Vijay K Rajagopal Well, not to be overly legalistic, but I'd say some definitions of terms are in order. If I had known my question was going to have inspired over 100 comments, I would have proposed some defined terms. But I am delighted with the course and the depth the discussion has taken on!

11 hours ago · Like · 2

Peter Rothman Don't forget "awareness" from the poorly defined words list.

And BTW....Does the world really have states or do we just imagine them? Hmm, all very complicated.

11 hours ago via mobile · Like

Peter Rothman What sort of experiment would prove the world has states, discrete discernible configurations, versus a universe that doesn't? Doesn't quantum mechanics tell us that particles don't act like is at all? Anyhow, my point is, this is deep rat hole. We've only scratched the surface and already we get into how the very fabric of reality is constructed. I conclude we have no idea what will motivate a post biological being anymore than we understand the life of a grasshopper. Mu. And good morning.

11 hours ago via mobile · Like · 1

Giovanni Santostasi Why is there air is a valid question. Definitions are important, one of the powers of physics comes from making very precise definitions of concepts and then using these concepts to describe patterns in nature. What I was trying to say is while I agree with the idea of a thermostat as a basic example of decision making (it is a simple control system) I think something very different happens when you have a lot of thermostats talking to each other. You give rise to behavior that could not have been predicted by analyzing just one separate unit. It is the idea of emergence in complex interacting systems. It is in many ways the same thing that happens with life, that even if made of relatively simple chemical reactions is not simple chemistry.

10 hours ago · Like · 1

Giovanni Santostasi In fact, reading what Micah is saying what I'm saying is very similar. It is the higher complexity of loops upon loops that creates enough flexibility and recursion that allows for free will and real decision making (and not simple automatic response to some environmental conditions).

10 hours ago · Edited · Like

Micah Blumberg look you are defining my position based on your collected knowledge, but I haven't even begun to make a full argument for free will because that was not what I came to argue. If you define freewill as a will that is free from the laws of physics, then no its not freewill. If you define freewill as something independent of another persons will that you are legally responsible for then yes you have freewill. Only you are responsible for your choices, your not free from the laws of physics, but you are accountable for what you do. Second, is the universe

deterministic or indeterminant? Einstein said [God does not play dice] in an apparent objection to what he was first learning about the reality at the quantum resolution, it is bizarre fasho. So at this point the cosmos could be either. Peter Tse argues that random electrical fluctuations invade the electrical activities of the brain at the quantum level adding an element of unpredictability so that your freewill is indeterminant, not pre-determined, but even if its deterministic you the organism are still responsible for making selections and thats what your brain is doing, when neurons and circuits use criteria to reset the firing criteria of other neurons and circuits. PLEASE do not define my position ever again, ONLY define your position, you don't know the first thing about my position, I have not the time to explain years of neuroscience research to you.

8 hours ago · Edited · Like

Micah Blumberg "Micah, what a tangled web you weave... it is your position of free will that assumes a consciousness that is disconnected from the physical brain and the logic circuits and memories that it has built up over decades. " what nonsense, I'm offended, ugh

9 hours ago · Like

Giovanni Santostasi Free will is very complex decision making with access to many possible states, it involves a fast reaction to internal and external stimuli that is continuously updated (maybe in a Bayesian fashion).

9 hours ago · Like

Micah Blumberg Information, non-physical information, that has no energy or mass, is detected by neurons as coincidences, patterns, this information becomes the criteria brains deliberate upon first before making a decision that results in some action. This means non-physical information drives your responses, so the brain is not simply physical reactions like a bunch of thermostats. It matters that you know. You are accountable for your actions, it matters what you know and believe, because your behavior is criteria driven. You are in a sense temporal information criteria.

9 hours ago · Edited · Like

Micah Blumberg Neurons fire tonically all the time, randomly, maintaining a baseline between excitation and inhibition, but they need specific information patterns to respond with phasic firing in the upper gamma frequencies, this information is collected as the coincidence of several neurons firing within milliseconds of each other, and it has to have a specific temporal signature that matches a specific neurons firing criteria to trigger a phasic burst. Simply stimulating neurons with electricity will not create phasic bursts. This means that top down information drives neural activity, so it is not just bottom up physical causation, its top down criteria causation.

8 hours ago · Edited · Like

Micah Blumberg Given the hypothesis that you are temporal non-physical information, coincidence patterns, ie live online criteria, driving selections in your brain, generated on the fly, making responses to everything you sense and have sensed in past experiences, you are for

the sake of argument NOT your piano lessons learned over the past decade. So if you made a copy of your brain and body, a new person that would be instantly hundreds if not actually billions of times more dramatically different from your expectation would be born, with the ability and memory of how to play the piano, but this new person would not be like you. Get any two random piano players and find out if these two people are the same, they are probably not, because you are not a skill, not a memory, not conditioned muscle memory, and you're not a talent.

8 hours ago · Edited · Like

Micah Blumberg "(..) and to extract low resolution images from brain monitoring." that's misinformation. If you are referring to Jack Gallant's lab, you misunderstood.

<http://newscenter.berkeley.edu/2011/09/22/brain-movies/>

Scientists use brain imaging to reveal the movies in our mind

[newscenter.berkeley.edu](http://newscenter.berkeley.edu)

Imagine tapping into the mind of a coma patient, or watching one's own dream on ...

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7 hours ago · Edited · Like · Remove Preview

Micah Blumberg memory has physical correlations, but the argument is that you are not a memory, instead a live online in the moment calculation based on location, circumstances, and criteria coming in through your senses

7 hours ago · Edited · Like

Micah Blumberg The argument of indeterminacy, because of quantum effects, is not my personal argument, it's from Peter Tse. It also has nothing to do with Stewart Hameroff's woo woo notion that consciousness is occurring in the quantum range inside microtubules.

5 hours ago · Edited · Like · 1

Micah Blumberg "Jim Lai Memory is state information. Life and cognition are processes, but they are no more non-physical than a pendulum swing.

I was referring to still images, not movies." information has no mass or energy so it's non-physical, I mean like patterns, how many times an event occurs is an information pattern, its non-physical criteria neural circuits recognize, deliberate upon, and respond to.

5 hours ago · Edited · Like

Micah Blumberg Information is non-physical because it has no measurable mass or energy. It exists as tempo-spatial coincidence patterns. The physical brain detects these patterns in real time, then these information patterns cause chain reactions resulting in coordinated movements.

5 hours ago · Like

Micah Blumberg If you see three apples you are having a spatial experience of the number 3. If you see an apple tossed into the air three times you are having a temporal experience of the

number 3. The number 3 as a tempo-spatial pattern does not exist in the physical sense, its information, it does not have a measurable mass, energy, and velocity like a physical object has.  
5 hours ago · Like

Micah Blumberg As I already explained above Neurons detect information (that is not physical meaning it has no mass and no energy) as tempo-spatial coincidences. This means that neuron D will only fire if neurons A, B, and C fire within 3 milliseconds of one another for example. If A, B, and C, do not fire within that window then neuron D will not fire. The fact that neurons detect tempo-spatial patterns is what allows brains to detect information, ie patterns that have no mass, and no energy.

4 hours ago · Edited · Like

Micah Blumberg look if you want to argue that information is physical and that the number three has mass, energy, and velocity go right ahead I am not stopping you. I'm not playing word games however. I became friends with a Nasa Scientist in the dog park where I took my dogs and he explained that everything in the universe is either information or energy, but these two things are not the same.

4 hours ago · Like

Micah Blumberg there is only one kind of information, and it has no mass, and no energy, so its not physical, this is not a word game

4 hours ago · Like

Micah Blumberg A table has mass, you can put your hands on it. That is why a table is physical. The concept of a table is a coincidence pattern in time, you can't put your hands on it. Why is it difficult for you to understand that this is not a word game, but instead its the ordinary convention and correct usage of the terms physical and non-physical. If nothing is non-physical then how can the word physical have any meaning at all? The way you have used it Matthew Reed Bailey is beyond distinction, and so it is a meaningless incorrect usage of the term physical. A word has voided meaning if it applies to everything.

4 hours ago · Edited · Like

Micah Blumberg You say the number three does not exist separate from the apple. Here is a link about how the properties of a photon can exist separate from the energy of a photon  
<http://phys.org/.../2013-11-physicists-quantum-cheshire...>

Physicists add 'quantum Cheshire Cats' to list of quantum paradoxes

phys.org

(Phys.org) —Given all the weird things that can occur in quantum mechanics—from ...

See More

4 hours ago · Like · Remove Preview

Micah Blumberg The physical properties of a photon (a temporal attribute, ie information like the concept of three) can exist separate from the energy of a photon (like the physical apple)

4 hours ago · Like

Matt Mahoney Storing and reading information are physical processes.

4 hours ago · Unlike · 1

Micah Blumberg No doubt.

4 hours ago · Like

Micah Blumberg Its not a word game to say that information is not physical and yet physical processed read and store information. Taking a temporal code and making it into a spatial pattern, and then taking a spatial pattern and converting it back into a temporal pattern. It is correct to say the spatial pattern is physical, and the temporal pattern is non-physical.

4 hours ago · Like

Matt Mahoney A temporal pattern of what? It has to be something physical.

4 hours ago · Like

Matt Mahoney That's not what it says. It says particles can move in a cyclic fashion without dissipating energy. We already knew this was possible with electrons in a superconductor.

3 hours ago · Unlike · 1

Micah Blumberg Really interesting article. It points out that the notion of space and time being one thing, spacetime, is from general relativity, and it isn't one thing in quantum physics.

3 hours ago · Like

Micah Blumberg "A temporal pattern of what? It has to be something physical." A physical thing is different from a temporal pattern. An apple is different from the movement associated with an apple. The apple is physical, the temporal pattern is not. The apple has mass, the temporal pattern has neither mass nor energy. I

Matt Mahoney Please describe how you can create a temporal pattern without using mass or energy.

