

# SCHEDULE

- |       |   |  |
|-------|---|--|
| 18:45 | - | <b>Introduction</b><br>What have we bought? What can we use it for?  |
| 19:00 | - | <b>Hygge and hang with VR, tDCS, hacking and Neurotech</b><br>Risengrød and risotto for everybody!   |
| 19:30 | - | <b>Showcases of what is possible</b><br>Luke on Art and EEG, Sebastian on tDCS, Aleks on EMG, Esben on biosignals<br>We will experiment with the tDCS and play with EEG data |
| 21:00 | - | <b>Slowly closing down</b><br>Some might stay for even longer  |

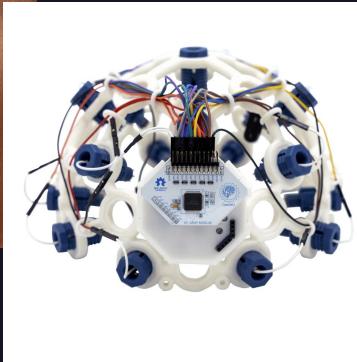
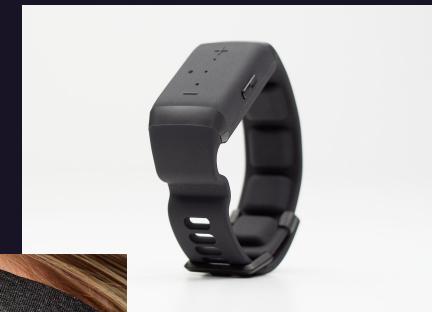
# BRAINJAMM

- Regular events with a focus on exploring neurotechnology
  - Imagining projects
  - Expanding NTX DK
  - Testing new technology
  - Getting a chance to work with amazing technologies!
- Tonight is about chill
  - 1st of December
  - Technology is on its way!
  - Food is also on its way 😊



# OUR PURCHASES

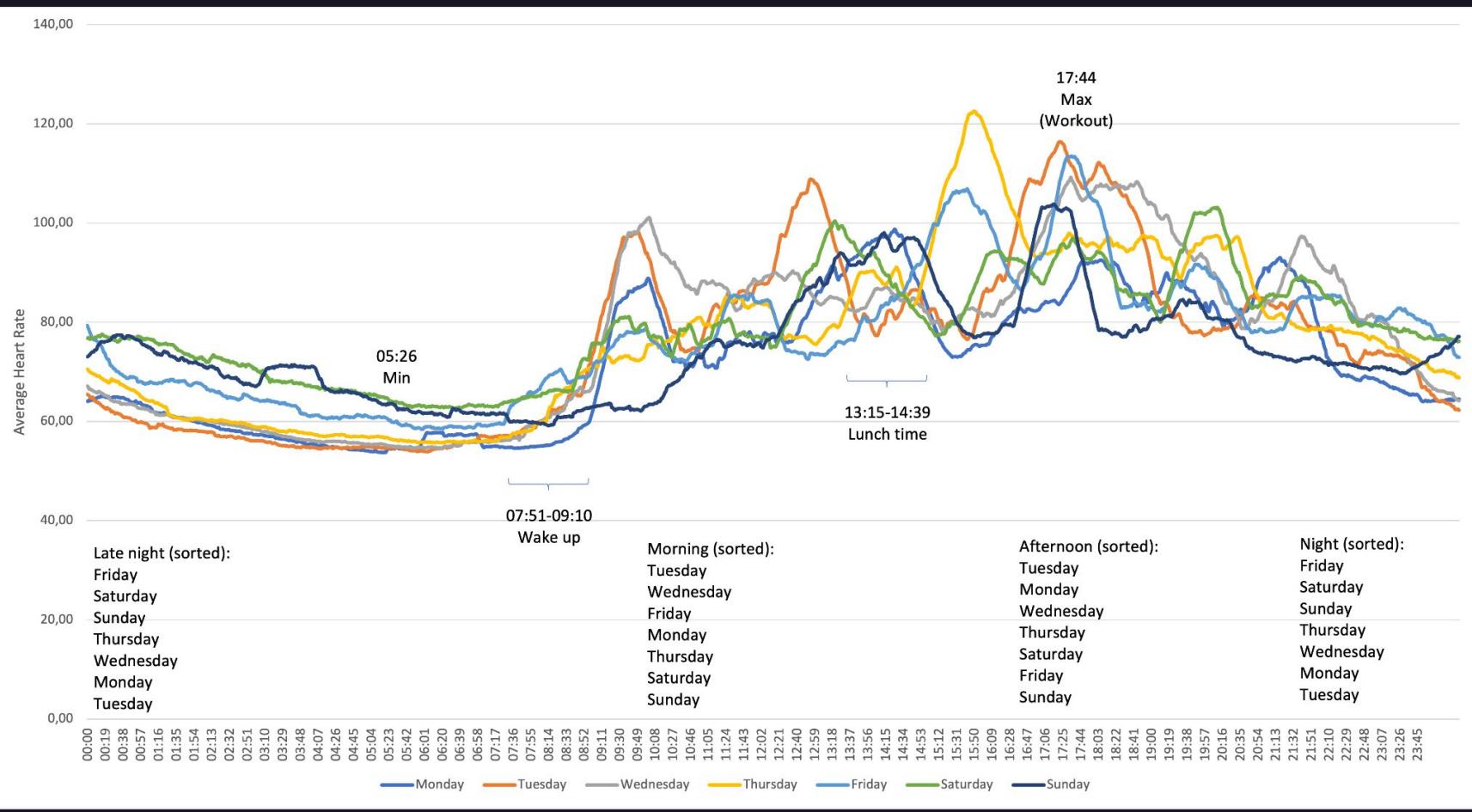
- OpenBCI biosignals R&D bundle
- Calutron tDCS gear
- VR headset (Quest II)
  - With developer possibilities
- Muse S
- Buzz with 8 vibrators
- Also spikeball 😊

