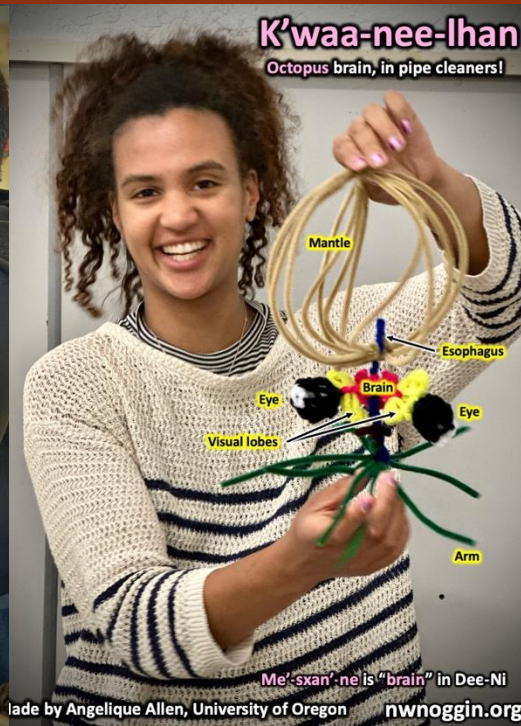


NORTHWEST NOGGIN



BRAINS LEARN WHAT BRAINS DO: AI AND THE BRAIN



WHAT IS AI?

ARTIFICIAL INTELLIGENCE (AI) USES ALGORITHMS TO SEEK PATTERNS IN HUGE AMOUNTS OF DATA, AND LEARN FROM THOSE PATTERNS TO MAKE PREDICTIONS.

LEARN MORE: *What is artificial intelligence (AI)?* <https://www.ibm.com/think/topics/artificial-intelligence>

Machine Learning

Models that make predictions based on data

Neural Networks

A machine learning technique that models the organization of the brain to find patterns in data; Often supervised (inputs/outputs provided)

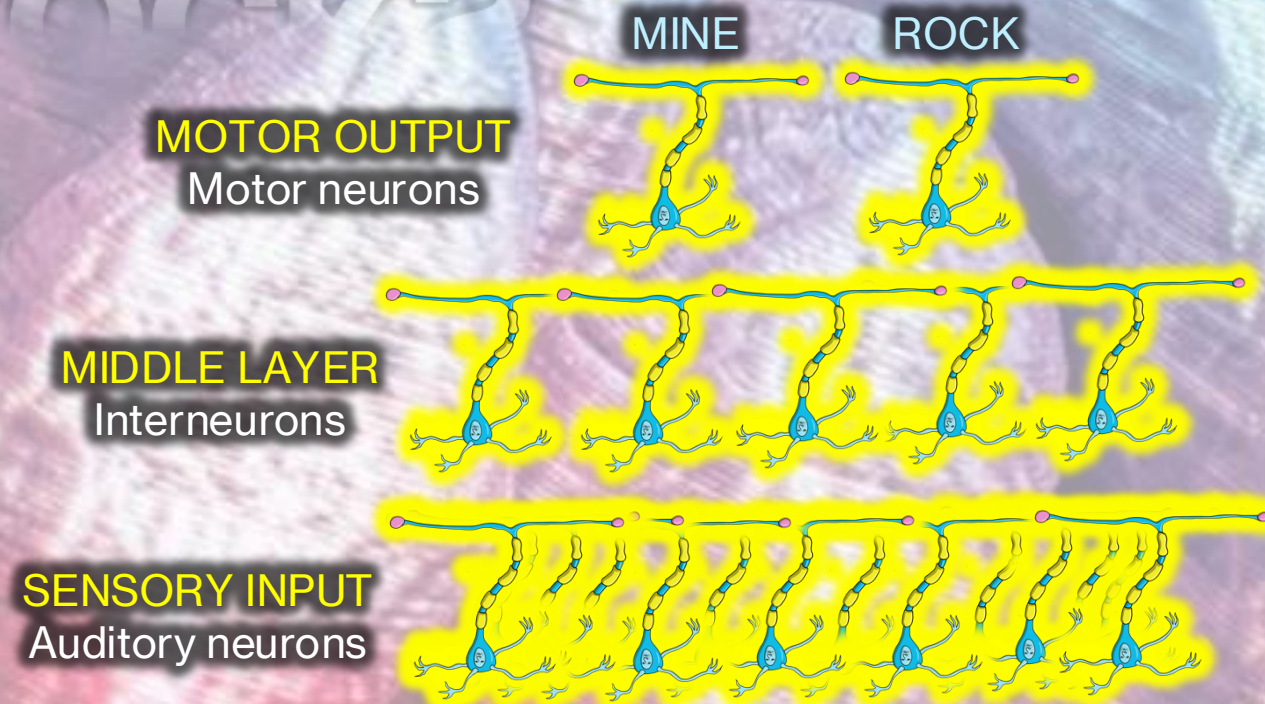
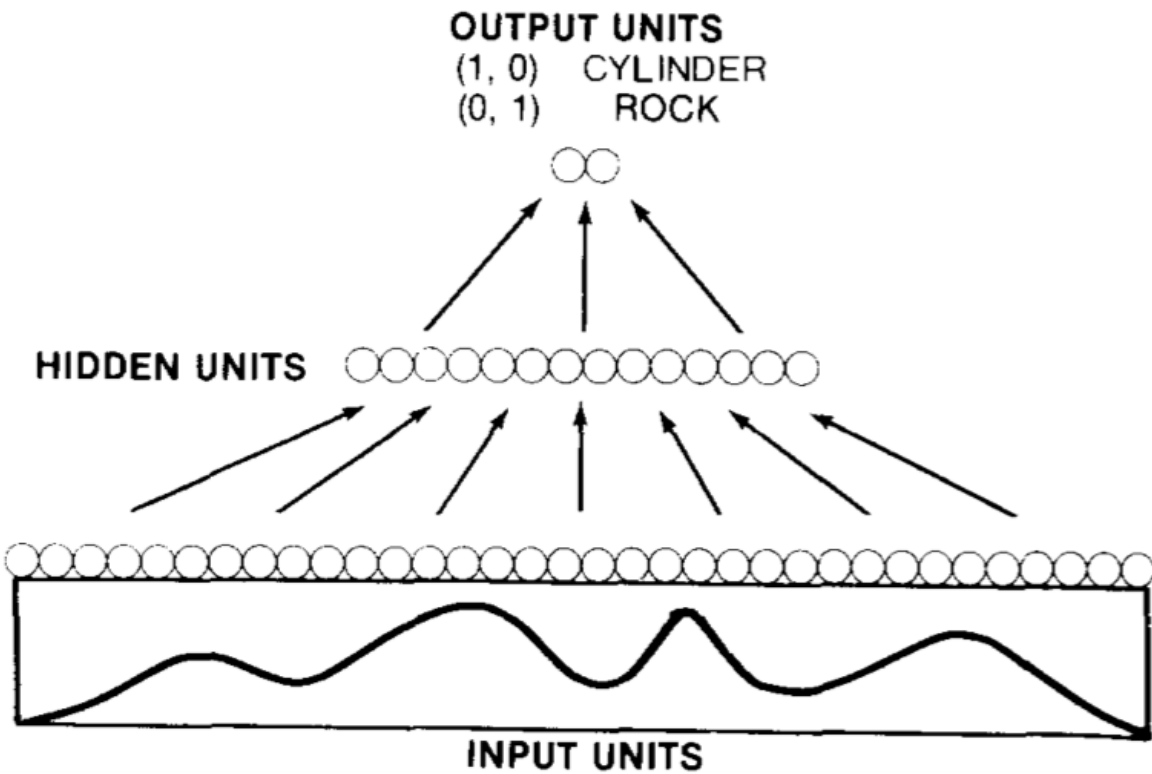
Deep Learning

More complex neural networks that find patterns; unsupervised

Generative AI (including LLMs)

Deep learning systems that create original content; unsupervised

“MINES” VS. ROCKS



“A neural network learning procedure has been applied to the classification of sonar returns from two undersea targets, a metal cylinder and a similarly shaped rock. Networks with an intermediate layer of hidden processing units achieved a classification accuracy as high as 100% on a training set of 104 returns...networks correctly classified up to 90.4% of...returns not contained in the training set...Specific signal features extracted by hidden units in a trained network were identified and related to coding schemes in the pattern of connection strengths between the input and the hidden units. Network performance and classification strategy was comparable to that of trained human listeners.” - *Analysis of hidden units in a layered network trained to classify sonar targets (1998)*

AI is certainly popular, and loads of people use generative AI every day. Sometimes we use it intentionally (for example, we type a specific request into ChatGPT) and in many cases we use it unintentionally (e.g., we read an "AI summary" of a Google search). There are situations where AI technology can be helpful.