3 hours ago · Like · 1

Micah Blumberg "Please describe how you can create a temporal pattern without using mass or energy." please explain how you can create mass or energy without a temporal pattern, no wait don't because both thought experiments are irrelevant to the definitions of what the terms physical and non-physical correctly apply to.

3 hours ago · Edited · Like

Micah Blumberg its like asking please me to explain how I can make a peanut butter and jelly sandwich without jelly, and all I'm arguing is that a different term correctly applies to jelly, who cares that you can't have a spacetime sandwich without time.

2 hours ago · Edited · Like · 1

Micah Blumberg in case you missed it, space and time go together like peanut butter and jelly, yes I said that  
3 hours ago · Like

Matt Mahoney An example of storing information in a temporal pattern is a delay line memory. Some early computers stored data as sound waves bouncing between piezoelectric crystals through a tube filled with mercury. [http://en.wikipedia.org/wiki/Delay\\_line\\_memory...](http://en.wikipedia.org/wiki/Delay_line_memory...)

a0332z

the brain reacts to information

"We have scientific data supporting the idea that environment shapes behaviour."

Reasons inform behavior. Not the environment.

Wind speed and air temperature over time make do not shape what color socks you choose to buy.

The brain is able to instead react directly to information patterns, with advanced neural circuits that compile vast memory databases of complex coincidence patterns mapping out associations between causes to allow the brain over time to predict shapes and other sensory based metaphors through which it builds an information based understanding of the world we inhabit so that information patterns that we call understanding are actually the patterns that drive human to move or make complex decisions like choosing to buy a Tesla vehicle.

The environment isn't doing very much to shape behavior, its mostly reasons, aka criteria causality.

Some of these ideas I learned about from Peter Tse  
<https://mitpress.mit.edu/books/neural-basis-free-will>

a0333z.md

From 2012 to 2014 with Neo Mind Cycle I considered myself to be in the business of brain optimization.

This note includes snippets of a conversation I had with someone in 2014 that I decided to save.

////////////////////////////////////

Micah Blumberg

I would be interested in a mechanical incarnation of the self realized deity Vishnu as my foot and a half tall friend who could come with me wherever I go and work with me. However I'm also interested in understanding the brain to create brain extensions.

I have a hypothesis that what I do with Neo Mind Cycle is creating another feedback loop that is expanding self awareness into a super brain, or extended brain. Naturally I want to know if my hypothesis is plausible, and also I want to know if there are other ways of extending the brain. Imagine a cyborg like attachment (with AI) that essentially gave you a brain that was 80 times bigger than your brain is now, except in virtual space? So that your life could be 80 times more precise.

I like how in AN model, intuition is the emergent result from points plotted in a vector tree map that you can describe in category theory. I think she describes it in C and or Java, but I think it lacks the fluidity that could happen in a functional language like Haskell. Where node memories can create vector memories and The model free nature means that the concept is the memory of the tree's reaction in a sense. With Haskell and an 80 core processor one could have each node in the tree creating emergent vector maps with the other activated nodes independent of a centralized process.

I like how in AN Model, the "concept" isn't pre-thought and pre-programmed, it's learned or built by the vector tree's memory system in response to the stream of data.

////////////////////////////////////

Micah Blumberg

Consider that the development of AGI may mean a future where everything is way less expensive than it is now. There might not be any real work for humans on earth at some point, however there may be infinite kinds of jobs that can be done in virtual worlds. Leisurely jobs, jobs that involve getting paid to have fun. Getting rewards to create games, art, music, experiences, or pretty much anything you could want to do, and each of us would be able to work with trillions of AGI assistants who could volunteer to join us in helping our projects. I want to share because there are many levels of feedback that are possible that may lead to this scenario. Perhaps if I have been sitting on a notion for a while, I share it, maybe I get no immediate reply, but if the notion goes somewhere, in someone's brain, stirring a direction in their research, making a dozen connections, and then a week later, something catches their eye, like a news article, it's the cosmos of collective intelligence has returned this. I sent out a ping, and then I get this, and this fits into my work with vastly more depth. I want to share because I want to create an industry, I want to support all the minds who are interested in developing and being apart of AGI research and development. I want to chart a fleet of companies with awesome AGI based products. I hope each of you succeeds in developing a working model of thinking in a machine!

Paweł Pachniewski

"I think releasing AGI upon the world is in itself a moral dilemma. Don't only look at the bright side. In the coming decades we'll deal with more turbulence than ever, due to life transforming technologies. They can bring great good, but also do a lot of damages. Even if we only consider evil people who will want to take advantage of them. And since there is no equipotential in the world when it comes to economy, there will be disjoints and discrepancies.



As for sharing on FB, too many rigid minds and too much intellectual dishonesty. But forget about that for a moment. If you truly would invent AGI on your own, I'd bet a trillion dollars you will be dead the next day." via Paweł Pachniewski, 2014

Micah Blumberg

"If you truly would invent AGI on your own, I'd bet a trillion dollars you will be dead the next day." All the more reason to give it away. Killing it's creator would yield nothing of value if they freely gave it away.  
Made it public knowledge

Paweł Pachniewski

Like I said, it's a moral dilemma, not so much because one could be murdered, but because giving it away is likely to wreak all sorts of havoc onto the world. I wouldn't be anywhere near so casual about deciding to make it public knowledge.

Micah Blumberg

However, consider that there are owners of trade secrets everywhere, Nixon famously tried to get the special files that J. Edgar Hoover had on world leaders, and celebrities and such. Hoover had those files destroyed on his death. Similarly many people would like to get at all of Apple's core secrets, and it really seems like the courts are becoming hackers tools to pry into the secrets of other companies via lawsuit.

Micah Blumberg

"it's a moral dilemma because giving it away is likely to wreak all sorts of havoc onto the world." Advances in technology have a history of both disasters and massive improvements in the quality of life.

"I wouldn't be anywhere near so casual about deciding to make it public knowledge."

I consider the world 5000 years from now, would I want to see dynasties ruling through technological secrets with absolute tyrannical power to enslave and control the lives of anyone they wanted?

The US had nuclear weapons, and then they were stolen and given to the Chinese and the Russians via spies who did not want to see the world fall under a US driven tyranny via nuclear weapons.

Paweł Pachniewski

Such secrets pale in comparison to AGI. And I am not saying it should stay a secret forever, but consider also that if you give parts away, a big strong company could connect the dots and do something you perhaps cannot due to not only lack of means but because you lacked a few insights that their teams jumped onto. But that's a sidetrack.

Releasing AGI into this world is one of the most important decisions in human history. While it would be an illusion to think one can maintain control over it and its dispersion, one should feel at the very least morally obliged to very thoroughly analyze its release and do whatever one can control, to make it go smoothly.

While I see many incredible things that will be the fruit of technological advancements this century, I also foresee lots of turbulence and trouble. Existential risks? Absolutely. If we don't wipe ourselves out, big parts of humanity or virtually all of humanity may end up in dire trouble.

Paweł Pachniewski

Primarily I am saying the release of AGI deserves the utmost care and attention, very thorough consideration.

Some, like Ben Goertzel, seem to be convinced it should be open source. I don't think that's very smart, for the aforementioned reasons.

I don't believe he has it right and isn't very close to creating AGI, though.

Okay, well, good. I recently spoke briefly to Dustin Juliano about this, and he initially thought it should be open source, but I think he is considering it more thoroughly now as well.

Anyway, I am worried about the ubiquity of information and tech and the sort of self-sufficiency they will be provide. To even the richest criminals, to name a thing.

Micah Blumberg

Imagine a virtual country of knowledge workers

Paweł Pachniewski

In that sense, the lifeboat foundation, <http://lifeboat.com/ex/main> is not out of place..

Lifeboat Foundation: Safeguarding Humanity

[lifeboat.com](http://lifeboat.com)

The Lifeboat Foundation is a nonprofit nongovernmental organization dedicated to ensuring that humanity adopts the increasingly powerful technologies of genetics, nanotechnology, and robotics/AI safely as we move towards the Singularity.

Micah Blumberg

I was thinking of swarm AGI, or an external artificial general intelligence

like an ant hive where contact with other ants creates a tcp like ping, and the ant hive acts much like tcp, sending out packets, and if packets aka ants don't come back it doesn't send out more, or a slime mold that uses the environment as a component in it's memory system

Paweł Pachniewski

Yep. Swarm intelligences can be very dangerous though. I am afraid we will create entities we will not understand well.

And it's "not hard" to achieve that. Engineer something you don't understand. It would just be done on very different engineering principles than are now common.

Micah Blumberg

imagine a nano swarm, that can just fly into a person and take over the person's mind?

Paweł Pachniewski

I think we'll need agents to be protected by their own nano swarms. I have a draft article on that. Our senses will be useless dealing with such threats.

Micah Blumberg  
unmodified senses

Paweł Pachniewski

Yep.

Not everyone may want to modify their senses and there might be some other specific issues with modifying them that we generally don't think of today, because it's so far away.

Micah Blumberg

we can expand the human range of senses with existing technology, in fact it's a goal of mine, you say that Luke Skywalker helmet the military is advertising?

[http://www.forbes.com/fdc/welcome\\_mjx.shtml](http://www.forbes.com/fdc/welcome_mjx.shtml)

Micah Blumberg

the eeg spikes are associated with eye movement, and AI vision, pin pointing spikes between all three, with an extra operator behind a desk. So you have three points being tracked by a fourth operator. Resulting in a superior tracking system, that isn't a permanent alternation to sensory perception, it's just something worn like a helmet. Augmentations to hearing and sight and balance come in the form of ear implants, chest strips, tongue strips, these things can be worn externally, and a Texas company (associated with David Eagleman) is working on sonar sense via a chest strip. In addition to that a chest strip that has wall street information on it, so the brain can be applied to raw wall street data.

Micah Blumberg

Can you imagine being able to feel or sense wall street data in a spatial way as easily as your able to track the events in a sports game that you are at?