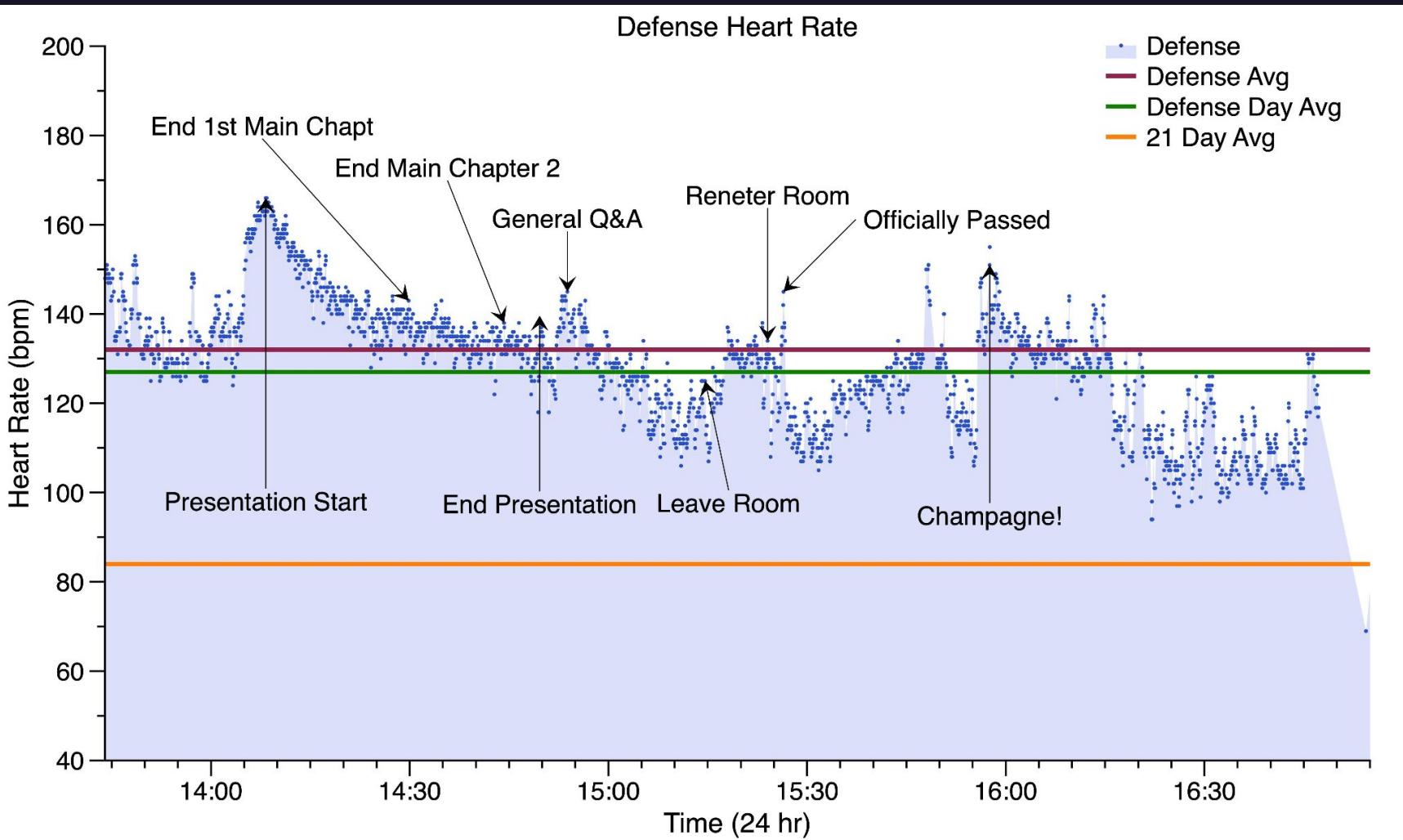


# Biosignals

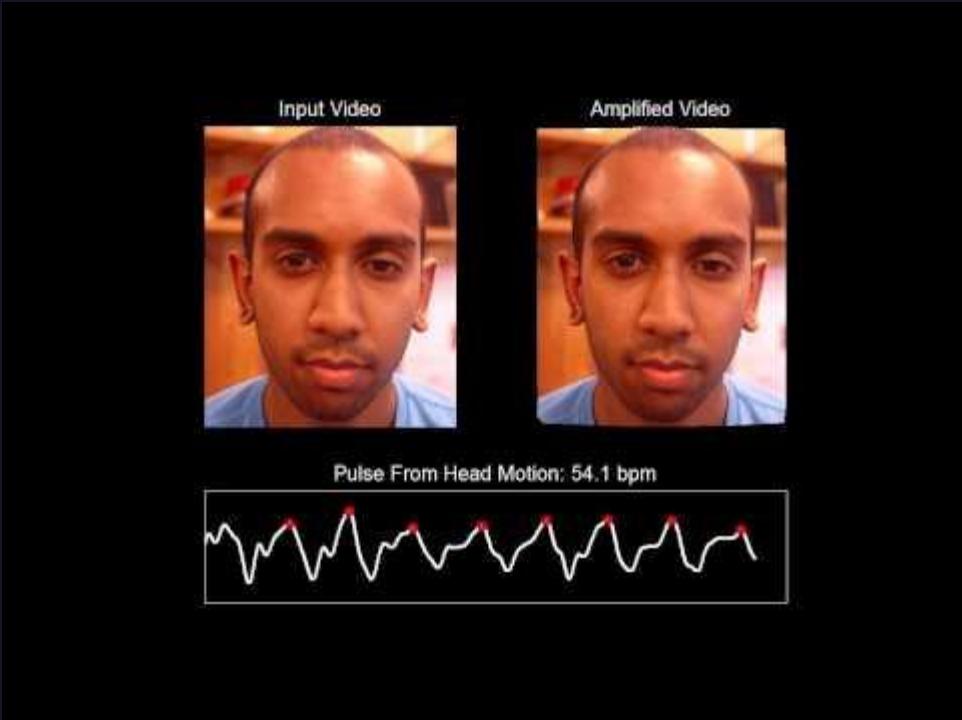
- Heart rate
  - Heart rate variability
  - Fear response and hunger levels
- Blood flow
  - Disease classification
- Steps
  - Long-term signal for health
- Breathing
  - Classifying exercising levels
  - Sleep apnea and other states
- fNIRS and other neuroimaging
  - Also biosignals





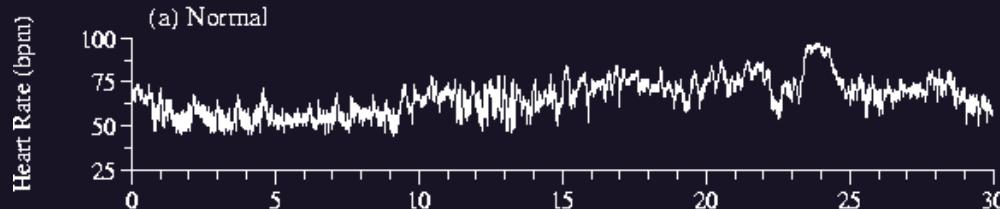
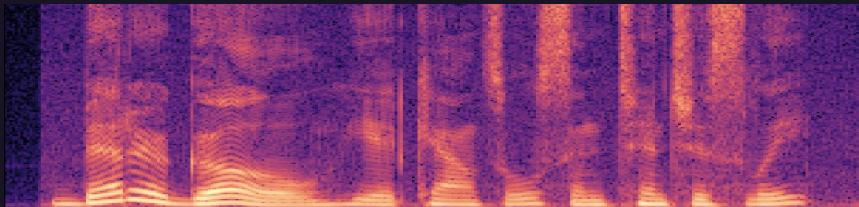


# POSSIBILITIES





# Multimodality

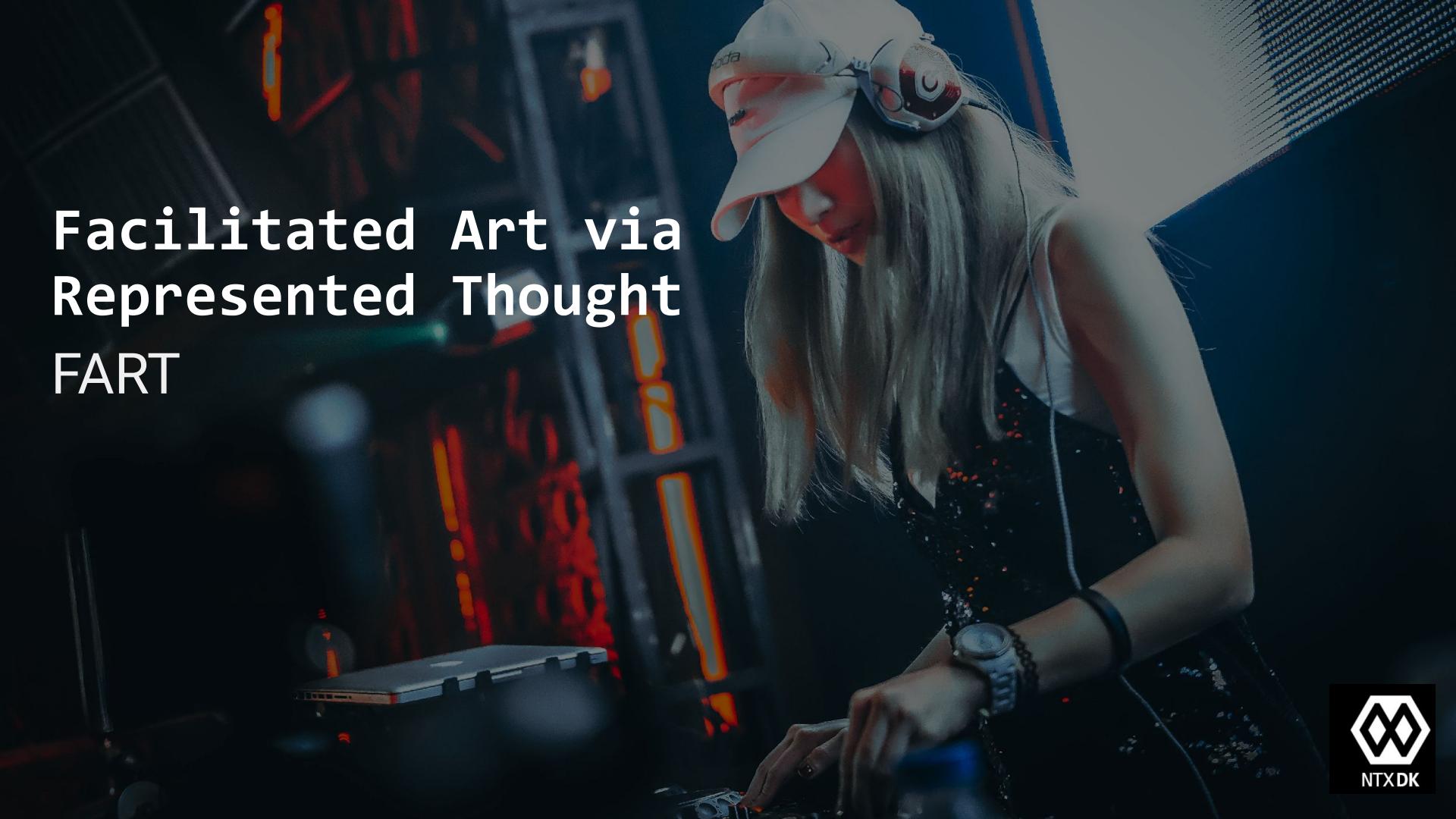




# ALL DATA IS GOOD DATA

- Big models with big data
- If we have more signals, our models might be better
  - E.g. if they're eating food or exercising from heart rate
  - How video, audio and heart rate correlate





Facilitated Art via  
Represented Thought

FART



A dense network of colored neurons on a black background.

Brain With Art -> Art With Brain



NTXDK



NTXDK

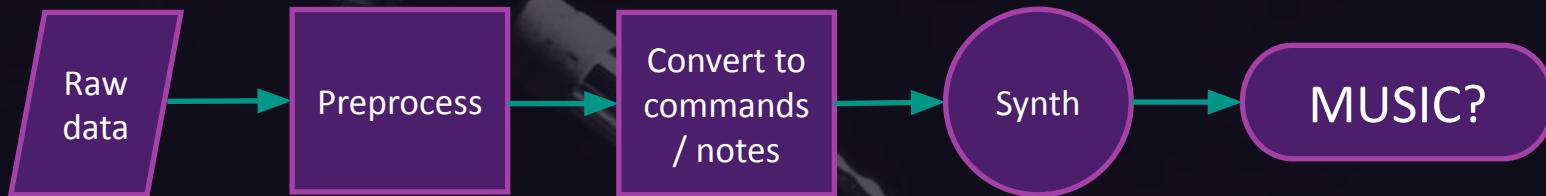
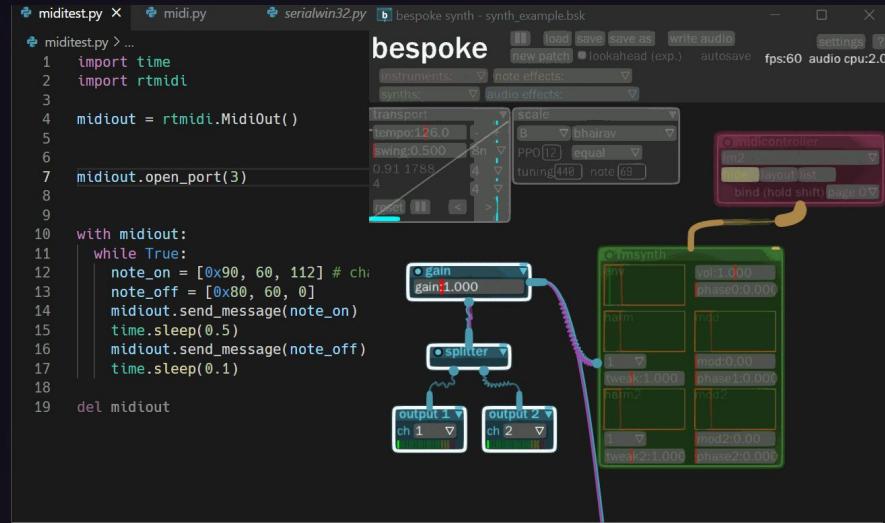