BUT...WHICH DATA?

Underrepresented populations

Predictions based on available data; who is missing?

Lack of context

AI has no global understanding of the why;
trained brains still required to assess

Hallucinations

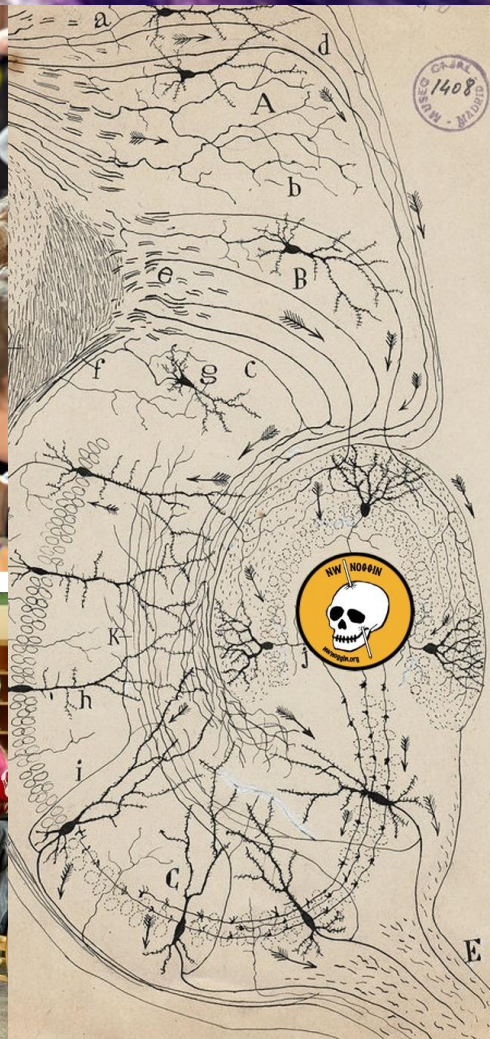
AI makes shit up

EXAMPLE: "AI improves diagnostic sensitivity, prioritizes critical cases, and optimizes radiology workflows. Clinical uses span triage, image classification, report generation, and administrative task automation. However, challenges persist, including limited model interpretability, lack of external validation, demographic bias, and inconsistent regulatory frameworks. Vision-language models expand AI capabilities but show reduced accuracy in underrepresented populations and lack contextual clinical reasoning." - *AI in radiology (2026)*

BRAINS LEARN WHAT BRAINS DO



nwnoggin.org



So if you use ChatGPT, for example, to write a paper, compose an email, or complete a project, your brain only learns how to format a query for ChatGPT.

SCALED DOWN CONNECTIVITY

"We assigned participants to three groups: LLM group, Search Engine group, and Brain-only group, where each participant used a designated tool (or no tool in the latter) to write an essay. We conducted 3 sessions with the same group assignment for each participant.

In the 4th session we asked LLM group participants to use no tools (LLM-to-Brain), and Brain-only group participants to use an LLM (Brain-to-LLM). We used EEG to record ' brain activity in order to assess cognitive engagement and cognitive load, and gain a deeper understanding of neural activations during the essay writing task.

Brain connectivity systematically scaled down with the amount of external support: the Brain-only group exhibited the strongest, widest-ranging networks, Search Engine group showed intermediate engagement, and LLM assistance elicited the weakest overall coupling."

"While LLMs offer immediate convenience, our findings highlight potential cognitive costs. Over four months, LLM users consistently underperformed at neural, linguistic, and behavioral levels..."

These results raise concerns about the long-term educational implications of LLM reliance and underscore the need for deeper inquiry into AI's role in learning..."

Your Brain on ChatGPT: Accumulation of Cognitive Debt when Using an AI Assistant for Essay Writing Task; Check MIT project's website: <https://www.brainonllm.com>



“NEGATIVE LEARNING EFFECTS”

"A key question is how generative AI affects learning – how humans acquire new skills as they perform tasks. Learning is critical to long-term productivity, especially since generative AI is fallible and users must check its outputs. We study this question via a field experiment where we provide a thousand high school math students with access to generative AI tutors.

To understand the differential impact of tool design on learning, we deploy two AI tutors: one that mimics a standard ChatGPT interface (“GPT Base”) and one with prompts designed to safeguard learning (“GPT Tutor”)...our results show that having GPT-4 access while solving problems significantly improves performance (48% improvement for GPT Base and 127% for GPT Tutor).

However, we additionally find that when access is subsequently taken away, students actually perform worse than those who never had access (17% reduction in grades for GPT Base) – i.e., unfettered access to GPT-4 can harm educational outcomes. These negative learning effects are largely mitigated by the safeguards in GPT Tutor. Without guardrails, students attempt to use GPT-4 as a “crutch” during practice problem sessions, and subsequently perform worse on their own. Thus, decision-makers must be cautious about design choices underlying generative AI deployments to preserve skill learning and long-term productivity..”

- *Generative AI Without Guardrails Can Harm Learning (2025)*

SKILL LOSS CONCERNS

AMA NEWS WIRE



More than 80% of physicians use AI professionally: AMA survey

Mar 12, 2026

The vast majority of physicians surveyed by the AMA say they are using augmented intelligence (AI) tools to stay on top of medical research, create discharge instructions, document medical visits and more. The 81% use rate is more than double what it was when the AMA first polled doctors on health AI in 2023, showing how physicians' comfort with this technology has grown rapidly as the tools have become more sophisticated.



Meanwhile, 88% of doctors reported having at least some concern about health AI-related skill loss, with 70% saying they are “very” or “somewhat” concerned about the loss of physician skills among the medical students and residents being trained today.

SOURCE: More than 80% of physicians use AI professionally: AMA survey

LESS CAPABLE BRAINS



IMAGE: <https://www.pixar.com/wall-e>

"...we observed an important effect of GPS use over time, whereby greater GPS use since initial testing was associated with a steeper decline in hippocampal-dependent spatial memory..."
- *Habitual use of GPS negatively impacts spatial memory during self-guided navigation*

GPS is not technically AI,
but again: **Brains learn
what brains do...**

"Our observation supports the assumption that externalization of spatial navigation to technological device (GPS in AR glasses) can decrease the functional coupling between hippocampus and associated brain regions..."
- *Could Prolonged Usage of GPS Navigation Implemented in Augmented Reality Smart Glasses Affect Hippocampal Functional Connectivity?*

ENVIRONMENTAL DEGRADATION

"... When tech giants build massive AI data centers, where do they choose to put them? This study reveals a disturbing pattern: companies consistently dump pollution on Black and Brown neighborhoods while building cleaner facilities in white communities. We call this 'digital redlining' - a modern twist on the racist housing policies that segregated American cities decades ago..."

- *Digital redlining: AI Infrastructure and Environmental Racism in Contemporary America (2025)*

IMAGE: <https://hillsboroherald.com/190-years-of-farming-ends-as-latest-massive-data-centers-and-factories-expand-in-hillsboro/>



TOP STORY SPOTLIGHT

NC's mixed feelings on data centers part of growing national trend

Richard Craver Mar 28, 2026 0

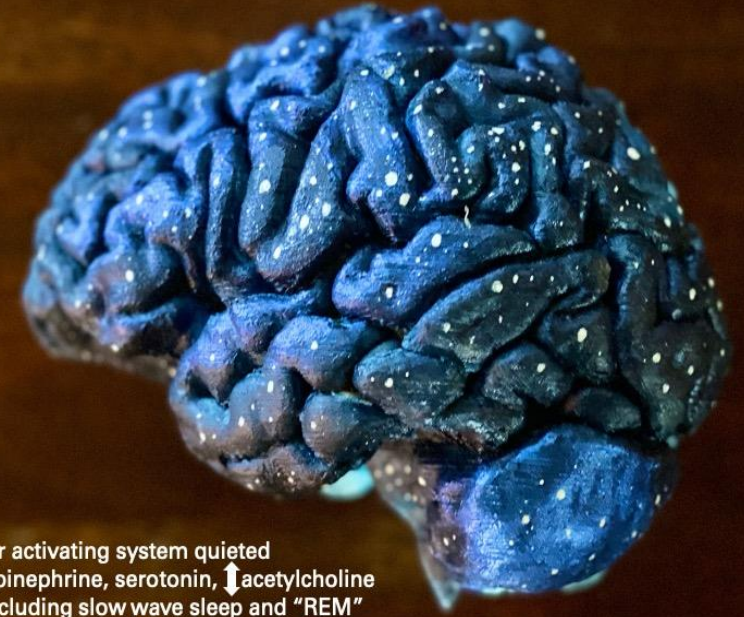
WINSTON-SALEM
JOURNAL

"... results reveal that AI activities, especially in high-intensity regimes, are significantly associated with increased CO2 emissions and environmental degradation..."