Paweł Pachniewski

Yep, such augmentations can be great. But we'll have to watch out not to become too dependent. I can, actually, if I have any talent then it is my imagination and creativity, coupled with all sorts of common, not so common and very odd and uncommon mixing sensory modalities ala synesthesia.

In fact, it's a big part of my thinking.

Micah Blumberg

I have an artificial synesthesia I gained using the technology in my business

I was wondering about your sense of humor there

Now I sense my brainwave patterns

Paweł Pachniewski

That sounds interesting - the artificial synesthesia.

Now that you're saying this, it makes more sense to me why your posts made such quite good sense to me too.

Micah Blumberg

yes and the subconscious is very much a comedian too

Micah Blumberg

what I mean is if you break up your entire sentence return into parts done by different parts of the brain, one tiny part of all those parts is probably doing a subconscious task, and deciding to substitute a humorous remark instead of original meaning a subconscious reflection of happiness I think

Micah Blumberg

Neo Mind Cycle

A not for profit group dedicated to Brain Health, Nutrition, Fitness with Neurotechnology, Neuroplasticity, Neurophysics, Nutrition, Neurofeedback, Brainwave Entrainment, Mind Machines, Physical Exercises, Dialog, Discussion.

Micah Blumberg

My background that led to Neo Mind Cycle?

I was 19 when the Matrix film came out, there was something about that film that pulled my life in a different direction than I expected. I had planned to be a fiction writer, writing fantasy books at first, then science fiction

In 2004 On Intelligence came out and I read it, then this book changed the direction of my life. Godel Escher Bach was confusing at first, then I am a Strange loop blew my mind, and so did Thresholds of the Mind by Bill Harris

the three books combined described to me consciousness in a way I had never thought of before

I mean Hawkins book, Hofstadter's book, and Harris's book.

Micah Blumberg

Do you think free will and choice are two different things or the same thing?

Micah Blumberg

well I think those words refer to different domains

Micah Blumberg

i think freewill only has meaning in a social context, and choice only has meaning in terms of describing the brain's ability to coordinate itself

and I think that on a higher level choice and determinism are a unified concept, not two, non-dual

Micah Blumberg

as if you are the one buddha, there is only one choice, seeing more than one choice is illusion

Micah Blumberg

what I mean is that free will means kim coordinates kim, and jake coordinates jake, kim's mind doesn't coordinate jake's mind, so jake's will is somewhat free from kim's will. so jake has freewill

being the one being is just a perspective, its not the only valid perspective  
from another perspective you have many choices

but as long as the perspective exists where all choices are one choice, then you choice from that place is apparently an illusion

Micah Blumberg

Are you familiar with Ilya Prigogine

he felt out of acceptance with general scientists for proposing an alternative to determinism one in which life is a dissipative system, and because of thermodynamics order increases to export increasing entropy elsewhere

Micah Blumberg

it's like saying the point of life is isomorphic to the point of a hurricane

and we are

isomorphic to hurricanes in the functional sense

so the factor of choice is indeterminism, infinite possible things can happen, and the living system, as a self organizing entity has a bell curve of possible options, it's almost like describing choice as a dice roll

the bell curve is fat in the middle with things you are more likely to choose, and thin on the ends with things you are less likely to choose

Micah Blumberg

Bill Harris includes him in part of his book Thresholds of the Mind  
which you can get from amazon.

Micah Blumberg

Thresholds of the Mind is why I got into Brain Optimization, and Neurotechnology  
brainwave entrainment and neurofeedback

Micah Blumberg

and nootropics aka smart drugs too, have you seen the film limitless?

what are the other right parts?

Micah Blumberg

okay well my new hypothesis is that intelligence is like the number of connections in your brain, highly intelligent people have tons more connections in the grey matter, and those connections translate to people like Jeff Bezos, Tim Cook, the heads of companies like google who are already using both kinds of AI, as we heard about in the new regarding Google Cat did you hear about that one?

Micah Blumberg

A google AI that created it's own concept of a cat from youtube videos without being instructed to do so

Micah Blumberg

10/11, 6:12pm

Micah Blumberg

<http://www.wired.com/wiredscience/2012/06/google-x-neural-network/>

Google's Artificial Brain Learns to Find Cat Videos | Wired Science | Wired.com

[www.wired.com](http://www.wired.com)

When computer scientists at Google's mysterious X lab built a neural network of 16,000 computer processors with one billion connections and let it browse YouTube, it did what many web users might do -- it began to look for cats.

Micah Blumberg

"We never told it during the training, 'This is a cat,'" Jeff Dean, the Google fellow who led the study, told the New York Times. "It basically invented the concept of a cat."

Micah Blumberg

Yes well if a person has too many connections, or violent experiences, or malformed early development that can result in epilepsy, post traumatic stress disorder, severe or slight autism, ringing in the ears, tons of serious brain conditions. Not excluding the useful stuff like synesthesia and there exists every kind of synesthesia I have been told, confirmed, every possible combination of senses

Micah Blumberg

Groups of brains are not brains, not yet, and so both neurofeedback, and brainwave entrainment drive connections in the mind, and what I do drives connections to brainwaves, which drive the eeg feedback (sounds) and the brainwave entrainment (light and sound) It drives more connections, creating more intelligence, but these are not uniform connections, unlike typical brainwave entrainment which creates uniform connections, these connections are as random as your own brainwaves, because they are your own brainwaves. So instead of creating autism, or epilepsy it does the opposite. It increases intelligence while removing cleaning up illnesses.

Paweł Pachniewski

Some believe AGI should just be open source. I am not against that, but making it so before an awful lot of pondering and consideration doesn't seem smart to me, not at all.

But there will be a lot of disruptive technologies this century that will bring about lots of societal turbulence, not mention economical and political.

Micah Blumberg

Identity is an illusion, but thanks. Consciousness, I can visualize and describe how it happens, I have an idea I have never heard anyone else ever communicate, but thanks to your advice I can't tell anyone, but now I have what feels like a biological imperative to build it.

Micah Blumberg

I was saying earlier, I have a plan to build sentient machines, I will need help from people who have expertise in very different areas, from electrical engineering, acoustics, 3d printing, neuromorphic chip architecture, but I will have to slice up the job into a lot of different pieces, similar to how Jobs had lots of people working on different pieces of the iPhone but only a few knew what they were actually building

Micah Blumberg

I had said that I prefer to think of self as a direction. So instead of saying "mind design" I think "cognitive direction" and the machines I am making will have to sort of choose their own development direction almost exactly the same as how humans do it.

My fundamental design principles are different from anything I have seen anyone in any AI or AGI group talk about.

Micah Blumberg

In my notes, we originally united (sort of) because of a few books we had read in common, such as "On Intelligence" by Sandra Blakeslee and Jeff Hawkins

When I started Neo Mind Cycle I was thinking about Neurofeedback as a cycle from brainwaves, into the computer, into light and sounds, into our eyes and ears, and back into brainwaves. It was a really simple idea.

On Intelligence was so influential it has changed my life since I read it.

Thresholds of the Mind was a book that, at the time, I held in similar esteem.

At some point I decided to actually learn neuroscience, all the nitty gritty details of neurons, axons, ion channels etc...

I didn't keep up in my Neuroscience Computation Class the first year it was on Coursera so I decided to get a crash course in Neuroscience by reading something really advanced.

A book called "The Neural Basis of Free Will: Criterial Causation"

I have never read a book so thick with concepts page after page, and links to dozens of research articles on every few pages.

Right at this moment in my life there is no book I hold in higher esteem.

I began to realize that there are cycles (feedback cycles) in the neo mind at every level from backwards propagating axon potentials to dendritic arbors, to neural circuits, to cortical thalamic loops, to regional brain activity patterns we can see with EEG

I could practically change my business name to Neo Mind Cycles (plural) and write a book to explain all this in loving detail.

In my humble opinion Peter Tse is a terrible author when compared to Douglass Hofstadter (another author whom my notes reveal that we both have read and admire) so someone should take the power of analogy and write a better book to explain the insights of cutting edge neuroscience, and I am working on that.

In considering the prep work for this project I thought back to "Thresholds of the Mind" and what it means, how it may fit into this picture, it's developmental levels of chaos and expanding awareness combined with the Neo Mind Cycles of our actual neurological mechanisms. Could his (Bill Harris: Thresholds of the Mind) work have relevance and meaning today? I'm not sure, but I think I will have to dust off an old copy and have another look at it.

Micah Blumberg

I am having a lot of new ideas, perhaps you will visit again my group "Neo Mind Cycle Research" because you have a regard for sentience that I can appreciate I am willing to share some of what I know with you, that I would not share with others.

Micah Blumberg

do you know about ethos, pathos, logos, the three notions about stages of rhetoric purportedly from the ancient greeks?

Micah Blumberg

imagine that you could shrink the size of the "power of society" in your mind and feel a lot more personal power from doing that

a0334z

Feb 13, 2014

(synap)

hameroff & peter tse

Hameroff is a woo woo sounding guy fasho, but I don't think that's "how" he arrived at his conclusion that the conscious experience involves quantum mechanics.

I think he was searching for some longer term memory than could be provided by the mechanism of strengthened synapses, something that could also both learn and react within three milliseconds and his answer was that inside the synapse the CaMKII interaction with micro-tubule was just the ideal mechanism to both store long term memories, and somehow alter the spiking in terms of either amplitude or frequency.

IF quantum mechanics is a random or non-random element that interferes or alters the spike trains that \*may begin at the microtubule (\*if Hameroff is right about the origins of spiking)

THEN human thinking would have an element of the quantum interfering with our normal programming.

Note: I am not in support of woo woo conclusions. I just think that the driving motivation for that direction in his research had to do with finding a mechanism of long term memory potential that was also fast enough for what we know the brain is mechanically capable of. The woo woo stuff was probably after market flourish, and incidental to his actual work.