NTXDK

Proof of concept

# Soul Music

- PoC: Using **bespoke synth**
- Take any brain/bio data
  - Let's say, processed channel activity from EEG
  - Turn into commands
  - ????
  - Profit



Worst case: Theramin 2.0



# But wait, more than music, you

## Components

In

Out

Brain
EEG
EMG
Eye tracking

Not (as close to) brain
Fine motor movement (Quest)
Position tracking
Heart rate
Galvanic skin response
Scene processing (group interactions)

### Feedback

TDCS

VR Headset

### Interactive

Remote control (e.g. videogame)

Multi-person interaction

### Environment

Sounds, soundscapes and synthesizers (pitch, velocity, composition, track selection, tempo)

Smart lightbulbs, color, brightness, on/off

Motors, lasers, IR (drive an RC car, light show)

Projected procedural imagery (representation of brain activity, state related motion, colors)

Shark pit (open trapdoor)



# References and further reading

Combrisson, E., Vallat, R., O'Reilly, C., Jas, M., Pascarella, A., Saive, A., Thiery, T., Meunier, D., Altukhov, D., Lajnef, T., Ruby, P., Guillot, A., & Jerbi, K. (2019). Visbrain: A Multi-Purpose GPU-Accelerated Open-Source Suite for Multimodal Brain Data Visualization. *Frontiers in Neuroinformatics*, 13, 14. <https://doi.org/10.3389/fninf.2019.00014>

*Creating music by mind power.* (2017, September 12). New Atlas. <https://newatlas.com/bci-music-mind/51289/>

says, Z. G. (2021, August 10). *The Amazing Brain: Visualizing Data to Understand Brain Networks*. NIH Director's Blog. <https://directorsblog.nih.gov/2021/08/10/the-amazing-brain-visualizing-data-to-understand-brain-networks/>

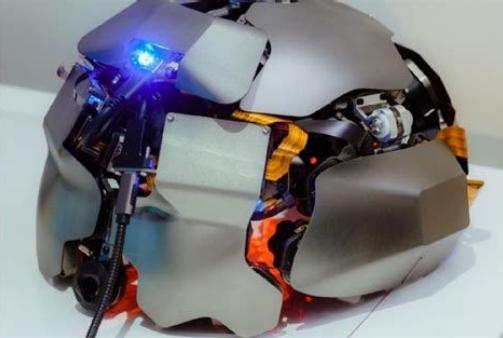
Thill, S. (n.d.). Mindflex Hack Turns Brain Waves Into Music. *Wired*. Retrieved 30 November 2021, from <https://www.wired.com/2010/10/robert-schneider-teletron/>

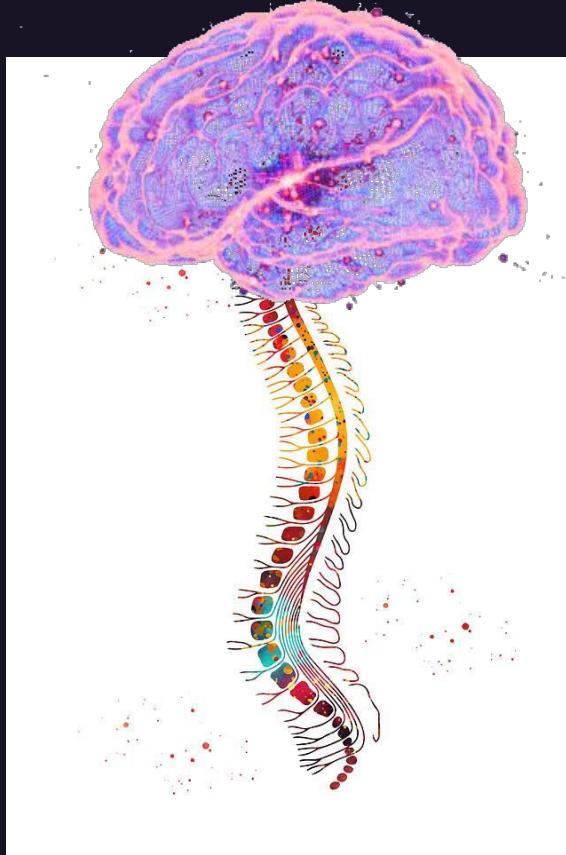


# input > output



# resolution/invasiveness tradeoff





# EMG





Thomas Reardon



MIT



Thomas Reardon



MIT

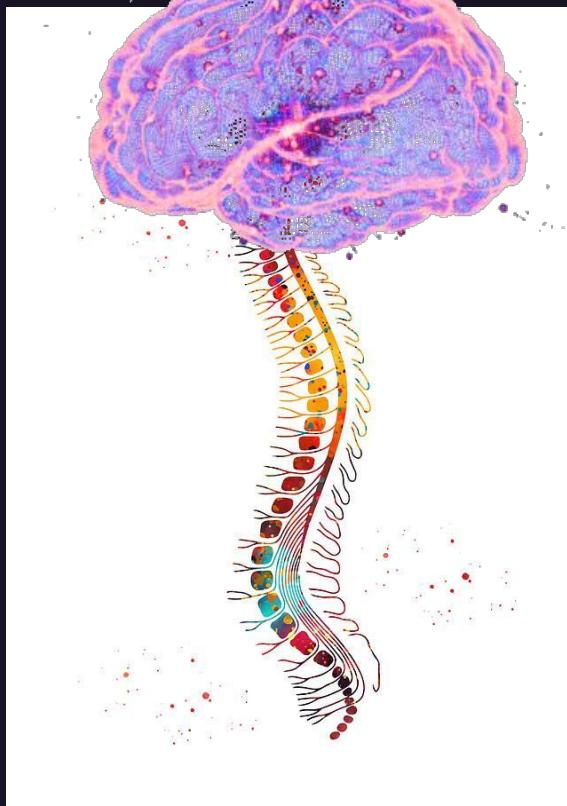


Thomas Reardon

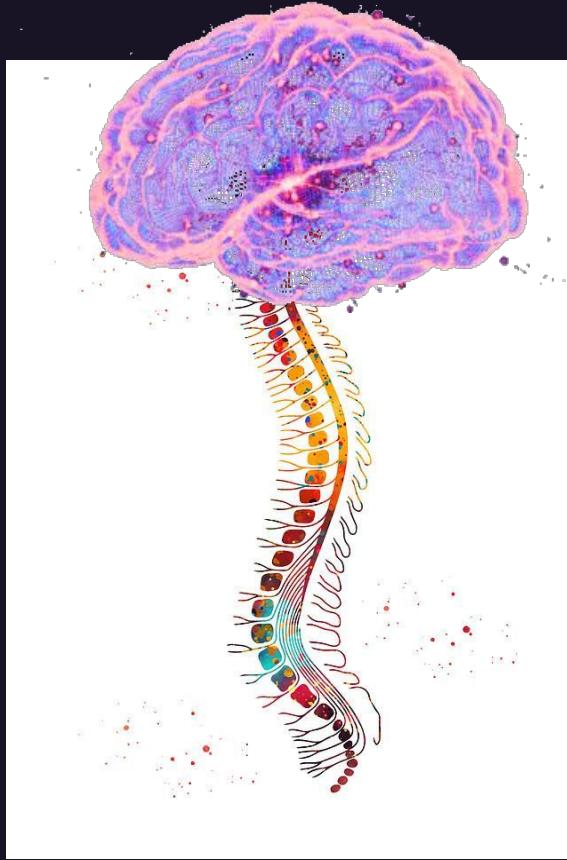


MIT

# from personal computing



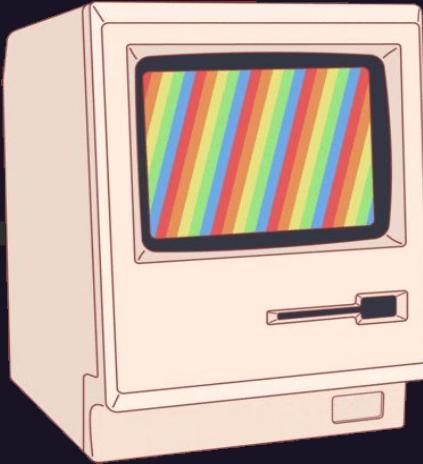
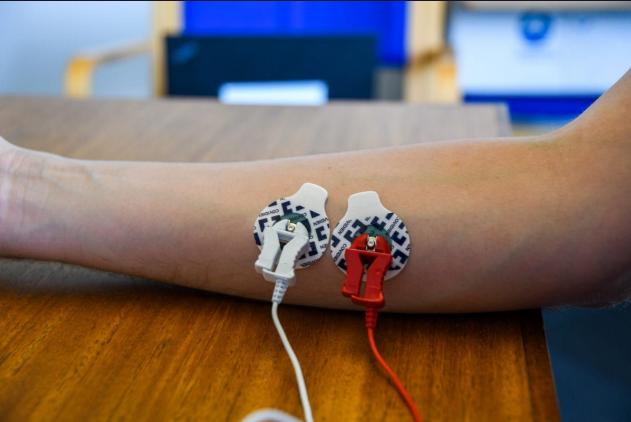
# to personalized computing