- *The Two Tales of AI: A Global assessment of the environmental impacts of artificial intelligence (2025)*

Sleeping Brain

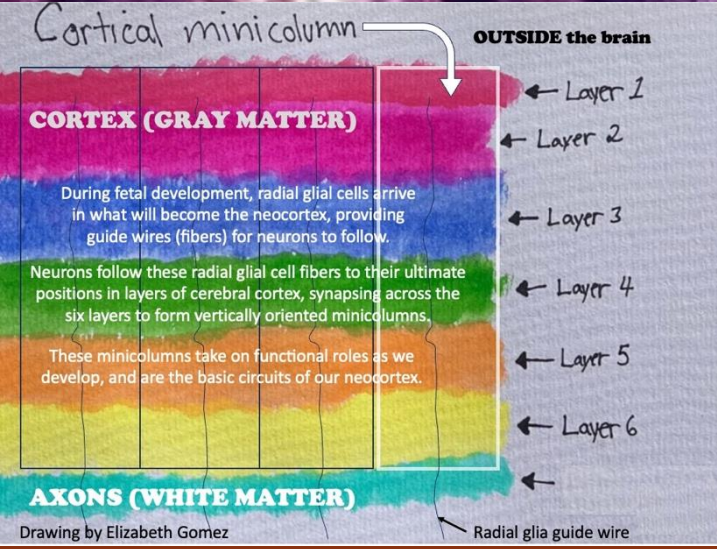
Circadian Brain, by Kindra Crick



Brainstem reticular activating system quieted
↓ Dopamine, norepinephrine, serotonin, ↑ acetylcholine
Multiple stages, including slow wave sleep and "REM"
Delta/theta activity recorded via EEG; beta/alpha (REM)
Cerebrospinal fluid enters brain, cleaning out debris

OVERFITTING

CAREFUL JUDGING



"... Recently, research on artificial neural networks has shown that during learning, such networks face a ubiquitous problem: that of overfitting to a particular dataset, which leads to failures in generalization and therefore performance on novel datasets. Notably, the techniques that researchers employ to rescue overfitted artificial neural networks generally involve sampling from an out-of-distribution or randomized dataset. The overfitted brain hypothesis is that the brains of organisms similarly face the challenge of fitting too well to their daily distribution of stimuli, causing overfitting and poor generalization. By hallucinating out-of-distribution sensory stimulation every night, the brain is able to rescue the generalizability of its perceptual and cognitive abilities and increase task performance...."

- *The overfitted brain: Dreams evolved to assist generalization (2021)*



“ ”

Don't let AI write anything for you. Write that email from scratch. Write that memo from scratch. Don't flee that strain. You need it as much as you need those 10,000 steps a day.

— **Cal Newport**, Georgetown computer science professor and bestselling author of *Deep Work*.

**THE CHRONICLE
OF HIGHER EDUCATION**

**Is AI Making Us Stupid?
Cal Newport Is Worried.**

The Georgetown computer scientist on resisting the temptation to automate hard thought.

For a Student Who Used AI to Write a Paper
Joseph Fasano

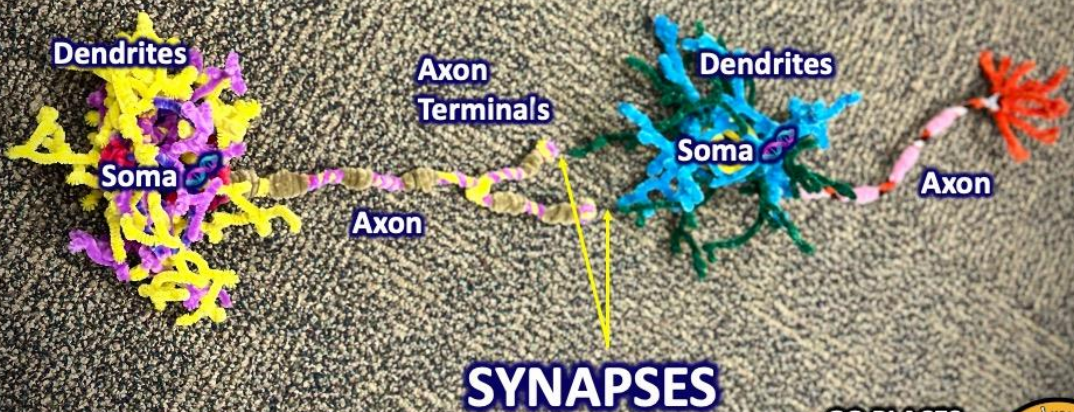
Now I let it fall back
in the grasses.
I hear you. I know
this life is hard now.
I know your days are precious
on this earth.
But what are you trying
to be free of?
The living? The miraculous
task of it?
Love is for the ones who love the work.

YOUR BRAIN IS UNIQUE

WE BEGIN WITH ~175 – 200 BILLION NEURONS
END UP WITH 86 BILLION IN THE AVERAGE ADULT!
FORMATION OF NETWORKS, BASED ON EXPERIENCE

Neurons Connect

YOU ARE NEURAL NETWORKS



100 TRILLION synapses!

GO PLACES
EXAMINE BRAINS
ASK QUESTIONS
MAKE ART



Perceptions, Memories,
Expectations, Habits,
Biases, Schema,
Jumping to conclusions

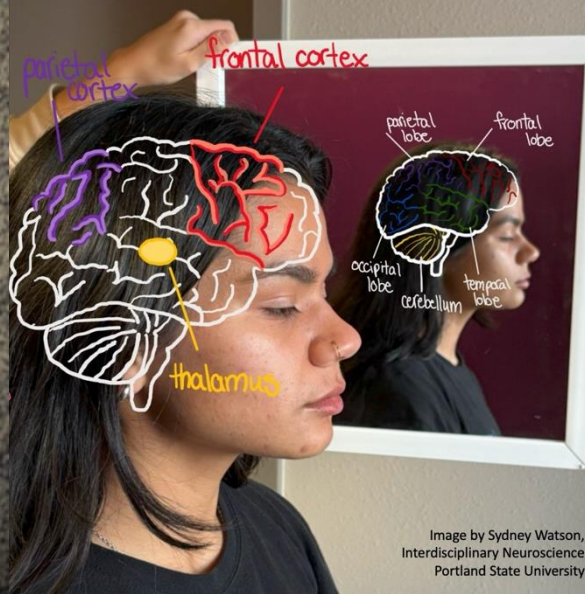
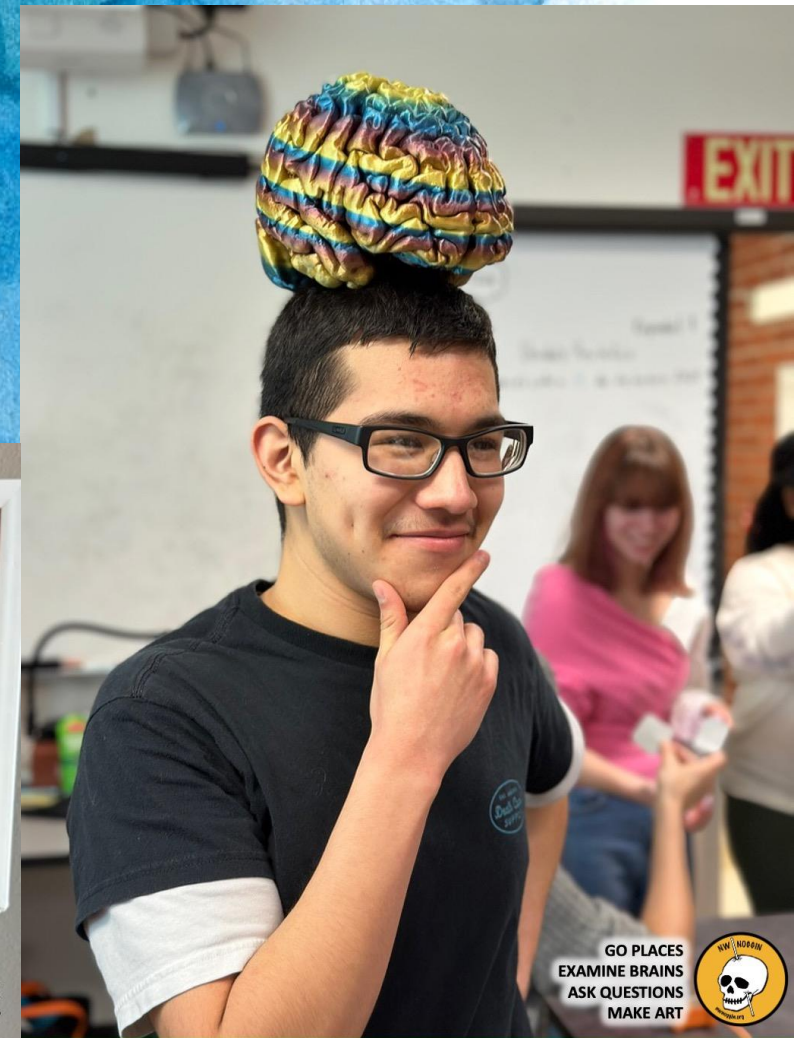