There was something that bothered me about Hameroff's woo woo, and that bother's me about Peter Tse's work as well. It's the idea that by introducing the quantum, by introducing randomness, you are introducing unpredictability, this idea they seem to claim is leverage against determinism, they think it means freewill. That is an annoying sort of claim.

a0335z

Feb 5, 2014

(criteria causation)

neo mind cycle books

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a0336z

(hippocampus, thalamus, emotion, cerebellum, cortex, qualia, ATP)

Emotions & Qualia & ATP rewards

my idea is that like particles and like brainwaves, emotions inside the brain are something neurons as a group detect as large scale phase patterns in certain frequency ranges

the patterns in your brain are distinct to you because of their sequence order in time, their phase rate, and their spatial configuration over time. So every pattern from emotion, feeling, thought, touch, sound, vision, taste, smell is a pattern that is encoded in phase differentials inside spatial patterns over time with mechanical wave force, and the electromagnetic force is helping to bind memories, stimulate ATP release to reinforce memories, connect neurons that fired close together (spatially or temporally), grow new connections via dendritic spines, and dissolve connections

I think about the hippocampus acronym for memory encoding & retrieval

Separate Phases at Encoding And Retrieval (SPEAR)

so the emotion of fear might be a large scale frequency pattern in the hippocampus-entorhinal-thalamic loop that is fast or slow, large or small with temporal-spatial characteristics

the VR headset in your brain, the places cells in the hippocampus might represent the orientation & position of your head in any space, the space might be represented by grid cells in the entorhinal cortex, and so I am imagining that the front seat of consciousness is accomplished somewhere in the trinity of the hippocampus, the thalamus, and the entorhinal cortex, with the neo cortex serving as utility to extend the resolution of your mental experience, so you have higher definition sound, visuals, language, the ball sack (under the occipital lobes), the cerebellum, with its excitatory neurons associated with balance, speech control, motor control, and ataxia, is perhaps good for maintaining high definition rhythm, and what I am suggesting is that these larger brain areas are giving us a higher resolution, or higher bit rate of cognitive function, or a higher def reality than animals with smaller brains, so we experience everything with much greater clarity, and we are less confused by noise and more likely to deduce essential and critical distinctions in extremely complex patterns.

It's interesting that a tiny insect can manage high speed flight, I've seen pigeons plot amazing flight trajectories that involve predicting the direction and velocity of the vehicles around it, such as the speed and direction of myself on a bicycle, other birds, and other vehicles. Bird flight in a big city is beyond self driving car technology, the bird needs a prediction-model of everything in its environment, the orientation, velocity, and mass of every object around it, and a prediction model of itself, its own orientation, velocity, and mass, so that it can correctly predict a successful flight path.

a0337z

(synap, oscillat, array, graph, decoherence, tomography, qualia) Oscillating awareness  
Neural Array Projection Tomography Properties (3D Patterns?)

Could it be that patterns gain dimensionality when activated & transmitted? As if a flat pattern unfolds to become a 3D pattern when synaptic activity are magnified onto an oscillating array? The neuron is like a projector because it passes its phase pattern to an entire sensory array of neurons who are combining it pattern with the patterns remembered and projected by other neurons.

Multi-layer phase field pattern representation (in brain wave oscillations), tomography with dendrites, and phase changes with exit terminal branches. Imagine the 4dimensional phase space as like a watercolor painting with layers of paint, or similarly an oil painting also with layers of paint, but imagine that this is a 3D painting that encode position, orientation & velocity of memories (represented by phase transitions), renders live action in pieces with different parts of the brain constructing different parts of your reality at different moments, from the layers sprouting from exit-terminal activities to create decoherence patterns in an oscillating group of neurons, the decoherence pattern of inhibitions & excitations is containing in its phase changes the representations of what we see, hear, taste, feel etc, ie our qualia are patterns in the phase changes of the brains electromagnetic phase field, and the dendrites inside arrays or grids of neural networks read these phase changes which are our predictions driving our muscle movements, our words, and our actions, and ourselves to help us navigate life, and respond to novel incidences. Humans are response able system, and in a sense the liability of a human being is similar to the liability that a self-driving vehicle with a self-aware network will be required to have.

a0338z

Nov 23, 2014

I wrote this (for Neo Mind Cycle originally)

An information pattern is non-physical because its a configuration of something physical, the configuration itself has no essential mass, energy, or velocity, the information pattern is like a function in a computer program, and the substrate that contains it is like the argument in a computer program. The physical argument is variable, the information pattern is invariable. Cells can detect patterns by firing at a high Gamma frequency ONLY when a specific pattern is recognized via a multiple possible path of near simultaneous presynaptic neuron firings within about 3 milliseconds of one another resulting in the recognition of a pattern via a phasic soliton

wave that will cycle through a neural circuit being recognized by other parts of the brain doing pattern recognition.

Tags:

brain, cells, circuit, firing, neuron, presynaptic, soliton, virtual

a0339z

Note from Sep 7, 2012

(observer, perception, cortex)

Atman is the profound wholeness, the identity of the entire cosmos and all spacetime considered as one being. That is not to say you do not also have a self defined in another context, the self aware feedback loop of you.

Truth is the only thing that has nothing to do with the adjustment of perception, truth is true regardless of subjective opinion, personal understanding, cultural framework, context, and reference point. Truth transcends the particulars of anything that does change. If one is to consider truth to be an illusion, it must be considered as the most consistent of all illusions. If the staff of truth became a snake it would eat all the snakes that became from staff's of other illusions.

it's a loop Wendy, the observer is the thought pattern making a thought pattern of the thought pattern, because that's what the neo cortex does when combined with incoming senses and outgoing actions, it creates loop of thought patterns about thought patterns, that circle around and around and around and around again until we die, we are the dissipative system (like tornado) that facilitates this cycle of self aka self awareness

We have a prediction of awareness, and it seems aware because this prediction is incorporating it's own development into an even higher level of awareness about itself. It evolves in our thinking as we become more aware of it, and the more aware it we become, the more aware of us it becomes, because we are like looking into the mirror of our own mind. Those with the most practice doing sitting will naturally have a cleaner mirror. It is a zen master who is often like a mirror for his student's neurosis. the observer is a complex machine, and yet it's a very straight forward mechanical process, we can put it into a machine, and people are already working on doing that, reference numenta.com

"Di Ana What a great confusion is going on in your minds." This is your disowned mind Di Ana, you are the one, the universe, all these people are inside your head right now. At least a virtual reality simulation of these people are in your head. So to be perfectly honest the confusion that you see is only in your head. No one else exists.

a0340z

Jul 15, 2012

I would like to have my own fmri machine, and other technology too!  
there are things I could discover with my own team  
just people who specialize in areas, for instance there is a guy who is encoding and decoding  
images and words from regions of the mind with fmri  
and the people at Numenta have a really special technology  
that I would like to use to predict EEG data, and if I had fmri I would use it to predict that too  
right now EEG technology is being used interactively  
to control video games and machines  
but I think that if we used something like either the google brain, or what numenta has to  
recognize EEG  
that our ability to mentally control characters in games and robots is going to be thousands of  
times better, meaning faster, more precise  
soon the computer will be a window into the mind, and in between minds, we will see what  
others think  
so imagine that we build the perfect brain to computer interface, and then we link two people,  
perhaps a husband and wife, so they learn each others mind in a new way  
imagine at some point, entangling the minds of a cat and a bird, so they begin to act as one  
system, then a human and a cat and a bird, one system of thinking, the cat's mind becomes a  
very cooperative component, learning from you as if you spoke the same language, and the  
bird, well the bird could be a spy for you

////////////////////////////////////

# "New Imaging Method Could Lead to Diagnosis of Early Stage Parkinson's Disease"  
"qMRI achieves its sensitivity by taking several MRI images using different excitation  
energies—rather like taking the same photograph in different colors of lighting. "  
<https://neurosciencenews.com/qmri-parkinsons-21052/>

a0341z

Sep 20, 2012

(optogenetics, hippocampus, field, synap, cortex) microelectrode implants

Reply to Dean Part 3

<http://web.mit.edu/newsoffice/2012/conjuring-memories-artificially-0322.html>"

Dean:

"This article is referring to clusters of neurons, not individual neurons. FTA - " In a new MIT  
study, researchers used optogenetics to show that memories really do reside in very specific  
brain cells, and that simply activating a tiny fraction of brain cells can recall an entire memory".  
In this case, "a tiny fraction of brain cells" may mean hundreds or thousands of neurons.

Micah Blumberg

This article isn't enough information for you then. Read about all the implantation of  
microelectrodes into the brain in studies done on apes, monkey's, rat's, mice, bats, and humans.  
Stimulating single neurons actually does produce memories, this is a fact, you just haven't read  
enough yet to know it for a fact.

Dean:

The "philosophers zombie" I believe you are referring to is part of an argument (Chalmers) made for dualism (in which mental processes are separate from physical processes) in regards to consciousness or subjective experience and really has nothing to do with what we are discussing.

Micah Blumberg

That's what you say now :) It's the idea that you can do inference, SDR, prediction, pattern recognition, heirarchal temporal conceptualization (association of temporal and spatial patterns) in a digital "Grok" model and still miss out on an entire dimension of sensativity, storage space, communication bandwidth afforded by unique neurons that transmit a "potential difference" of their whole shape to other neurons in the brain, as information packets. I mean what if the internet, instead of being a connection between computers was instead a connection between light bulbs. That's how much your missing out in the current stream of "digital Groks" or ANN models.

Dean:

""Contrary to your suggestion I am not making the argument that collective temporal & spacial patterns in the "electrical spiking" aka firing of neurons are not also making representations in the network. Far from it."

"Good, on this we can agree.""

Micah Blumberg

I do not agree with the notion that the electrical spiking at the network level is the "whole and complete province" of "temporal&spacial" patterns in the brain, to the exclusion of all other kinds of "temporal&spacial" memories that may operate in other ways, including my proposal that Neurons are Programs transmitting copies of their shape to the rest of the brain.

Dean:

There is no " neuron with the most synapses at the top of the hierarchy".

Micah Blumberg

I know. That was a joke to explain that you don't have a whole integrate metaphor united the entire brain if the only information that a neuron has comes from what it is directly connected to.