∞ Meta

# CO-OP EMG rhythm game





Free To Fry



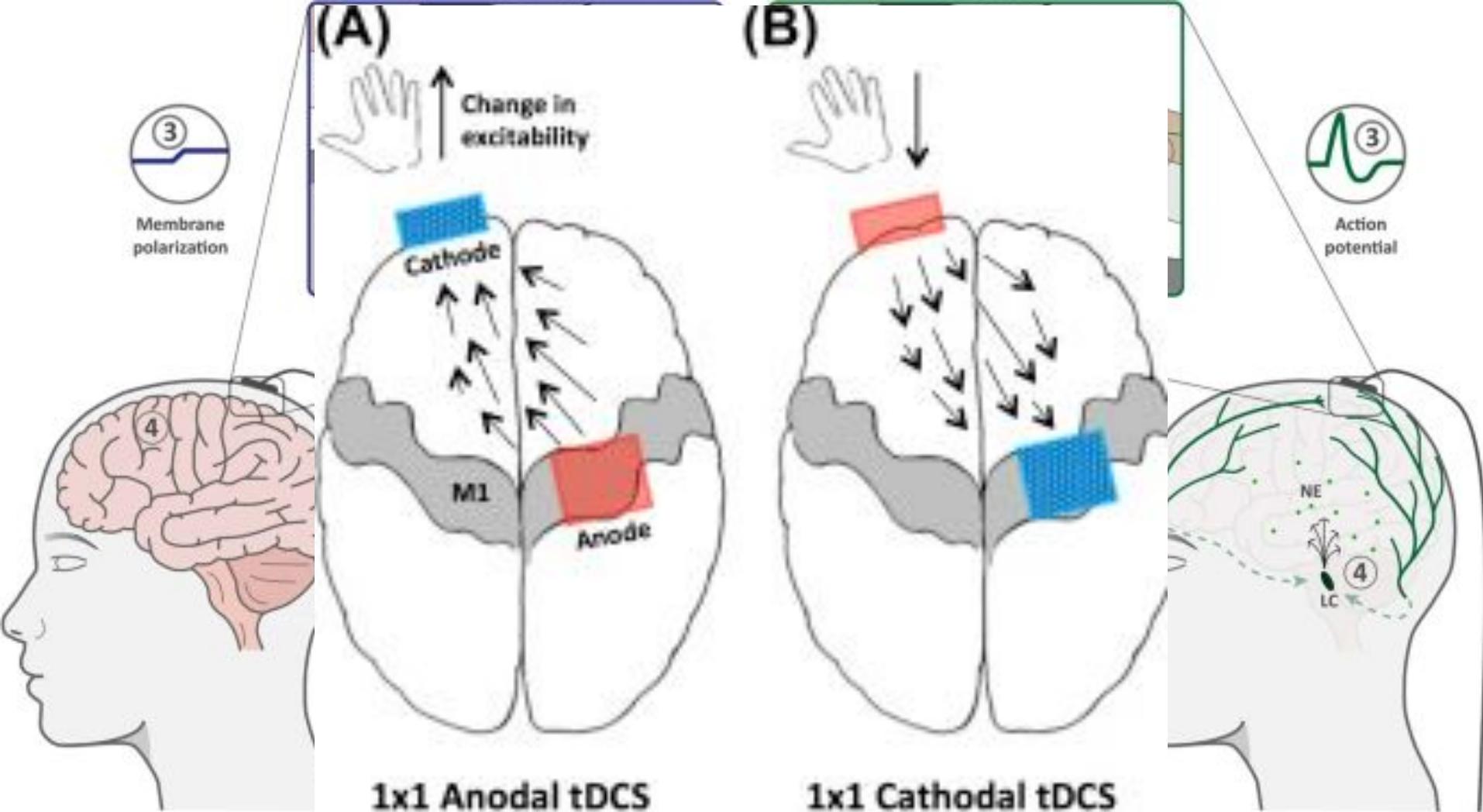
# TRANSCRANIAL DIRECT-CURRENT STIMULATION



Ampere = How many electrons

MilliAmpere = Mini Ampere

Volt Per Meter = Electric Field





# META



# Creative Measures

## (AUT)omating creativity assessment

Sebastian Scott Engen<sup>1</sup>

<sup>1</sup> School of Communication and Cognition, University of Aarhus, Jens Chr. Skous Vej 2,  
8000 Aarhus, Denmark

Handwriting identification  
is based on the observation  
of the way people write