Image by Sydney Watson,
Interdisciplinary Neuroscience
Portland State University



GO PLACES
EXAMINE BRAINS
ASK QUESTIONS
MAKE ART



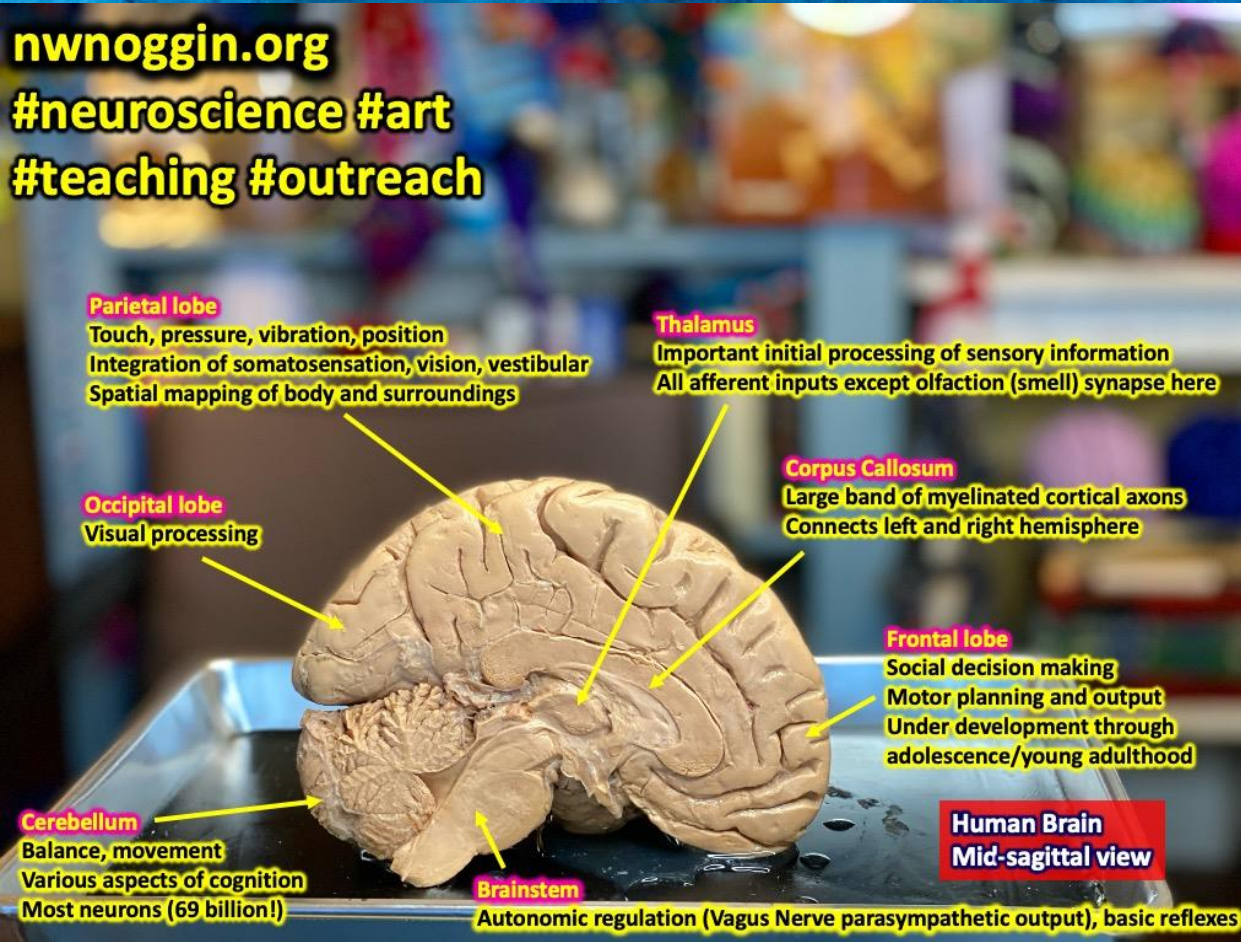
BRAINS DEVELOP

*How are you perceived?
What experiences shape you?
What opportunities do you have?
What are the social rules for you?*

**ADULT BRAINS BECOME MORE FIXED: NETWORK IN HABITS AND BIASES
YOUNG BRAINS ARE MORE PLASTIC, CHANGEABLE, AND RESPOND TO NOW**

nwnoggin.org
#neuroscience #art
#teaching #outreach

And the world always changes
We need brains that are changing TODAY



LEARN MORE @ nwnoggin.org

ENRICHMENT MATTERS

MARIAN DIAMOND RESEARCH

More enrichment, more pathways, more possibility,...