Dean:

There are regions of the brain where evidence of a hierarchical structure has been found (such as the visual cortex), but this has not been shown in all regions and even so, there is no single neuron at the top of any hierarchy, but rather, hierarchies of clusters of containing thousands or millions of neurons.

Micah Blumberg

I recommend that you actually read "On Intelligence by Jeff Hawkins" seriously, your behind the times. Jeff proposes that the top of the neocortex the Hippocampus. Yes the entire Neo cortex is structured into a heirarchy, not just the vision area. Here is a link to the passage in "On Intelligence"

[http://books.google.com/books?id=Qg2dmntfxmQC&pg=PA170&lpg=PA170&dq=hippocampus+is+the+peak+is+the+top+of+the+neocortex&source=bl&ots=6iBvJaPliU&sig=W8xZ\\_0A7tqzZ\\_Y-q34hAVvzcF4o&hl=en&sa=X&ei=flxbUOajGuzsiwLki4DQCQ&ved=0CEMQ6AEwAg#v=onepage&q=hippocampus%20is%20the%20peak%20is%20the%20top%20of%20the%20neocortex&f=false](http://books.google.com/books?id=Qg2dmntfxmQC&pg=PA170&lpg=PA170&dq=hippocampus+is+the+peak+is+the+top+of+the+neocortex&source=bl&ots=6iBvJaPliU&sig=W8xZ_0A7tqzZ_Y-q34hAVvzcF4o&hl=en&sa=X&ei=flxbUOajGuzsiwLki4DQCQ&ved=0CEMQ6AEwAg#v=onepage&q=hippocampus%20is%20the%20peak%20is%20the%20top%20of%20the%20neocortex&f=false)

Dean:

NED does not suggest that electrons have shape (that would be silly since electrons are point particles - no shape, only a field of influence). What it proposes is that the "charges" that pass through the neural structures have shape (temporal variances in amplitude and spatial dimension) and direction of flow - quite a different thing, and that it is this "spike directivity" that carries meaning, not temporal patterns which he considers epiphenominal.

Micah Blumberg

Thanks for the clarification on NED, I'm not making any argument for the shape of the electrical message except that it represents the potential difference, a sparse distributed representation of the physical changes at both dendritic and synaptic levels, but not only that, also including the whole protein structure of the neuron. Including the variations of change inside the synapse itself, including the microtubule and every part of the neuron.

a0342z

(field)

"A neural network can learn to organize the world it sees into concepts—just like we do"

Generative adversarial networks are not just good for causing mischief. They can also show us how AI algorithms "think."

by Karen Hao January 10, 2019

GANs, or generative adversarial networks, are the social-media starlet of AI algorithms. They are responsible for creating the first AI painting ever sold at an art auction and for superimposing celebrity faces on the bodies of porn stars. They work by pitting two neural networks against each other to create realistic outputs based on what they are fed. Feed one lots of dog photos, and it can create completely new dogs; feed it lots of faces, and it can create new faces.

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As good as they are at causing mischief, researchers from the MIT-IBM Watson AI Lab realized GANs are also a powerful tool: because they paint what they're "thinking," they could give humans insight into how neural networks learn and reason. This has been something the broader research community has sought for a long time—and it's become more important with our increasing reliance on algorithms.

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"There's a chance for us to learn what a network knows from trying to re-create the visual world," says David Bau, an MIT PhD student who worked on the project.

So the researchers began probing a GAN's learning mechanics by feeding it various photos of scenery—trees, grass, buildings, and sky. They wanted to see whether it would learn to organize the pixels into sensible groups without being explicitly told how.

Stunningly, over time, it did. By turning "on" and "off" various "neurons" and asking the GAN to paint what it thought, the researchers found distinct neuron clusters that had learned to represent a tree, for example. Other clusters represented grass, while still others represented walls or doors. In other words, it had managed to group tree pixels with tree pixels and door pixels with door pixels regardless of how these objects changed color from photo to photo in the training set.

The GAN knows not to paint any doors in the sky.

MIT COMPUTER SCIENCE & ARTIFICIAL INTELLIGENCE LABORATORY

"These GANs are learning concepts very closely reminiscent of concepts that humans have given words to," says Bau.

Not only that, but the GAN seemed to know what kind of door to paint depending on the type of wall pictured in an image. It would paint a Georgian-style door on a brick building with Georgian architecture, or a stone door on a Gothic building. It also refused to paint any doors on a piece of sky. Without being told, the GAN had somehow grasped certain unspoken truths about the world.

This was a big revelation for the research team. "There are certain aspects of common sense that are emerging," says Bau. "It's been unclear before now whether there was any way of learning this kind of thing [through deep learning]." That it is possible suggests that deep learning can get us closer to how our brains work than we previously thought—though that's still nowhere near any form of human-level intelligence.

Other research groups have begun to find similar learning behaviors in networks handling other types of data, according to Bau.



Being able to identify which clusters correspond to which concepts makes it possible to control the neural network's output. Bau's group can turn on just the tree neurons, for example, to make the GAN paint trees, or turn on just the door neurons to make it paint doors. Language networks, similarly, can be manipulated to change their output—say, to translating from one language to another. “We’re starting to enable the ability for a person to do interventions to cause different outputs,” Bau says.

Embedded video

Hendrik Strobelt

@henddkn

Tataa ! I'm happy to announce the release of #GANpaint today - based on the new #GANdissect method, which helps to identify what units in a #GAN have learned. It's a joy to be part of the team of David Bau, @junyanz89, Antonio Torralba,... #MITIBM #AI See <http://bit.ly/ganpaint>

3,596

6:54 AM - Nov 27, 2018

1,380 people are talking about this

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The team has now released an app called GANpaint that turns this newfound ability into an artistic tool. It allows you to turn on specific neuron clusters to paint scenes of buildings in grassy fields with lots of doors. Beyond its silliness as a playful outlet, it also speaks to the greater potential of this research.

“The problem with AI is that in asking it to do a task for you, you’re giving it an enormous amount of trust,” says Bau. “You give it your input, it does its ‘genius’ thinking, and it gives you some output. Even if you had a human expert who is super smart, that’s not how you’d want to work with them either.”

With GANpaint, you begin to peel back the lid on the black box and establish some kind of relationship. “You can figure out what happens if you do this, or what happens if you do that,” says Hendrik Strobelt, the creator of the app. “As soon as you can play with this stuff, you gain more trust in its capabilities and also its boundaries.”

a0344z

Further Insight into the Brain's Rich-Club Architecture

<http://www.jneurosci.org/content/36/21/5675>

<http://www.jneurosci.org/content/jneuro/36/21/5675.full.pdf>

Rich-Club Organization of the Human Connectome

[http://www.jneurosci.org/content/31/44/15775?ijkey=d3ca225fdeed57da70fea1af8743e8a17c1119ec&keytype2=tf\\_ipsecsha](http://www.jneurosci.org/content/31/44/15775?ijkey=d3ca225fdeed57da70fea1af8743e8a17c1119ec&keytype2=tf_ipsecsha)

a0345z

(observer)

Jordan Tribby

November 9, 2013 · Edited ·

I was watching a white herring gracefully diving into a lake to catch fish and marveling at how a slower than molasses evolutionary process squeezed out such a sophisticated product, how the laws of physics even allow for there to be a tiny and energy-efficient computer capable of this amazing feat. The idea of neuromorphic computing makes me visualize people flying around on pterodactyl-like vehicles, taking leisurely rides on the backs of highly realistic robotic elephants who talk to us and tell us stories, being served by butlers that look like giant penguins and a whole stream of other whimsical applications I can imagine flowing from powerful, small, energy-efficient computers; this time, not evolved computers like the herring's brain, but a product of brilliant and painstaking science and engineering - humanity's best-to-date partial plagiarism of nature (and perhaps the crowning achievement of our species before our final invention and that fateful day when humankind's stolen promethean fire is snatched away by superhuman AI's, hopefully for the betterment of all sentient beings). At any rate, as far as the near future goes, I'm sure I am not alone in preferring a pterodactyl to a self-driving car for those short local trips that don't require pneumatic-tube transport.

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Micah Blumberg but why shouldn't AI be developed by an artificial natural selection? imagine a virtual digital ecosystem that simulates millions of years of evolution within an afternoon?

November 9, 2013 at 4:20pm · Like · 1

Jordan Tribby "Artificial natural selection" I like that idea a lot and often wonder how long it would take for intelligent life to evolve in that kind of simulation, how much computing power would be required, and whether simulating a range of different environments such as those we'd expect to encounter on exoplanets might one day tell us something about the variety of alien life in the universe. If quantum computers manage to achieve a speedup over classical computers I wonder if they might be able to help. I feel like efficiently simulating billions of years of natural selection is exactly the kind of thing that having strong AI would help us to achieve so it's a bit of a catch-22 if that is how we want to create the AI to begin with. I think it would be cool to evolve communities of AIs in the presence of some kind of selfishness hunter so that from very early on, altruism was selected for. Perhaps these AIs which naturally helped each other for the good of the group could be taught to invite any sentient being they encountered (such as us) into their group.

November 9, 2013 at 8:06pm · Unlike · 1

Micah Blumberg Earlier today I made a post, this was it:

"As I watched this video I tried to picture how what goes on in human brains could be similar to a procedure generated world. Our memories do not need to be stored in our minds as long as the same input can trigger the same procedures that generate the same temporary memory.

The same temporary canvas of information, the same moment in a brain canvas we will call consciousness."

Then I revisited your wall and I had another thought. What if the evolution of Artificial Intelligence will be really simple, like the way the computer draws a unique tree in an exact location because of math based drawing procedures.

I mean the evolution of the design of the artificial brain will almost fall out as a matter of it's mathematical procedural underpinnings within it's ecosystem as the major source of inputs. One could advance the program in time as another input, generating an instant jump of say millions of years of evolution.