## **Fluency & Ideation**

Idea generators with a higher chance of creating breakthrough ideas



## **Flexibility & Adaptability**

Able to see situations from multiple perspectives

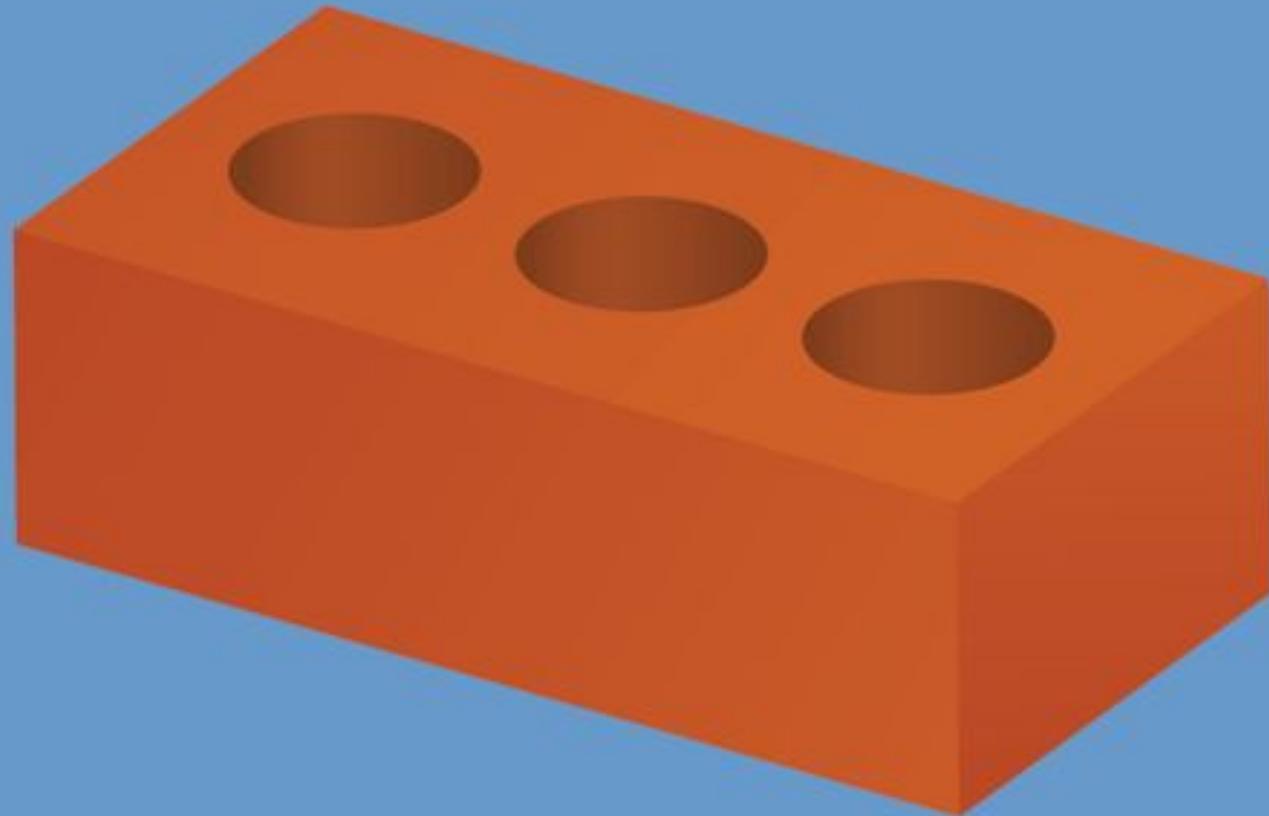
## **Originality & Novelty**

Able to generate novel and breakthrough ideas and solutions

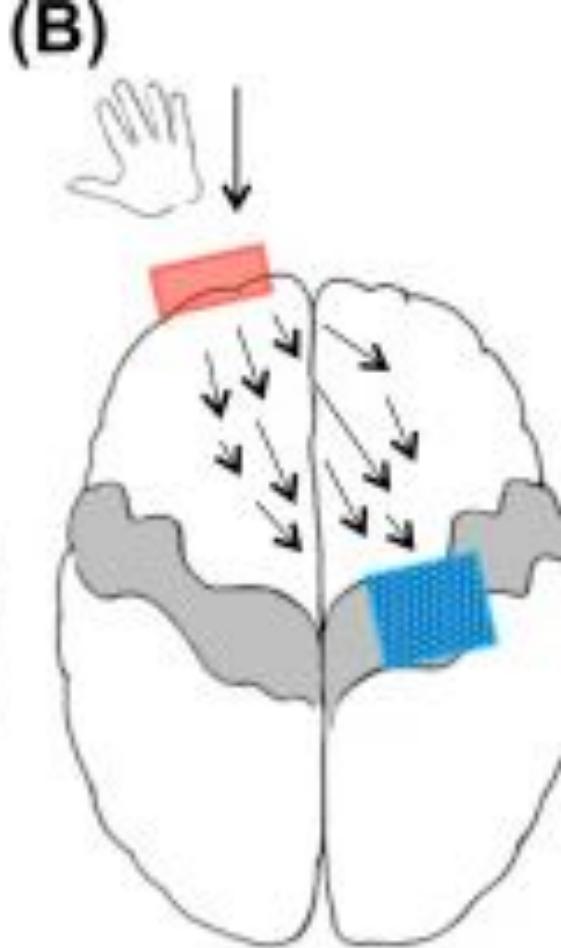
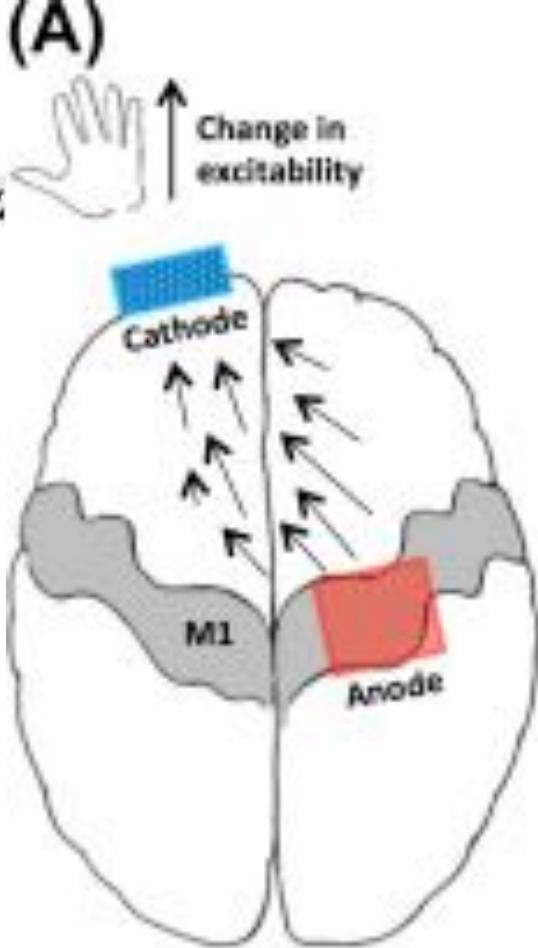
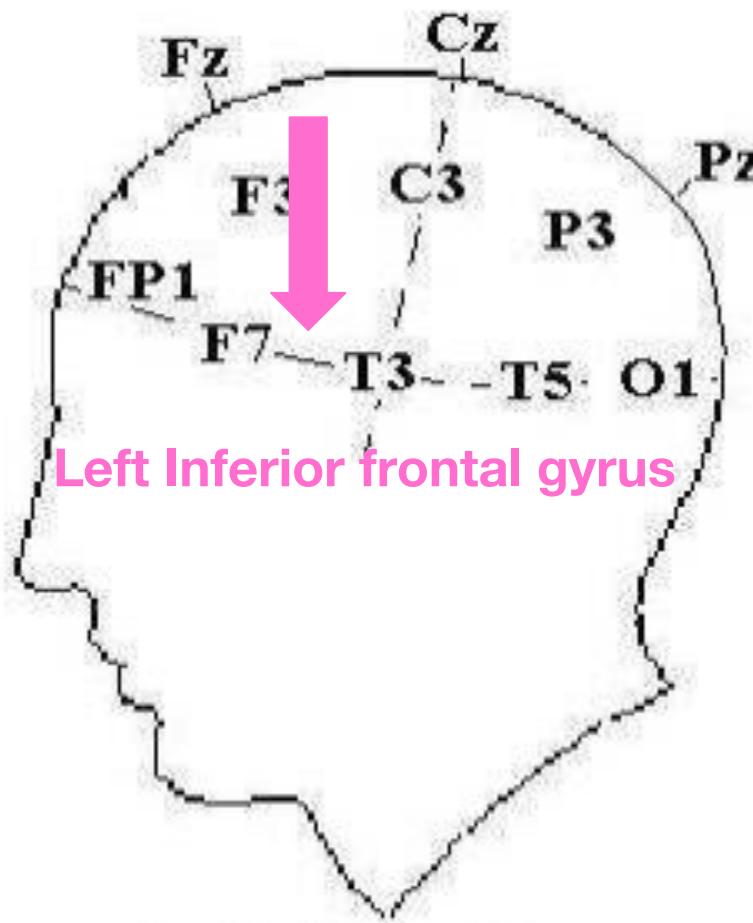
## **Elaboration & Explanation**

Detail-oriented and able to generate intriguing plans

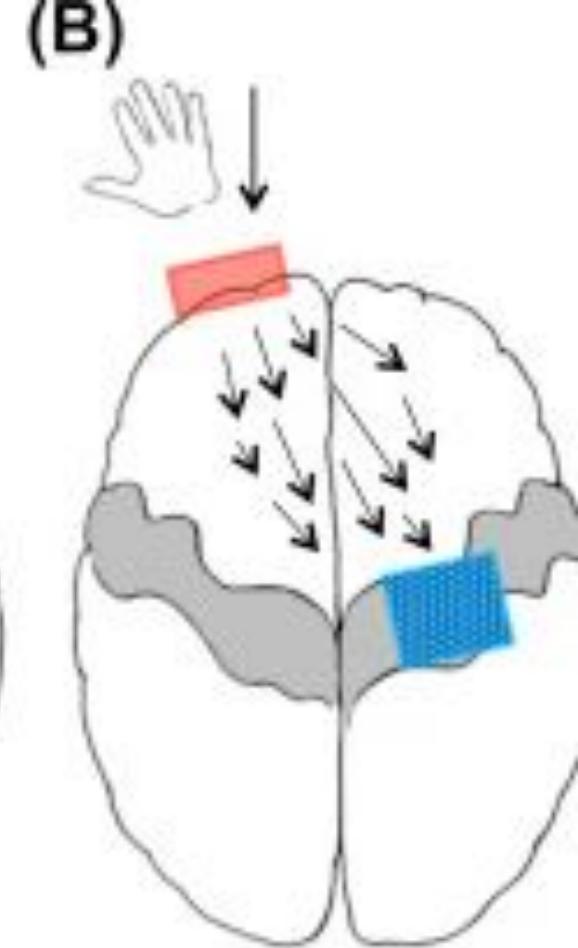
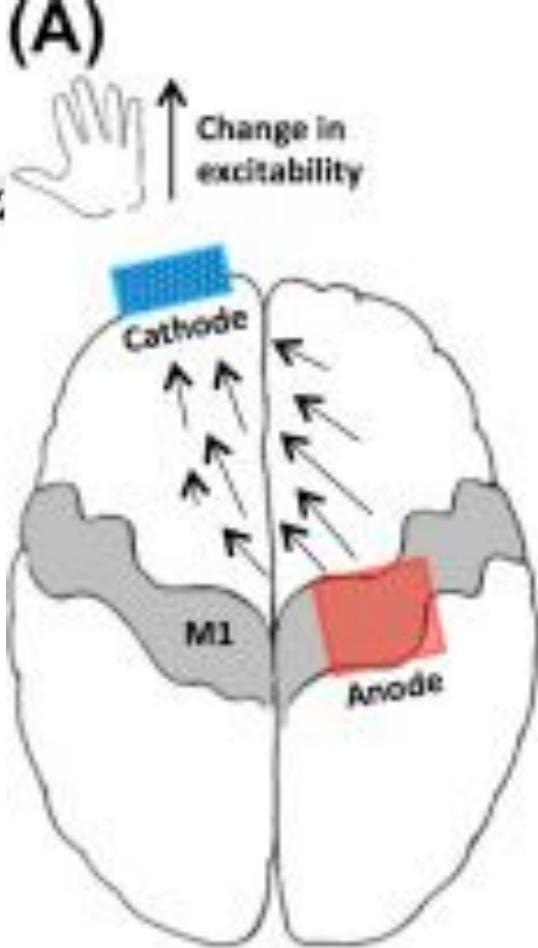
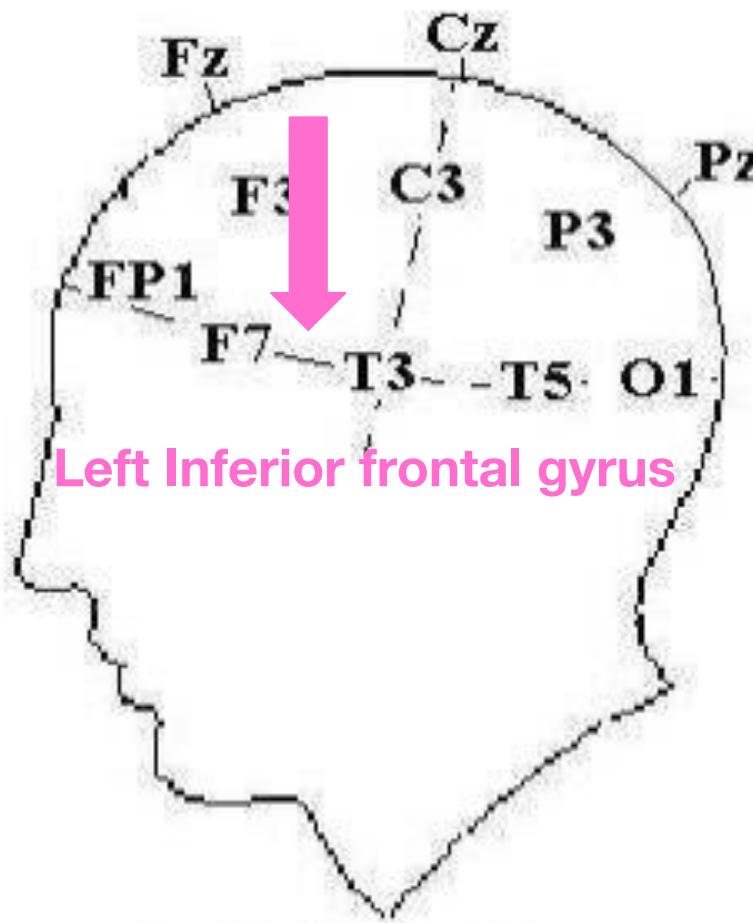