AVOID OVERFITTING
Less standardized testing
Fewer textbooks, more art



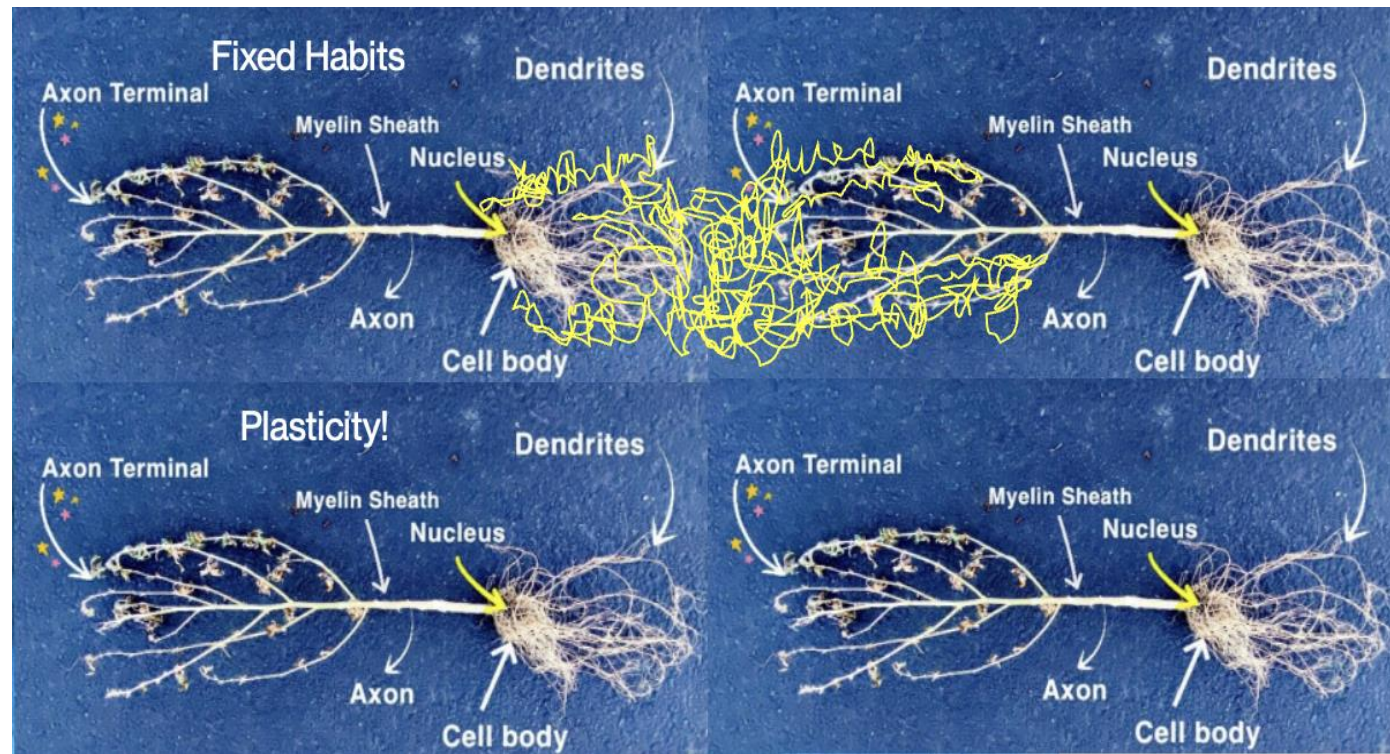
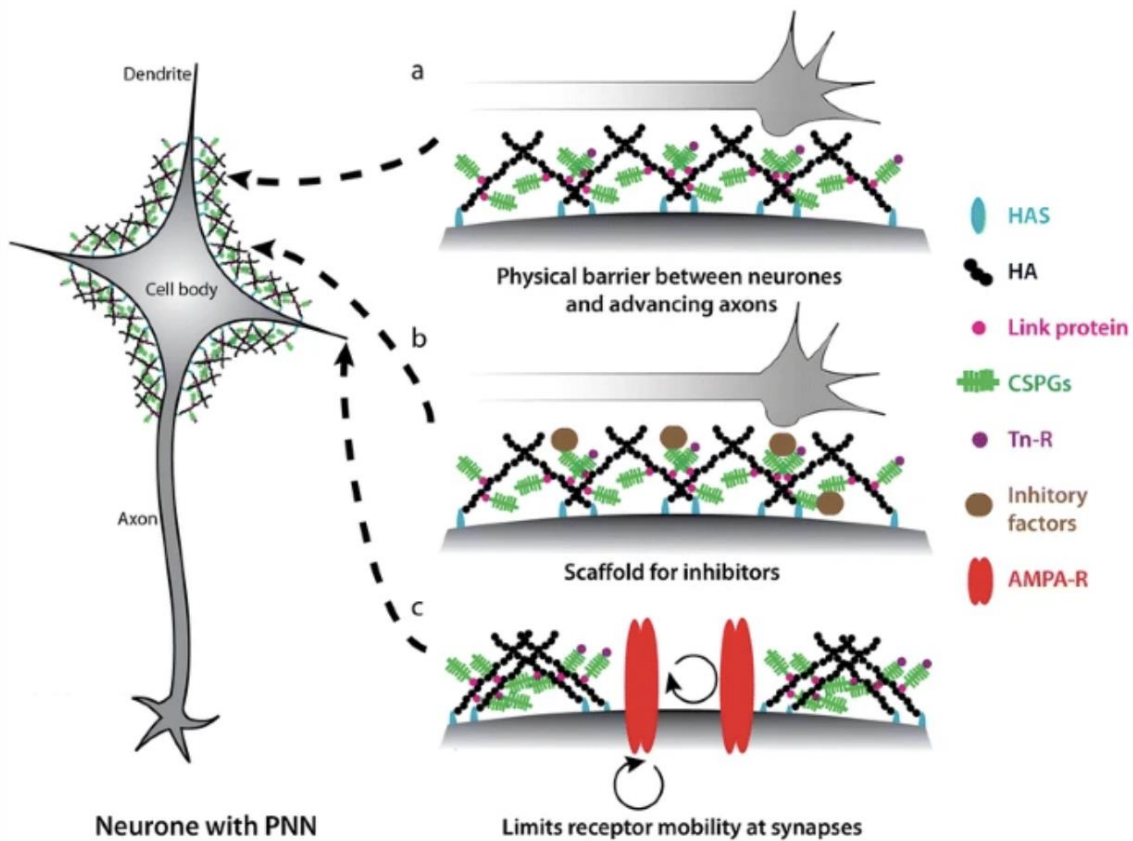
if the human brain is so "complex" and "smart" why are some people so stupid?



PLASTICITY IS POSSIBLE

ADULT BRAINS CAN ADAPT!
FIXED NETWORKS REQUIRE LESS ENERGY TO MAINTAIN AS IS
PLASTICITY (CHANGE) TAKES ENERGY, EFFORT AND GROWTH

The perineuronal net and the control of CNS plasticity,
Difei Wang & James Fawcett, Cell & Tissue Research (2012)



MOTIVATION MATTERS

**SOMETHING RELEVANT/NOVEL INCREASES AROUSAL AND ATTENTION
DOPAMINE RELEASED, PLASTICITY RESTORED, LEARNING OCCURS**

“Although we speculate there is a wide range of factors, one such biological factor that may...trigger PNN plasticity is dopamine.” - *Net gain and loss: influence of natural rewards and drugs of abuse on perineuronal nets (2022)*

Dopamine pathways in the CNS

GO PLACES EXAMINE BRAINS ASK QUESTIONS MAKE ART

NIGROSTRIATAL PATHWAY
Substantia Nigra to Striatum
Striped ("striated") regions of basal ganglia; caudate and putamen
***MOVE

MESOLIMBIC PATHWAY
VTA to Nucleus Accumbens (Nac)
And other limbic regions, including hypothalamus
***MOTIVATE

MESOCORTICAL PATHWAY
VTA to cortex
Including frontal cortex
***MOTIVATE

TUBEROINFUNDIBULAR PATHWAY: Hypothalamus to Pituitary (DA prolactin)

Learning underway

GO PLACES EXAMINE BRAINS ASK QUESTIONS MAKE ART

LEARN MORE @ nwnoggin.org

Teaching Matters

GO PLACES EXAMINE BRAINS ASK QUESTIONS MAKE ART

ATEA AMERICAN TECHNICAL EDUCATION ASSOCIATION

Your brain learns what your brain does

Guilford Technical Community College
Wednesday, May 27, 1 – 2pm

GO PLACES EXAMINE BRAINS ASK QUESTIONS MAKE ART

ALL VOLUNTEER

ALL OF US. FOR FOURTEEN YEARS (SINCE 2012)!
NO ADMISSION - NO TUITION - OPEN TO EVERYONE
80,000+ PUBLIC K12 STUDENTS/COMMUNITY MEMBERS
LOCAL/NATIONAL/INTERNATIONAL COLLABORATORS



Northwest Noggin and the Interdisciplinary Neuroscience Association at SfN 2025



GO PLACES

- WHERE STEM PROGRAMS DON'T GO
- WHERE MONEY AND RESOURCES DON'T GO
- K-12 PUBLIC SCHOOLS
- RURAL AND URBAN COMMUNITIES
- HOUSELESS YOUTH NONPROFITS
- CORRECTIONAL FACILITIES

Siletz, Amity & Willamina, OR
Pop: 4000

Davenport, WA
Pop: 1700

Astoria, OR
Pop: 10,000

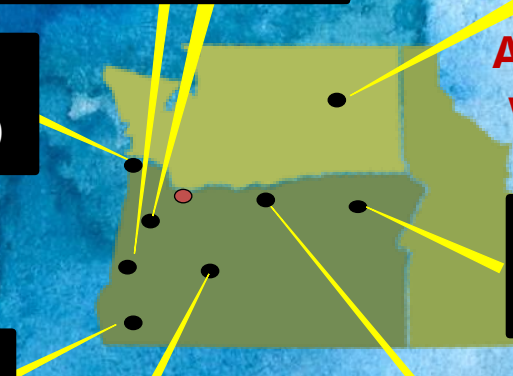
A few places we've been

La Grande, OR
Pop: 13,000

Meservy Meadows, OR
Pop: ~40

Sisters, OR
Pop: 3081

Heppner & Lone, OR
Pop: 1240



Youth get visual, hands-on experience with the brain

NW Noggin, a neuroscience outreach nonprofit, reached out to youth at MacLaren Youth Correctional Facility this week to teach about brain development.