<https://www.youtube.com/watch?v=ZVI1Hmth3HE>

Play Video

How Does No Man's Sky Actually Work? - Reality Check

Cam investigates the question we've all been wondering: how does the procedurall...See More

2 hrs · Like · 1 · Remove Preview

Jordan Tribby "Our memories do not need to be stored in our minds as long as the same input can trigger the same procedures that generate the same temporary memory." I think this is a deep insight, but I suspect it's not as clean as a 1:1 correspondence between inputs and activation of particular memory patterns. A certain procedure might define a certain tree in a video game, but given that there is a lot of redundancy in the brain, I think the identical input could actually instantiate more than one version of a memory depending on which happened to be more available (the preceding activity of the brain probably has a lot to do with which particular version of a given memory might be available for activation [or reassembly from stored primitives, or whatever you want to call it]. Random noise also probably plays more of a role in the brain than in a video game). Suppose you met a person twice, once in a cafe and once in a library. In the first instance they had blonde hair, in the second instance they had black hair. If you're presented with the input "describe this person", will you always resound the same way? Will you always form the same image in your mind? I'd hypothesize if you were primed with either pictures of the cafe, or pictures of the library, and asked to recall details about the person, despite having the same input, you might activate different versions of the stored memory you have of how that person looks, depending on how you were primed. There are probably many studies that basically demonstrate this. So-called "state-depenedent" memory would also fit with this picture ([http://en.wikipedia.org/wiki/State-dependent\\_memory](http://en.wikipedia.org/wiki/State-dependent_memory)). If you have many copies of a memory, say of walking down a particular street, I'd expect the state you were in when activating the memory would have something to do with which version gets put together, and which specific details you'd be able to recall, even though the input (the question "remember this particular street") could remain the same.

As far as evolving artificial brains, I'm not sure that I'm following your train of thought. Are you describing a virtual world in which a feature of the virtual world is some virtual machine that evolves brains which pop out of the machine and then interact with other features of the virtual

world to form feedback for subsequent iterations of the brain? Would you provide the first version of the brain, or are you expecting it to evolve on its own? I'm not sure how you can skip a million years of evolution. If the entire evolutionary history of the brain was already part of the program, then yes, you could jump to arbitrary points in its evolutionary history, but if you had only the brain's initial conditions and some evolutionary algorithm, you'd still have to apply those computational steps to update the brain, you couldn't skip a million steps and see how the brain would be. Perhaps if patterns emerged, there could be some shortcuts but I don't think you could ever skip ahead arbitrarily far to get the output of computations that hadn't actually been performed yet. Maybe I'm not understanding what you had in mind, but I think if you want to apply evolutionary algorithms to an artificial brain, you have to actually run those algorithms on the brain (and then run them again, and again) so the brain evolves.

State-dependent memory - Wikipedia, the free encyclopedia  
en.wikipedia.org

State-dependent memory, or state-dependent learning is the phenomenon through which memory retrieval is most efficient when an individual is in the same state of consciousness as they were when the memory was formed.[1][2] The term is often used to describe memory retrieval while in states of consci...

1 hr · Unlike · 1

Jordan Tribby As far as evolutionary algorithms as a path to AI in general, I think if you already start with a good architecture, you can improve it with evolutionary algorithms, but if you tried to get from really primitive structures like RNA to fully developed brains, even with computers that might exist 100 years from now (even assuming Moore's law continued), I think it's computationally intractable to simulate billions of years of evolution within a reasonable amount of time. We still don't know how likely our history was (more accurately, we don't know what percentage of SIMILAR planets given the same amount of time, would evolve life comparable to earth), so we might have to run simulations for much longer than 5 billion years to replicate the level of intelligence we have on earth. Obviously, nobody is really interested in trying to get artificial minds from that brute force kind of approach that involves molecules interacting in virtual worlds for billions of simulated years. I think it's very much an open question how far other evolutionary approaches can us get towards general intelligence (such as ones that modify code, or change the parameters of neural nets), but I suspect such approaches are best once we already have a ballpark idea and we want to improve upon it. I could imagine an evolutionary approach would be useful for taking a whole-brain emulation and getting it to perform better. I haven't read much about this topic, it would actually be really interesting to know what has actually been accomplished so far using evolutionary algorithms.

38 mins · Edited · Unlike · 1

Micah Blumberg What I mean is, in the video they have described the computer drawing a virtual animal that is moving from point A to point B which might take a super long amount of time, the game designer says if you leave the planet in a spaceship and then return later on the computer will create a new drawing of the same land, and the same creature, but the creature will be farther along in it's journey than it was before. In this instance the creature sort of jumped

farther along in it's journey toward B without actually moving through the distance between it's previous position and it's next position, because it didn't exist during the time that the player wasn't actually there.

What the computer is generating is an entire location in both space and time that didn't exist before, and won't exist when the player leaves, but exists again when the player returns, and when the player returns the world will be drawn with all of the locations of the animals advanced as they would have advanced had the player not left at all.

It makes me think of how spacetime could be just like that, but more interestingly I think about how a brain has so many connections, more connections than the stars of a galaxy like earth's galaxy. If each connection was represented as a planet, and each pulse that traveled through that connection was represented as an animal or a spaceship moving, and all of that was only generated as needed, and didn't exist when it was not needed.

It's sort of like a universe that exists consistently for a dissipative system, but it's existence can sort of be off or non-existent when there is no dissipative system there to observe it.

The brain is a dissipative system, and if you took a program like they have, that creates a universe for players, with billions of planets, that can generate the positions of animals at any point in time, all those procedural generated details could track the positions of soliton wave signals in an artificial mind of similar scale.

Additionally you could look at the development of that mind at any point in time, because the computer doesn't have to render all the inbetween steps between point A and point B, it only has to use the mathematical formula to generate a result of what the information output would be at a given point in time.

If you could somehow take the mind, represented by a program this large, and put that entire mind program inside a virtual character that is itself inside the same program, it would be like being a character on a planet inside your own mind. The universe itself would be doing the thinking for you. Or you could take the mind program and put it inside characters in a different program. Either way as these characters interact, they develop, live, eat, sleep, mate, create copies of themselves, die, and over time they evolve.

However all their movements, and all their thoughts are just movements, do not need to happen sequentially. A new observer might enter the game a trillion years later, and a trillion years will take the same amount of time to render as the next second takes to render, because it's all drawn from mathematical formulas, so it doesn't matter when.

Both time and space become sort of like secondary properties to underlying mathematical formula's.

Jordan Tribby Very fascinating stuff. I will have to think about this more. I think I understand what you mean better now, but I think there's something wrong with that picture (at least as it pertains to our actual universe which is limited to storing something on the order of  $10^{122}$  bits of information)

If it were possible to create artificial minds inside a virtual world that could be called up at any arbitrary point in its future from a set of simple formulas, then it would be possible to solve NP-hard problems in polynomial time (which I'm afraid is too good to be true). Suppose my virtual brain is a mathematician and he checks one possible solution to an instance of the traveling salesman problem with 1000 nodes each virtual "day". If you're correct, then we could just skip ahead to day 1000!, by entering this 2557 digit number, and we could ask the virtual mathematician what the shortest path was between the nodes and he would be able to tell us the right answer.

The problem seems to be that during all of those days that "didn't exist" between day 1 and day 1000!, had they existed, the brain would have engaged in LEARNING. Even though the representation of the memories could be reduced to a set of rules, the specific content of these memories, the information determining which rules should be applied, would have to be stored somewhere (and in the example I gave, the the physical storage media for the memory would quickly exceed the size of the universe.) If we called up the brain on day 1000!, and asked it for the answer, given the actual computational resources available in the universe, the best it could tell us would be "I have no clue, yesterday was day 1. I closed my eyes and suddenly woke up here."

If we wanted the brain to give us the correct answer, to store all the information the brain would have LEARNED during the missing days, the computer would have to store something like an additional

Micah Blumberg Well not exactly, the idea is that the universe only has to render what is being observed, (it doesn't have to store what isn't being observed) and what is being observed is generated from mathematical formulas that result in all these fractals we seem to see everywhere. The universe doesn't have to store any data beyond the fundamental mathematical formulas that give rise to the position of every calcium ion in your brain. The reasoning is that these mathematical formula's can regenerate whatever your learning would have been, in the moment they are needed, regardless of whether you vanished from existence for some period of time prior to whatever is happening right now.

13 hrs · Edited · Like

Jordan Tribby Since one thing that can be observed are the solutions to arbitrarily hard math problems, the kinds of formulas you are describing probably do not exist, and if they did, the memory requirements for storing them would approach infinity (as would the memory requirements for formulas that produced brains that thought of formulas that produced brains only as they were needed). I don't think there is any free lunch, if you replace straightforward

memory storage with formulas that construct memories on the fly inside of a brain, and further stipulate that these formulas can output the same information that "would have" been output given traditional memory AND a lengthy computation, I think those formulas would themselves have to be extraordinarily complex, so complex in fact that I don't think you could store the formulas within the universe. I don't believe there are a few simple formulas that can "regenerate what you would have learned".. that information has to come from somewhere, it can't come out of thin air.

12 hrs · Unlike · 1

Jordan Tribby In the original example you gave of moving an animal linearly from point A to point B, it's clear that you can cut out the intermediary steps and figure out where the animal will be at some time in the future. This doesn't hold if there is learning that takes place along the path that causes the animal to change trajectory midway.

12 hrs · Unlike · 1

Micah Blumberg 1. We could be a four dimensional holographic projection of rules that are stored in 2 dimensions on the surface of a black hole, all the memory needed to generate (any part of) our 4 dimensional galaxy could be stored there in two dimensions.

2. An animal moving from point A to B be is no different than a calcium ion in your brain moving from point A to point B.

I think what you are missing is that assets generated in the moment from procedurals cost a lot less in terms of memory than actual assets that are permanently stored somewhere.

An asset would be a tree for example. You only need a few rules to generate a tree, you don't need to store the data of the actual tree when it doesn't exist. (or not being seen?) if you need to regenerate that tree, it will be the same tree, not because you stored it's data, but because it's regenerated from the same rules.