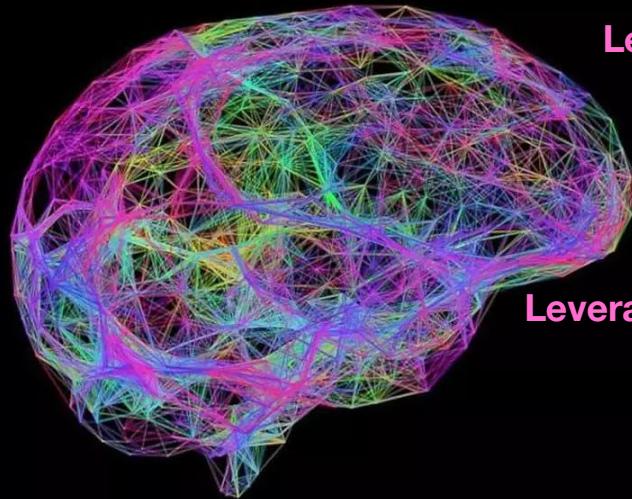




**Downregulate the Downregulation**



# Networks



Left Inferior frontal gyrus

An Important Node

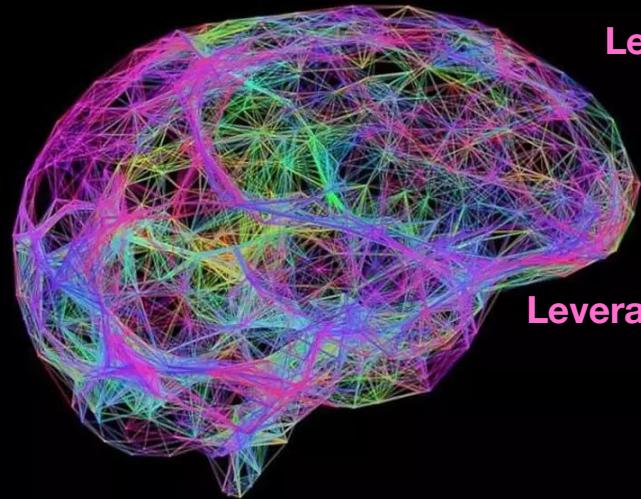
A key to Divergence

Leverage over Neural Populations



Generative      Evaluative

# Networks



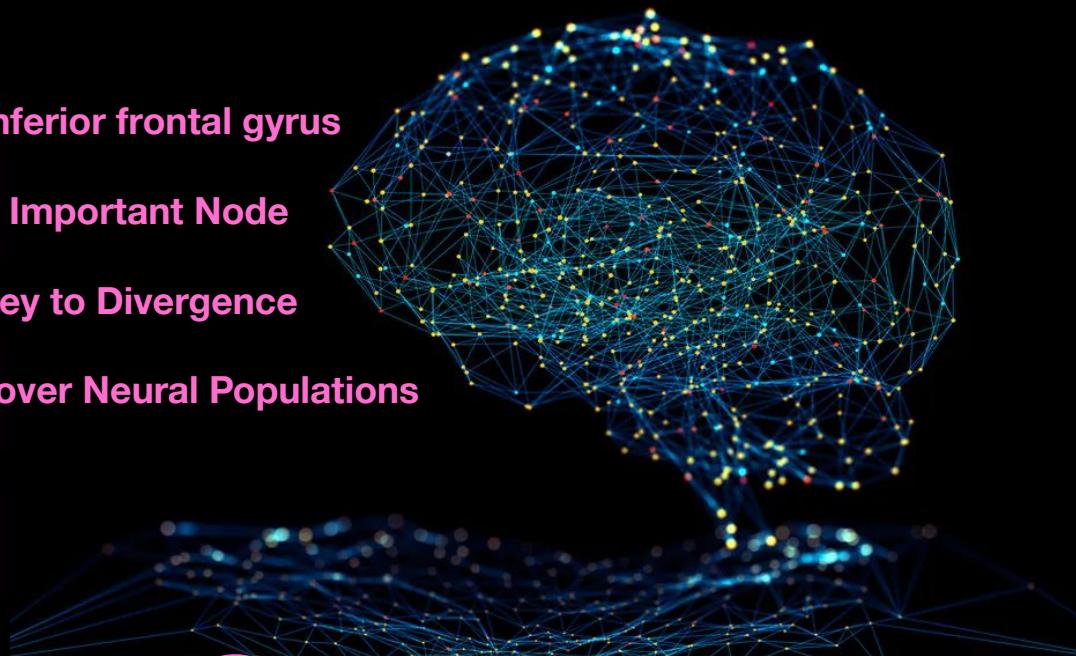
Left Inferior frontal gyrus

An Important Node

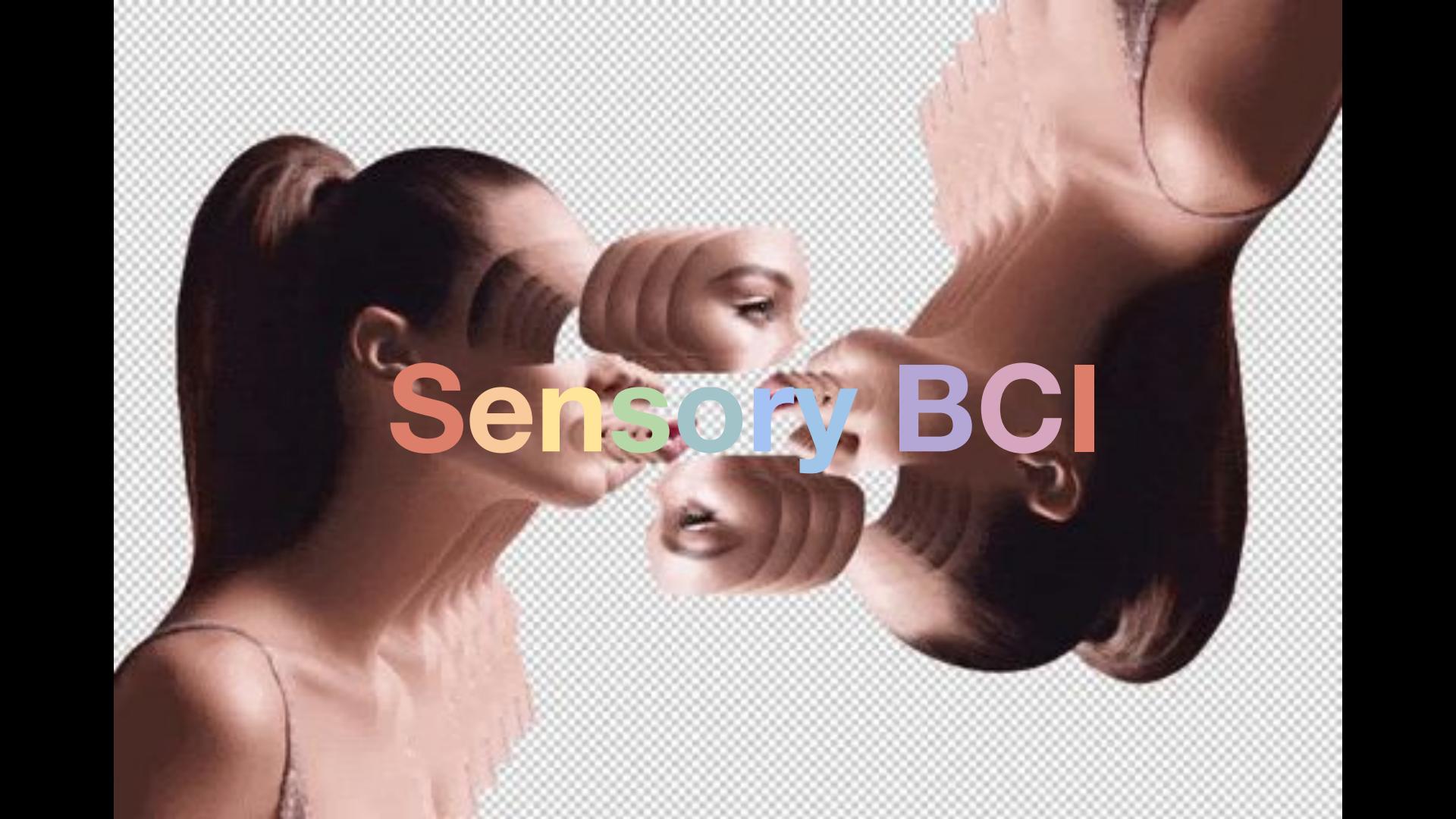
A key to Divergence

Leverage over Neural Populations

# Divergent



# Convergent

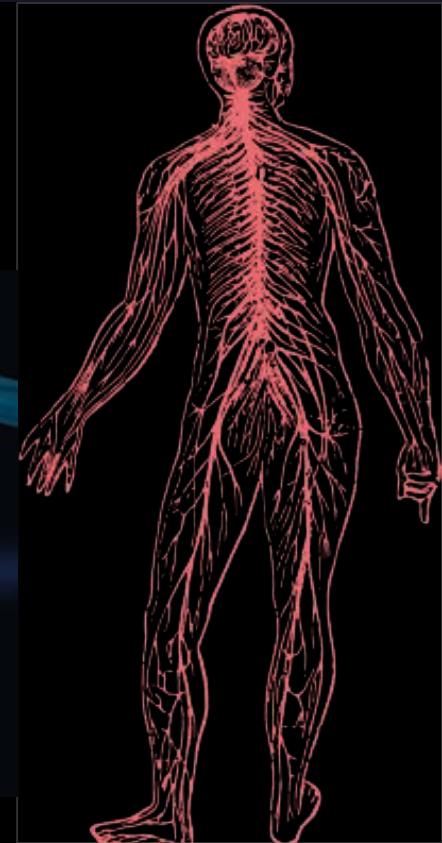
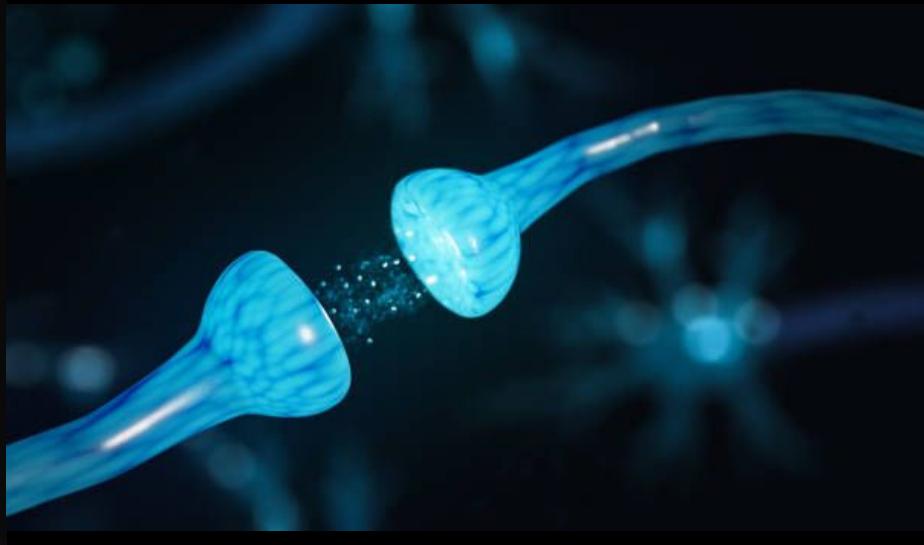
A woman with dark hair tied back is shown from the neck up. She has her head tilted back, eyes closed, and her hands are raised near her face, fingers spread. The lighting is soft, creating a peaceful atmosphere.