Noggins on the Coast

Astoria-Megler Bridge
A four mile long steel cantilever through truss bridge connecting Oregon and Washington state



Corpus Callosum
White matter (myelinated neuron axons) connecting the cortex in both our left and right hemispheres





PORTLAND AREA
 Portland Public Schools
 Vancouver Public Schools
 Beaverton Public Schools
 Evergreen Public Schools
 Hillsboro Public Schools
 David Douglas Public Schools
 Parkrose High School
 Reynolds High School
 Oregon City High School
 Tigard-Tualatin Public Schools
 Columbia City Elementary
 Pear Center for Homeless Youth
 Bio Gift
 SIN Chapter Mtg
 Portland Art Museum
 University Club
 PLACE Gallery
 Vancouver Symphony
 Science on Tap
 NOGGINFEST
 Paragon Gallery
 Bridge to Pathways, St. Helens
 Doug Fir
 Oregon Public Broadcasting (OPB)
 Portland Tennis & Education Center
 March for Science
 STEAM Nights
 Comic-Con
 AMWA (American Medical Women's Association)
 Providence Hospital BRAIN WATCH
 Intel
 Noggin Talks @ Velo Cult/Honey Latte/Floyd's Coffee
 OMSI Brain Fair
 PNCA Make + Think + Code
 OHSU Brain Institute
 Alzheimer's Association of Oregon
 Legacy Research Institute
 RACC Juice Awards
 ONPRC
 KGW News
 Helen Gordon Child Development Center
 Asian New Year in the Park
 Oregon Youth Neuroscience Conference
 Undergraduate Research Opportunity Fair
 University Center for Excellence in Developmental Disabilities

WILLAMETTE VALLEY
 Amity/Willamina High Schools
 Canby School District
 Eugene Public Schools
 OAEA Conference
 Oregon State University
 University of Oregon
 OPAHEC
 Maclaren Youth Correction Facility
 Coffee Creek Correctional Facility
 Oregon Psychiatric Physicians Association
 Oregon Senate testimony

OREGON COAST
 Astoria Public Schools
 Warrenton Public Schools
 Knappa Public Schools
 Jewell School
 Seaside Public Schools
 Lincoln County Schools
 Fort George Brewery
 Street 14 Coffee
 Siletz Valley Academy
 Kids Make Theater/Liberty Theater
 Girls Rock Coos Bay
 Salishan (TRIO)

CENTRAL/EASTERN OREGON
 Eastern Oregon University
 Sisters Public Schools
 Roundhouse Foundation
 Frontier county schools
 Heppner & Lone Public Schools
 NEDAHEC/La Grande
 Caldera Arts

SOUTHERN OREGON
 Indian Education Summer Camp
 Grants Pass Public Schools
 Southern Oregon University
 SW Oregon Economic Summit

INTERNATIONAL
 Universidad de Chile, Valparaíso Chile
 Ciencia al Tiro, Valparaíso Chile
 Gordon Museum of Pathology, Kings College London
 Sidmouth Science Festival, England
 British International School, Gaza
 Brain Olympics, the Netherlands

UNITED STATES
 SIN conferences (San Diego, Washington, New Orleans, Chicago)
 San Diego Unified Public Schools
 Washington DC Public Schools
 Chicago Public Schools
 Eastern Washington, Davenport Public Schools
 Society for Social Neuroscience conference, Chicago
 Sidwell Friends School
 NOGN (Neuroscience Outreach Group) @ NYU
 Dana Foundation
 Waikiki Elementary School, Hawaii
 White House Frontiers Conference (Pittsburgh)
 U.S. Congress
 White House Office of Science & Technology Policy
 Phillips Collection (DC)
 TRIO conference, Boise ID
 TRIO Conference, Bellevue WA
 Boise State University

MORE places we've been!!



LISTEN

-LIVED EXPERIENCES
-RELEVANT KNOWLEDGE
-SEEING OTHER PEOPLE



Heppner, OR



Knappa, OR

HOMELESSNESS & THE BRAIN

Portland, OR

Thurs, Oct 19th
10am - 1pm



pearmentor gallery
338 NW 6th Ave

nwnoggin.org pearmentor.org

STREET KIDS
ART
NEURO-
SCIENCE

Noggins + NeuroChem visit Gaza



Soma
Cell body – الجسم الخلية

Dendrite
Finger – أصابع
Snakeskin – جلد الأفعى
Ear – أذن

Axon
Spine – محور عصبي
Stem – جذع
Rope – حبل

Axon terminal
Roots – جذور
Mouth – فم

#showusyourbraincell

GO PLACES
EXAMINE BRAINS
ASK QUESTIONS
MAKE ART



DEE-NI NEURON

Siletz, OR

Do neuroanatomical terms have
to derive from Latin and Greek?

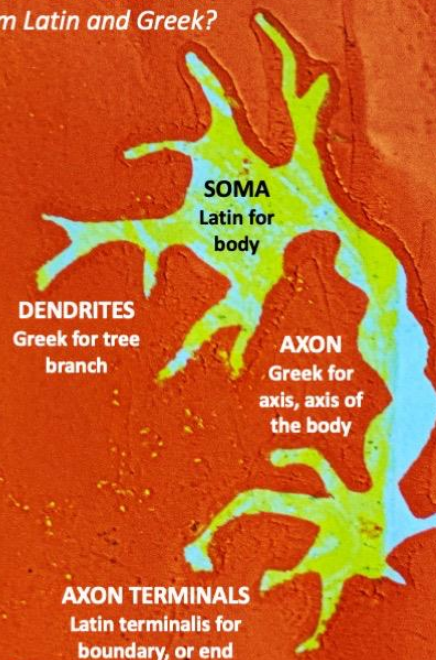


HII-NVST'E
Body

K'WEE-DE
Tree needles

CH'VTLH-K'VSH TIN'SH
Long, skinny lightning

LE'-VN'
End of an object



SOMA
Latin for
body

DENDRITES
Greek for tree
branch

AXON
Greek for
axis, axis of
the body

AXON TERMINALS
Latin terminalis for
boundary, or end

#showusyourbraincell

nwnoggin.org

Why do we throw up?

New Post!

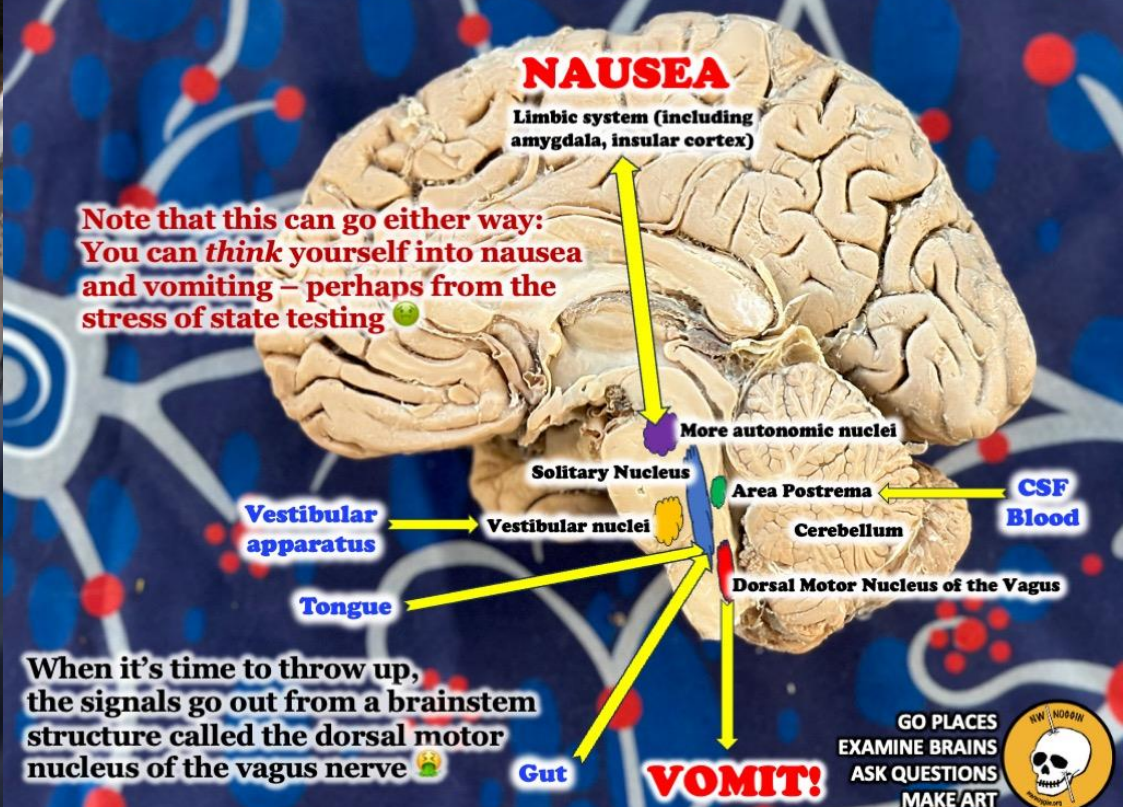
"I don't like testing, and sometimes it makes me throw up. Why do we throw up?" - Third grade student

Important questions from elementary school!