I don't know how much programming experience you have, but there is a joke, that goes, if your AI is more than 10,000 lines of code you're doing it wrong. Because really light programs can achieve amazing things from simple rules.

I'm not arguing that you can get a free lunch, only that this type of universe would necessarily be massively less costly in terms of the amount of data it had to store (compared to the universe you might imagine you are actually in). Somehow you think that the rules for regenerating a single moment in the cosmos would require more bits than everything that appears to exist in that moment, an idea is that is ignoring the principle idea. The principle idea that the information to generate what exists in any moment of the universe is far less than what appears. What appears is a complex outcome of far less complex rules.

6 hrs · Edited · Like · 1

Jordan Tribby I don't disagree with you about any of these general principles, so I probably wasn't clear if I gave the opposite impression. I understand for example, Jurgen Schmidhuber's idea about trying to discover the shortest possible program that could produce our universe, and that it can be quite short. I understand cellular automata, and how you can get extremely complex structures from simple rules. I also understand how the information within the volume of the universe might actually be stored on the 2D surface of the cosmological horizon rather than within, analogous to what the math says about the information contained within black holes being found in fluctuations on the surface of the event horizon (I don't think the holographic principle requires our universe actually is inside a black hole). Regardless of whether the information is fundamentally stored within the universe or on it's surface, if there is a block universe where past, present, and future all exist, it's not clear to me that you really save any computational resources by rendering only the scene of observers (if in a sense, the whole universe is already there, this would actually be more like a subtractive process where you had to first 1.) identify which observers you wanted to have a point of view and 2.) delete everything outside their view). I think that it would actually be less "expensive" to have a fully formed universe than one which reveals itself a little bit at a time because of the additional need of determining who counts as an observer. I could be wrong about this, but I'm having trouble understanding at the scale of a whole universe how you would save any resources the way you do in a video game by rendering objects as they are needed from the pov of your ONE observer (the built-in assumption that there is only one observer in a video game saves you the need of determining who counts as an observer.)

I don't dispute that you can build up objects from procedurals in a way that requires less memory than storing the whole object, but these procedurals still DO require memory, they are not free. I don't dispute you can build up a brain in this manner. Where you lost me was in suggesting that you can skip ahead into the future and have the brain know as much as it "would have known" if it had actually gone through the experiences it "skipped". Suppose a brain has 10 years of experiences. Even if all of these experiences are not individually stored in memory ahead of time, if the past moment ceases to exist as soon as it is no longer observed, the input that determines what is rendered using your procedurals is still included the prior state of the brain, those inputs are vital information that ultimately determine what state the brain will be in on the last day of year 10. Because there's a dynamic interaction between the brain and it's environment, you can't feed-forward knowing just the brain state on day 1 to know the brain state at some arbitrary future point. If you're on day 1 and you want to skip ahead 10 years, you can still render SOME BRAIN from the procedurals, but without all of the information contained in the series of ten years of brain states, it won't be the SAME brain you would have gotten if the brain had been allowed to have ten years of experiences. If you wanted that missing information to be made up for using the procedurals themselves, and indeed wanted the procedurals to make up for ANY potential missing experience, I was speculating that the storage requirements for such procedurals would approach infinity.

So to sort of summarize my thinking: The advantage you get from going sequentially is that you don't have to store all of the information ahead of time, you can forget the information as soon as it's no longer needed, but that information still has to pass through the system. If you want to



skip ahead however, then that information DOES have to be stored somewhere ahead of time, you can't get that information for free. If you want that information (and any such information) to magically pop out from the formulas, then I have the strong suspicion that even if such formulas existed (which I doubt) they would end up not fitting within the universe because there would be so much potential information you'd have to make up for).

46 mins · Like

Micah Blumberg okay, lets go one more round on this one, lets say that you can calculate the location of all the atom/ions in the universe at any point in time from the core mathematics of it, and lets say that all the learning in a person's brain is just a relocation of atoms/ions really.

35 mins · Edited · Like

Jordan Tribby What you're describing is basically Laplace's demon, but I don't think it works because of quantum mechanics. I don't think we can know the precise location of every particle at every time from some fundamental equations, even if in some sense the universe "knows", or this knowledge might be accessible from some kind of god-like observer outside of the block universe.

28 mins · Like

Micah Blumberg I think Laplace's demon isn't invalidated by quantum mechanics because Bohmian Mechanics was mistakenly invalidated, and thus is still potentially valid. It's possible that the quantum realm is just as deterministic as imagined perhaps by Laplace.

24 mins · Edited · Like

Jordan Tribby I think if we, within the universe, had the ability to know the precise location of every particle at any time, it would lead to all kinds of violations, like no superluminal communication, the no-cloning theorem, etc. And it would also lead to some weird time paradoxes, like if you knew that you were alive ten years from now, could you commit suicide tomorrow?

23 mins · Like

Micah Blumberg I'm not suggesting that we can know the future of the universe that we are in, but, shifting the topic slightly, I think the mind does make predictions that it is then able to react to.

21 mins · Like

Jordan Tribby I'll reserve judgement about the pilot-wave thing, but even if physics is fundamentally deterministic, we still can't see behind the curtain, certain things are still probabilistically unpredictable from our point of view

20 mins · Like

Micah Blumberg Sure, I don't disagree on that point. However I think the rules are a little bit different when we are talking about a simulated universe and simulated minds inside computer systems.

17 mins · Edited · Like

Jordan Tribby I agree there are advantages to sitting outside the simulation looking in, but if the simulated universe and the simulated minds are of similar complexity to our own, I think you run into difficulties if you want to essentially predict the future within your simulation.

12 mins · Like

Jordan Tribby I just had a funny thought of Goldman Sachs simulating the entire universe.

11 mins · Unlike · 1

Micah Blumberg "I think you run into difficulties if you want to essentially predict the future within your simulation."

I don't think so because generating one fourth dimensional location from procedurals alone should be no different than generating any other fourth dimensional location from procedurals alone, regardless of the point in time

6 mins · Like · 1

Micah Blumberg It goes back to the idea of Quantum Weirdness, that we are literally defined by everything else. Have you seen this video?

[http://www.ted.com/.../aaron\\_o\\_connell\\_making\\_sense\\_of\\_a...](http://www.ted.com/.../aaron_o_connell_making_sense_of_a...)

Making sense of a visible quantum object

[www.ted.com](http://www.ted.com)

Physicists are used to the idea that subatomic particles behave according to the...See More

4 mins · Like · 1 · Remove Preview

Micah Blumberg The current fractal structure of my brain at a single point in time should be at one with the physical vortex of the entire cosmos as one giant dissipative fractal structure that can be calculated from far simpler mathematical rules encoded in the building blocks of the cosmos. What I know in this moment is the result of the current state of the entire cosmos.

1 min · Like · 1

a0346z

(field)

Micah Blumberg I study neuroscience, not psychology, because psychology is not real science. These labels like narcissist are subjective impressions, characterizations, and statistical interpretations, they are not based on provable neural correlates, or hard medical science.

Edit or delete this

Like

· Reply · 2h · Edited

Michael Adam Guul

Michael Adam Guul Micah Blumberg Maybe you should try to study psychology- Then you Will find out that you are wrong and dont know your Own field either ?A lot of prefrontal correlates to personality disorders.

Hide or report this

Like

· Reply · 1h

Micah Blumberg

Micah Blumberg

<https://www.fastcompany.com/90520750/duke-university-researchers-say-every-brain-activity-study-youve-ever-read-is-wrong?fbclid=IwAR0UT07b1roB0gRPWCY4q7Lp1qqII-GSzl3uRZ9VAP2vQ9uY4AkvYCC7vMI>

Duke University researchers say every brain activity study you've ever read is wrong

Like

· Reply · Remove Preview · 1h

Micah Blumberg

Micah Blumberg Except that when you go back and test to see if the same neural correlates are still there, to match the same personality disorders, they are not there anymore.

Edit or delete this

Like

· Reply · 1h

Micah Blumberg

Micah Blumberg Trying to find a personality disorder in brain activity is like trying to find a file on your computer by reading the heat coming from your hard drive.

2

Edit or delete this

Like

· Reply · 1h

Micah Blumberg

Micah Blumberg I should clarify that I study computational neuroscience, specifically how the brain renders what you might describe as your conscious experience of reality. This involves networks and memories that are sparse and distributed all over a network, involving sensory areas of the brain, and all sorts of brain regions in even small tasks.

Edit or delete this

Like

· Reply · 1h

Micah Blumberg

Micah Blumberg I study all the different forms of medical imaging, and what's captured is not even the tip of the iceberg of what's going on in the brain.

Edit or delete this

Like

· Reply · 1h

Manvi Arora

Manvi Arora Micah Blumberg This stuff is interesting, man! I'm gonna follow your profile for such insights.

a0347z

(field, synap)

Superconducting Synapse Brings Us A Step Closer "To An Artificial Brain"

Fiona McMillan

This article is more than 3 years old.

Researchers at the National Institute of Standards and Technology have built a superconducting switch that mimics the behavior of a synapse between neurons. This artificial synapse could help advance the development of computing systems that behave and learn like the human brain.

Artificial synapse developed by NIST is able to adapt to high use

Artificial synapse developed by NIST is able to adapt to high use NIST

They say that neurons that fire together wire together, which is a nice, rhyming way to say that neurons that actively signal in a group tend to develop stronger connections with each other. Indeed, from an evolutionary stand point, this makes a lot of sense because it facilitates learning. During new experiences like learning to walk or speak a language or making mental maps of the way home, neurons make new connections. The more an activity is repeated, or the more learning involved, the stronger those connections become. Zoom in and you'll see that these neurons don't actually physically touch, but instead right at the junction where two neurons meet is a tiny gap called a synapse.

And by tiny, we are talking in the ball park of around 40 nanometers.