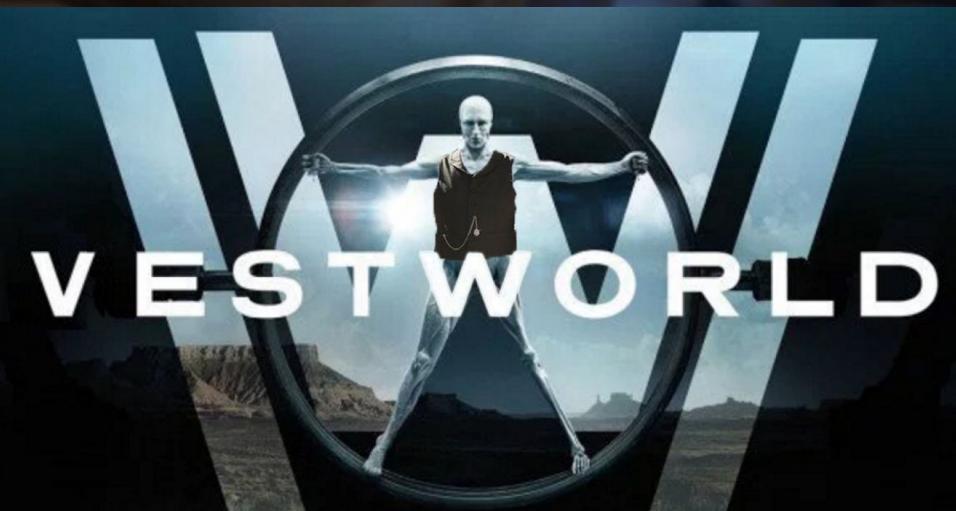
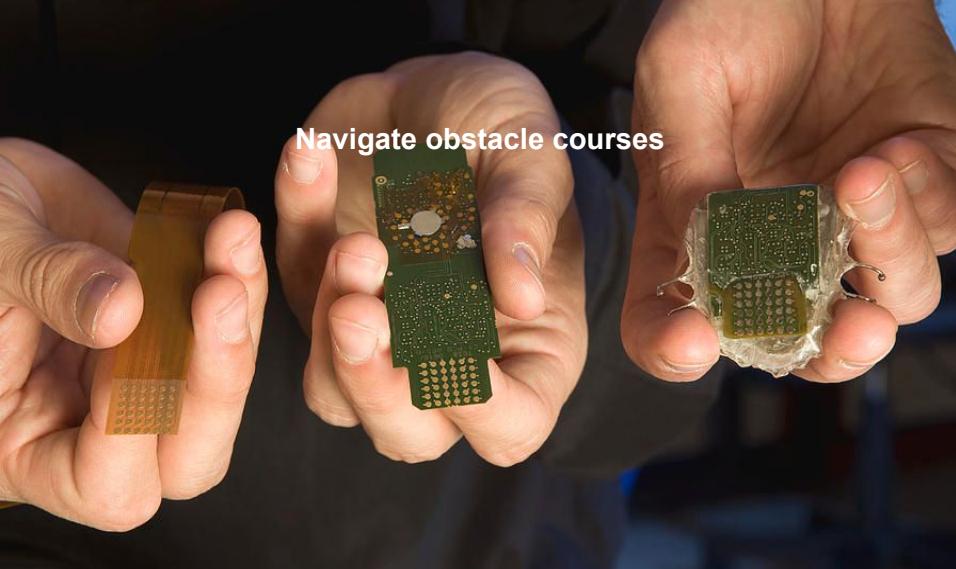
Sensory BCI