Vomiting and Nausea in the Brain

The brainstem receives inputs from the gut (including the microbiome) and tongue in the solitary nucleus, the area postrema samples the blood and cerebrospinal fluid, the vestibular nuclei and cerebellum respond to signals from the vestibular apparatus, and additional autonomic nuclei further integrate this information and share it with higher limbic and cortical regions that generate feelings, including nausea...



When it's time to throw up, the signals go out from a brainstem structure called the dorsal motor nucleus of the vagus 🤢

GO PLACES
EXAMINE BRAINS
ASK QUESTIONS
MAKE ART

GO PLACES
EXAMINE BRAINS
ASK QUESTIONS
MAKE ART



SHARE STORIES

- EMPOWER NEW VOICES
- BROADEN THE CONVERSATION
- MAKE PUBLIC INVESTMENT IN RESEARCH RELEVANT
- INVITE NEW PARTICIPANTS, PERSPECTIVES & **BRAINS**



“The youth had an AMAZING time on Friday. They were beaming when we left and told me that’s the most fun they have had in a really long time. Thank you so much for providing such a rewarding outlet for them! 🌟” – Project Pooch



Portland, OR



Astoria, OR

MacLaren Youth Correctional Facility

**GO PLACES
EXAMINE BRAINS
ASK QUESTIONS
MAKE ART**

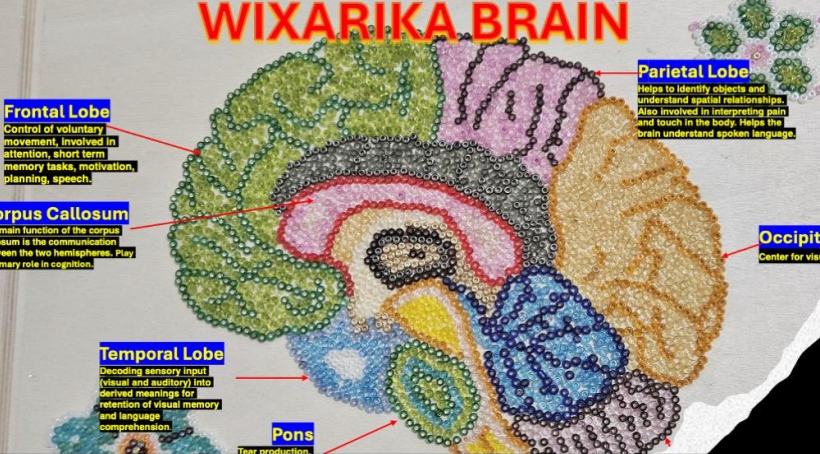


MAKE ART

- ENGAGEMENT
- PERSONAL RELEVANCE
- SELF-AWARENESS AND EMPATHY
- ADAPTATION AND PLASTICITY



WIXARIKA BRAIN



Frontal Lobe
Control of voluntary movement, involved in attention, short term memory tasks, motivation, planning, speech.

Corpus Callosum
Main function of the corpus callosum is the communication between the two hemispheres. Play primary role in cognition.

Temporal Lobe
Receiving sensory input (visual and auditory) into derived meanings for retention of visual memory and language comprehension.

Pons
Brain reproduction.

Parietal Lobe
Helps to identify objects and understand spatial relationships. Also involved in interpreting pain and touch in the body. Helps the brain understand spoken language.

Occipital
Center for visual

"Wixarika art is made by indigenous people from the states of Nayarit, Jalisco, and Sinaloa in Mexico. It consists of forming figures with 'chaquira' beads one by one, using bright colors. Among the multiple Wixarika designs are peyote cactus, which is a stimulant that indigenous people use in rituals. I decided to do a Wixarika brain so I could easily remember the lobes, and the internal parts of the brain. Additionally, I wanted to connect part of my culture with what I have learned in this wonderful class." — Cristina Gomez Aguilar, Portland State University





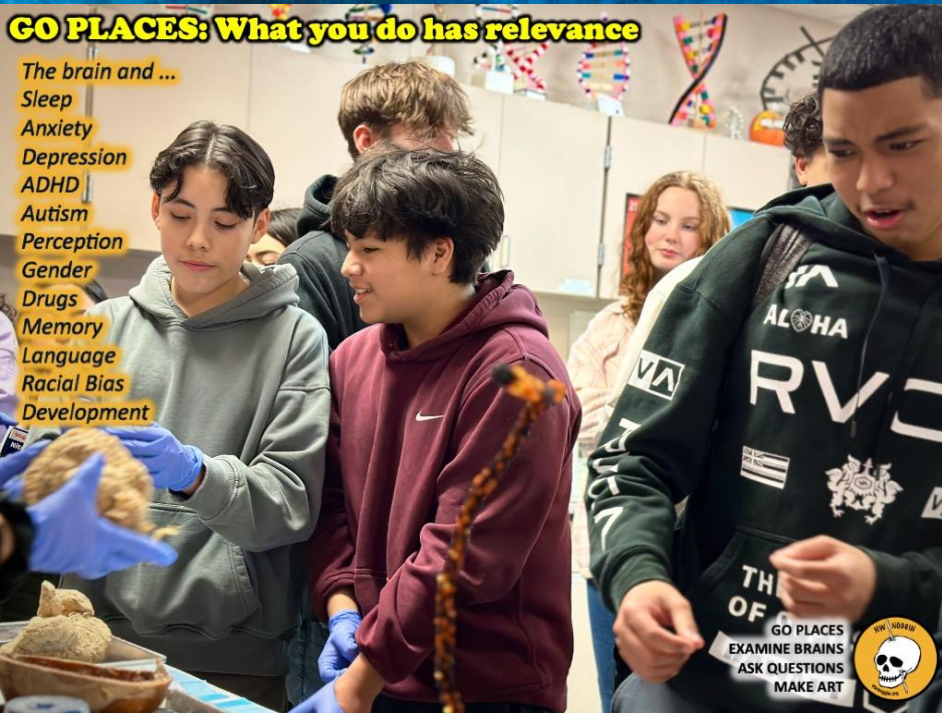
INFORM POLICY

- RESEARCH TOPICS ARE POPULAR!
- INTERDISCIPLINARY/STEAM APPROACHES WORK
- 1. SCHOOL START TIMES FOR ADOLESCENTS
- 2. PERMANENT STANDARD TIME
- 3. HOUSING FIRST



GO PLACES: What you do has relevance

- The brain and ...
- Sleep
- Anxiety
- Depression
- ADHD
- Autism
- Perception
- Gender
- Drugs
- Memory
- Language
- Racial Bias
- Development



Teaching Matters 

GO PLACES
EXAMINE BRAINS
ASK QUESTIONS
MAKE ART



“About half my students wouldn’t make it to first period class last year; now that school starts an hour later everyone gets here! They’re still a bit tired but a lot more ready to learn...”
— Coreyanne Russell @ Fort Vancouver High School, Vancouver, Washington



**GO PLACES
 EXAMINE BRAINS
 ASK QUESTIONS
 MAKE ART**



Healthy start times

**VANCOUVER PUBLIC SCHOOLS
 VPS**

What is changing?