In order for information to flow from one neuron to the other, neurotransmitters are released at the end of the long tail-like axon of one neuron. They flow across the gap and are picked up by receptors on the other neuron. This, in turn, can trigger an electrical signal that will be transmitted along this second neuron.

Of course, if the signal from the first neuron isn't very strong, the second neuron won't become activated in response. After all, not every new connection is going to be useful and it's not in the brain's best interest for every connection to be hypersensitive and easily activated.

And yet, neurons that frequently signal together do become much more in tune with one another, so much so that threshold for activation becomes lower. With repeated interaction, the second neuron becomes much more sensitive to signals coming from the first neuron.

Consequently, well used neuronal pathways that involve such mutually sensitive neurons fire much more quickly. You become better at walking, at speaking that new language, and finding your way home.

Neuron pathways are able to adapt this way because synapses can, for lack of a better term, learn. As firing becomes more frequent, the first neuron can increase the number of neurotransmitters it sends, and/or the second neuron can become more sensitive to those

neurotransmitters. This involves changes in the way certain genes are regulated in response to regular use.

Researchers are working on building computers that function much like the brain, and to do that they want to mimic the way neurons behave and respond to one another. Adaptable connections are important for this. The problem then, is how do you achieve this same kind of learning mechanism in an artificial synapse, so that the threshold for activation is lower for connections that are used frequently, but higher for those used less often? In other words, how do you get an artificial synapse to 'learn' without the benefit of finely tuned genetic and biochemical feedback mechanisms?

To address this, researchers at NIST used something called a Josephson junction. Instead of two electrically active neurons meeting at a synapse, this junction involves two superconductors separated by an insulator. The junction they built is extremely small, only 10 micrometers in diameter.

When a sufficient current runs through the junction, it produces low voltage spikes, in an analogous way to how a sufficient electrical signal in the first neuron can trigger a spike of electrical activity in the second neuron.

That was the first step in mimicking a neuronal connection. But what about the synapse learning effect?

Here's where it gets really interesting. The researchers filled the insulating gap with magnetic nanoclusters to the tune of 20,000 per square micrometer. Each of these nanoclusters behaves like a tiny bar magnet polarized along an axis.

Filling the gap between the two superconductors, this multitude of tiny magnets begin in a disordered jumble, with their magnetic 'spins' pointing all over the place.

The current threshold is high when the nanomagnets are disordered

The current threshold is high when the nanomagnets are disordered SEAN KELLEY; NIST  
When they are in this magnetically disordered state, they tend to put a damper on any current trying to cross the gap between the superconductors. Consequently the amount of current needed to trigger a voltage spike is quite high.

However, in the presence of a magnetic field, repeated pulses of current will cause all the nanoclusters to align in the same magnetic direction. The more aligned they become, the more current friendly they are, lowering the amount of current needed to trigger a voltage spike. In other words, frequent electrical activity at this junction leads to a more sensitive interaction between the two superconductors. Sound familiar?

In the presence of a magnetic field, repeated pulses of current start to align the magnetic... [+] direction of the nanoclusters

In the presence of a magnetic field, repeated pulses of current start to align the magnetic... [+] SEAN KELLEY; NIST

With frequent pulsing, the nanoclusters become aligned and the current threshold is low enough to... [+] trigger a voltage spike in the second superconductor

With frequent pulsing, the nanoclusters become aligned and the current threshold is low enough to... [+] SEAN KELLEY; NIST

How does it compare to a real neuron-neuron interaction in terms of energy and speed?

If you have a 100 watt lightbulb in your lamp and turn it on for one second, you've just used 100 joules. A neuron is so energy efficient that it would have to fire around 100,000,000,000,000,000 times to match that amount of energy use.

This is because a single synaptic event only uses around 10 femtojoules of energy.

By comparison, the amount of energy needed for the artificial synapse to function was always less than 1 attojoule. This about 10,000 times higher than the energy used by a natural synapse, but it's still pretty impressive.

In terms of speed, though, the artificial synapse wins by a long shot.

A neuronal synapse may fire a few times to a few hundred times per second, but these artificial synapses were able to fire faster at a rate of 100 billion times per second. This, coupled with the small size and a design enabling 3D stacking of these junctions, suggests that a significant amount of computational complexity could be achieved in a very small amount of space.

A person could easily burn a lot of femtojoules just thinking about such a possibility.

Further information:

Original research article:

"Ultralow power artificial synapses using nanotextured magnetic Josephson junctions"

Science Advances 26 Jan 2018: Vol. 4, no. 1

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<http://advances.sciencemag.org/content/4/1/e1701329.full>

Fiona McMillan  
Fiona McMillan  
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I am a science writer with a Bachelor of Science in physics and a PhD in biophysics. I have researched distant stars, extremophiles and the fine-tuned architecture of proteins.... Read More

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a0348z

May 13, 2011

(graph)

imagine a stereographic camera, a 3-d camera, and imagine your brain has 1080p or really high resolution image sensors right, and now imagine that each sensor captures a different part, each pixel sends a different part of the image back, a sequence plays, and everything is captured, but there is statistical effect, all the similarities in all the sequences produce patterns between different layers of this stereo graphic camera, so it's basically like a 3d video camera which statistical connections between each pixel of each frame, and the more connections that exist the clearer the pictures becomes in your mind, and each new picture is match up with the current picture because of the new statistical connections, even small parts of patterns can become huge patterns, and even small parts of patterns can be connected to huge patterns, because what happens is a sort of inferential pattern recognition, our prediction is precisely the prediction of an incoming pattern and it's statistical connection to a previous pattern. and that describes the visual part of your mind, all the other senses are done in the same way basically, and all the patterns combine to form a multisensory picture that is constantly being updated

as your awareness expands

the matrix is the mind, the films are encoded with deep layers of meaning

remember there were three worlds, the matrix, the real world, and the machine city

the represent mind, body and the mind respectively

at the cellular level it's machine city

when you unravel the metaphors bit by bit, the extensive nature of that artwork becomes

"exceedingly clear"

the real world is real yes

each film is like a complete perspective, but you need all three perspectives to appreciate the art in all it's glorious dimensions

the first film represents ethos, or know thyself

ethos is character

the second film represents pathos, understanding, empathy, listening, and the theme is "control thyself"

the third film represents the logos perspective, giving, satori, or "give thyself"

all three are important because all three are just perspectives on but all three are important

because all three are just perspectives on one picture

so all three manifest at the same time

as one

the mind is a process creating a dream that tells itself it is you, and not a biological computer, your identity my identity is just a program our brains made in order to survive, reproduce, and prosper

we think we are friends, but really bunches of neurons have decided to be friends, because bunches of neurons are initiating this communication channel

because there is an exchange of ideas happening

what is true from one perspective may seem completely wrong from another perspective, this is why there are no right perspectives, just perspectives

to see yourself as a computer, is to see the art of your beingness

a0349z

(neurotransmitter, dendrite, synap, dopamine) #5 #dendrites

specific firing pattern

when neuron is a pattern,

are all of the upstream neurons going to fire?

neuron

how can a neuron detect a pattern?

distinguished from noise

neuron pattern

neurons are predicting that they

dendrites

receptors

spike in synapse

spike in the dendrite

spike in the

waves

brainwaves-energy

signal traveling

neuron pattern detector

how would a neuron throw out patterns throw out



excitatory  
neuron is weighing what is for and against,

two kinds of excitatory firing

dendrite, internal inhibitory process for a dendrite  
lots of guesses, the network as a whole makes a conclusion, winner take all,  
the inhibitory inputs could suppress, so that is the network inhibiting  
dendrites can do intermediary  
spontaneous firing.  
open minded  
the enteric brain a parallel agency, a neuron sums up some inputs  
serotonin camp, tweak and tune the neuron  
calcium concentrations, tune the spine

how do ampa receptors, nmda receptors differ in affecting dendrite activity

How does the dendrite activity affect sodium, potassium, and calcium, and chloride atoms?

sodium is the positive input  
chloride is the negative one  
chloride  
Potassium is a positive charge not a negative charge?  
is about maintaining the baseline  
calcium is a special story

when glutamate, sodium atoms, how the positive atoms flow in  
gabba receptor, chloride atoms, that's how the negative atoms

the sodium channels are voltage dependent, they go from open to inactivated  
the potassium, the action potential, the neural spike?  
the potassium it causes the spike to return to negative  
and the potassium regulates the base line level of the cell

How does potassium trigger the down regulation of the action potential?  
the concentration of the potassium causes.

potassium receptors on the dendrite side or the axon side?  
inside /  
sodium & potassium are both positive,

calcium,

complex intracellular processing

old classical patch clamp literature, how they change the bio physical changes, the voltage changes, the ionic side,

the neuron maintains a -70 or -60 cortical, between -90 to -40 negative charge, resting state of a neuron

the ions are individual atoms  
the potassiums are single atoms  
chloride atoms are in a solution.

longer neurons do mean longer transmission delays, if it has to cross over the hemispheres, each spine is doing a computation?

spine is peninsula, dendrites have the boutons or the synapse

two axonal boutons,

different receptor types on one spine? different receptor receptors on boutons,

the axon side or the dendrite side,

axon side releases dendrites, dendrite

the dendrite spine is sort of the receiving

from the dendrite to the axon, cannabinoid receptors work in reverse

how do neurotransmitters get recycle

they get reabsorbed by the axon side

the reuptake of the dopamine

when you block the current it compacts the dendritic space, removing a leak

a0350z

Nov 1, 2014

"The personal activity is absolutely useless."

this is the next delusion that will fall away from you

Personal activity is essential, even though our choices are not driven by ourselves they are important, our choices are driven by criteria, information criteria patterns, as coincidental firing patterns in brain cell circuits recognizing specific information patterns and they plan future responses to what may happen.

So the reason it seems like a choice is happening before conscious awareness is because you had a planned reaction in your cells that was actually your choice driven by reasons.

Peter Tse Neural Basis of Free Will: Criterial Causation

<http://www.amazon.com/The-Neural-Basis-Free-Will/dp/0262019108>