# The Human Sensory Landscape

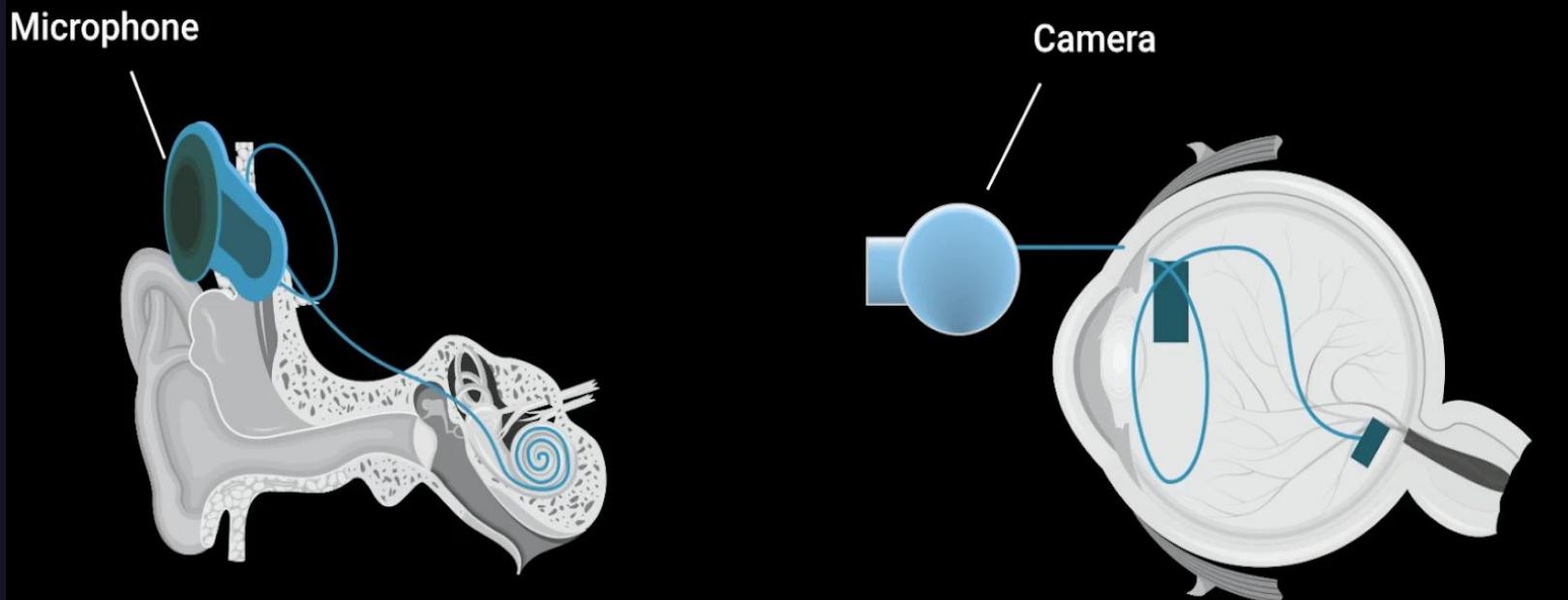
# Sensational Spectrums





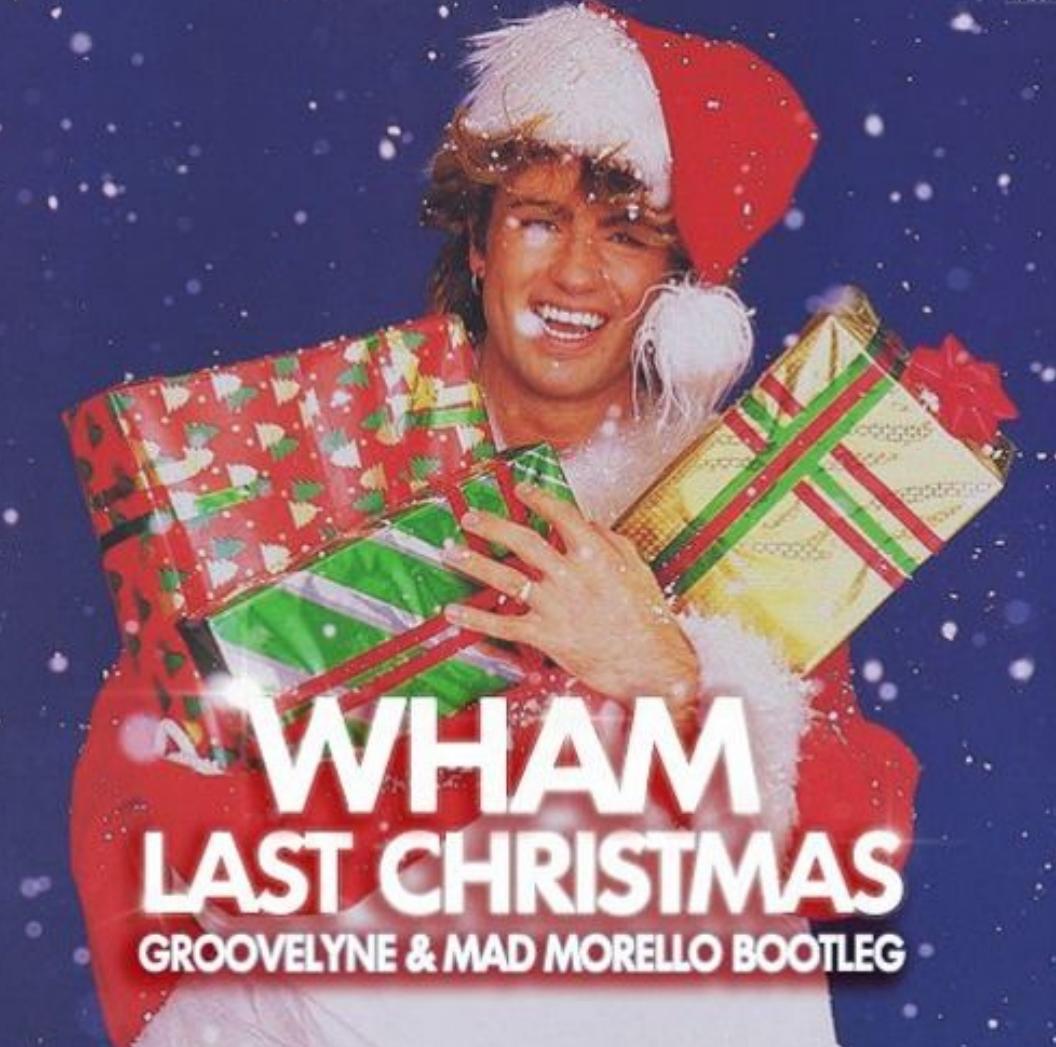


# Fixing Sensory Hardware



Cochlear implant

Retinal implant

A photograph of George Michael dressed as Santa Claus, wearing a red suit and a white fur-trimmed hat. He is smiling and holding several wrapped Christmas gifts in front of him. The background is dark blue with white snowflakes.

# WHAM

# LAST CHRISTMAS

GROOVELYNE & MAD MORELLO BOOTLEG



GEORGE MICHAEL ANDREW RIDGELEY

L A S T C H R I S T M A S

**108 BPM**

# Data Analysis



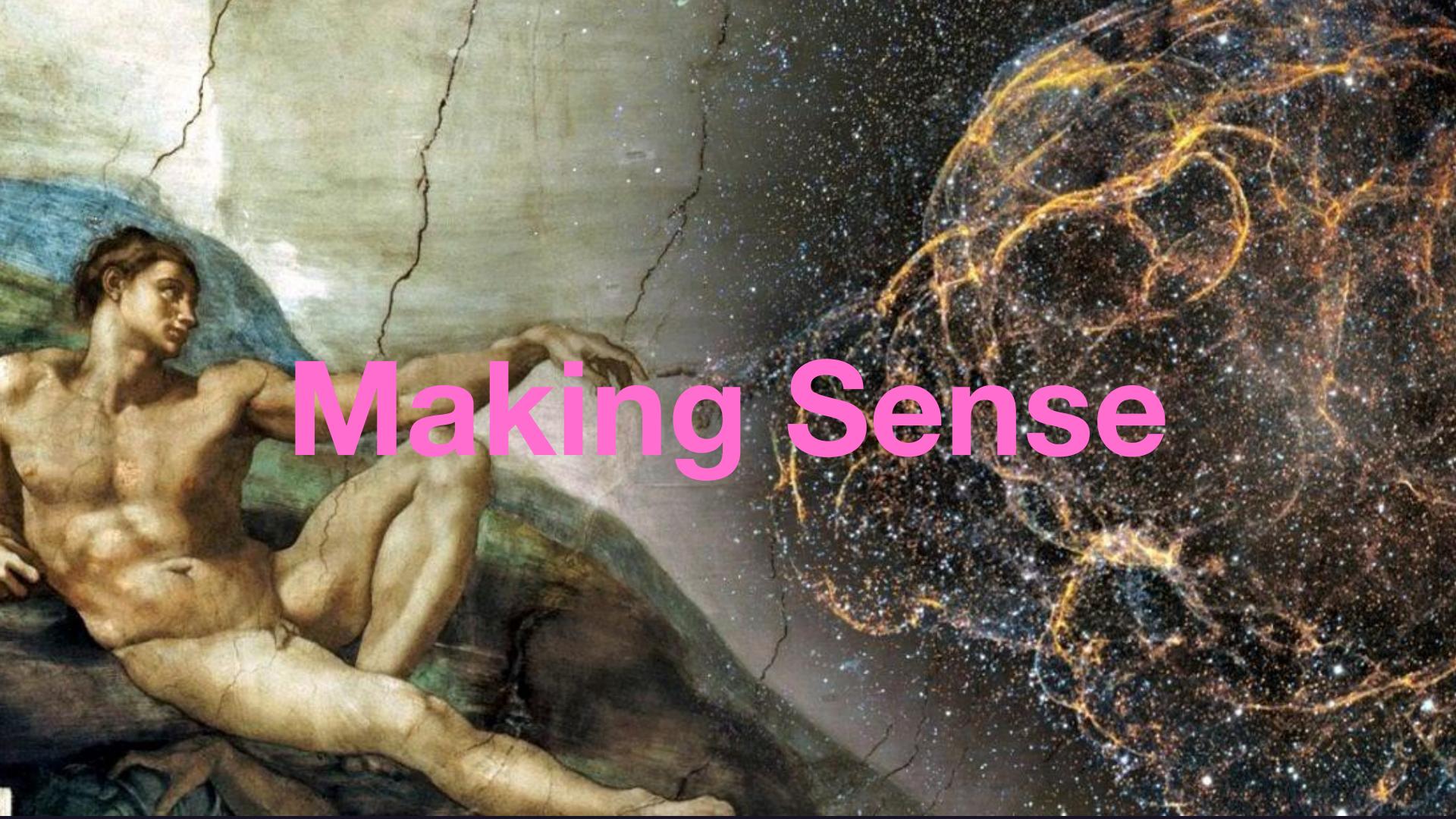
twitter

Data Experiences

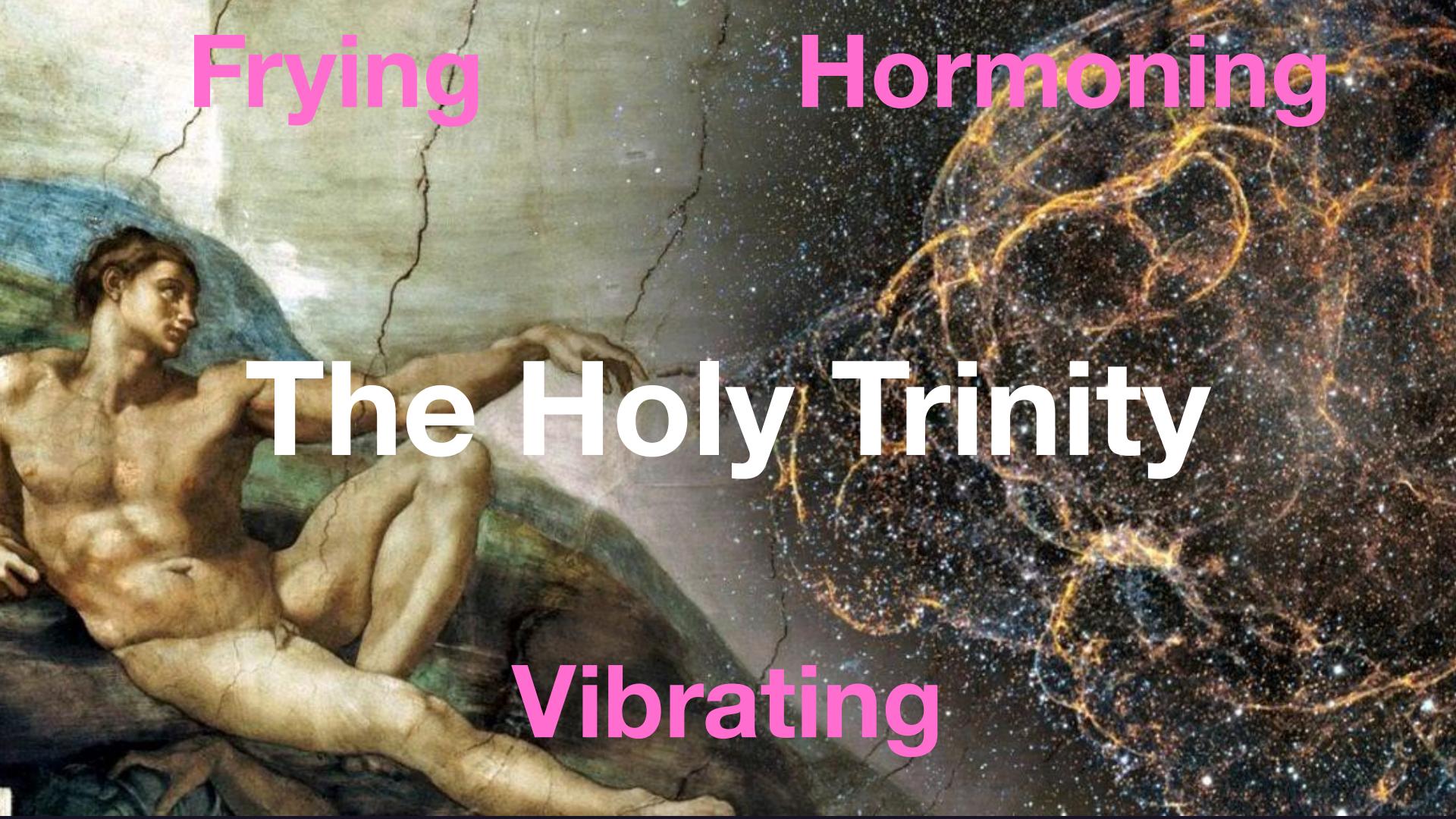


Let's Go  
Oral



A composite image. On the left, a classical painting of a muscular, nude male figure sitting on a rock, looking towards the right. On the right, a dark, star-filled space scene, possibly a galaxy or nebula, with bright yellow and orange filaments.

# Making Sense



Frying

Hormoning

The Holy Trinity

Vibrating