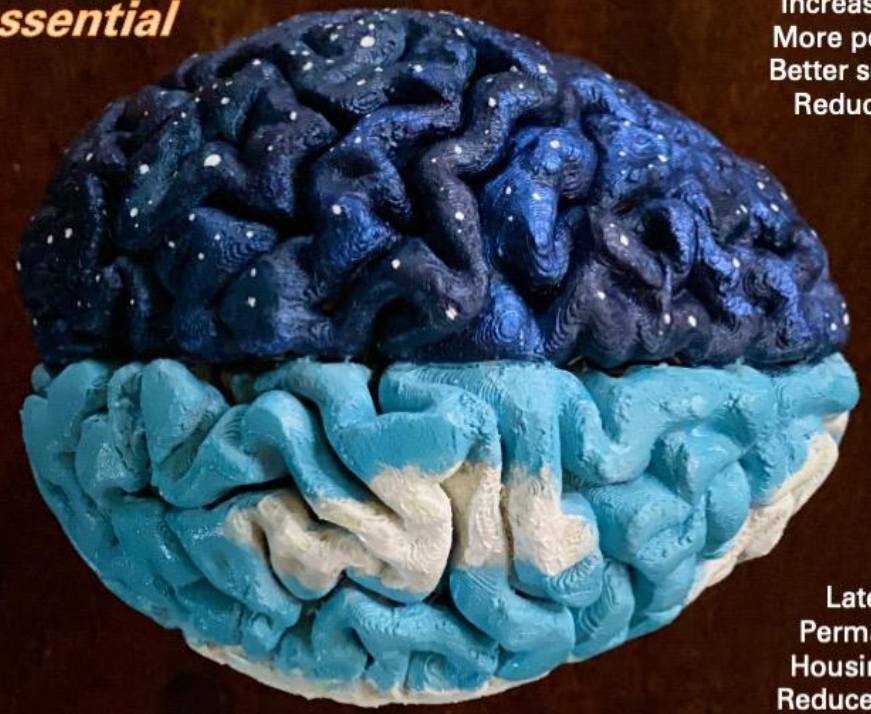
We are changing our schools' start times schedule next year based on learnings from our community feedback as well as the most current research about adolescent development. We plan to solidify our bell schedules and announce the official new times before the last day of school on June 20, 2023.



Sleep/Wake Brain

Circadian Brain, by Kindra Crick

Sleep is essential



**#showusyourbraincell
 nwnoggin.org**

- Improved memory
- Increased immune response
- More positive interpretations
- Better social decision making
- Reduced anxiety and stress
- Healthy development

- Later school start times
- Permanent standard time
- Housing first for everyone
- Reduced nighttime lighting
- Good nutrition & exercise
- Less income inequality
- Accessible healthcare

Public policy changes matter

Federal and State Governments Took the Brains Out of Biology!

WHERE ARE THE BRAINS IN K-12 PUBLIC CLASSROOMS? KIDS BENEFIT FROM AND WANT TO LEARN MORE ABOUT NEUROSCIENCE

Fourth Grade

- 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.** [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]
- 4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.** [Clarification Statement: Emphasis is on systems of information transfer.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]

We need better standards:
Brains only mentioned in 4th grade!



JENSEN HUANG: “I would advise that every college student, every teacher should encourage their students to go use AI. Every college student should graduate and be an expert in AI.”



Chief executive officer of Nvidia



DiscussingFirastopher
@firastopher

CEO OF OREO: “I would advise that everyone eat 50 Oreos a day. Maybe even 100.”

ENGAGING BRAINS

If you're motivated, intrigued, curious, engaged, your brain is more plastic.

CHANGE YOUR ENVIRONMENT: GO PLACES (W/O GPS!)
WELCOME NEW BRAINS, FROM MORE BACKGROUNDS
LISTEN TO WHAT YOUNG PEOPLE HAVE TO SAY
PROVIDE RESOURCES AND ENRICHMENT
PROMOTE ADULT PLASTICITY

MAKE ART

GO PLACES

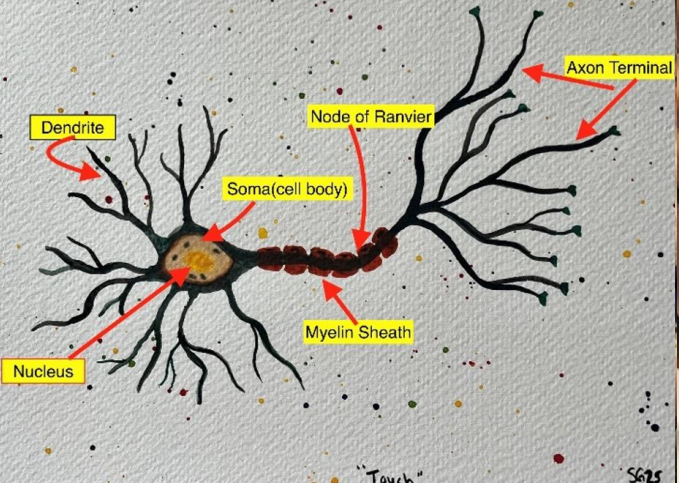


NW NOGGIN

GO PLACES
EXAMINE BRAINS
ASK QUESTIONS
MAKE ART



Watercolor neuron painted by Sheila Grayson,
Psychology student at Portland State University



Engagement, Questions, Learning 😊

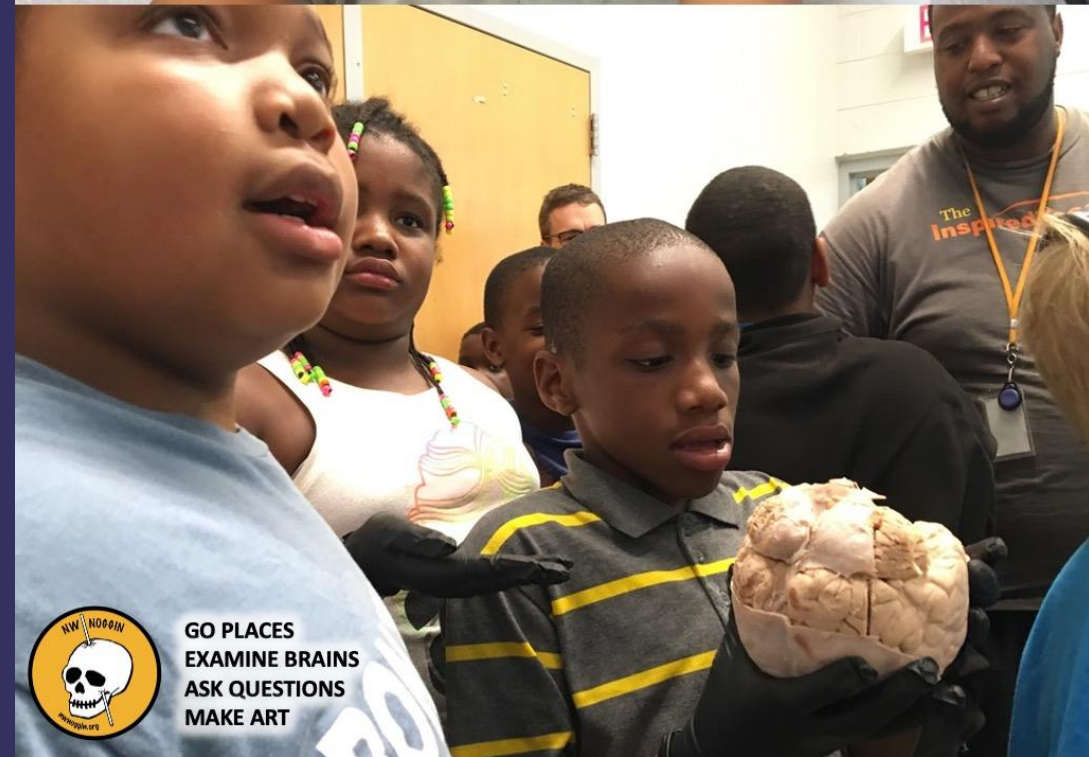
INVEST IN THESE DATA CENTERS 😊
Libraries, community colleges, students, teachers, BRAINS



"It also takes a lot of energy to train a human...It takes, like, 20 years of life and all of the food you eat during that time before you get smart. And not only that, it took, like, the very widespread evolution of the hundred billion people that have ever lived and learned not to get eaten by predators and learned how to, like, figure out science and whatever to produce you, and then you took whatever, you know, you took." –Sam Altman, Open AI 🤖

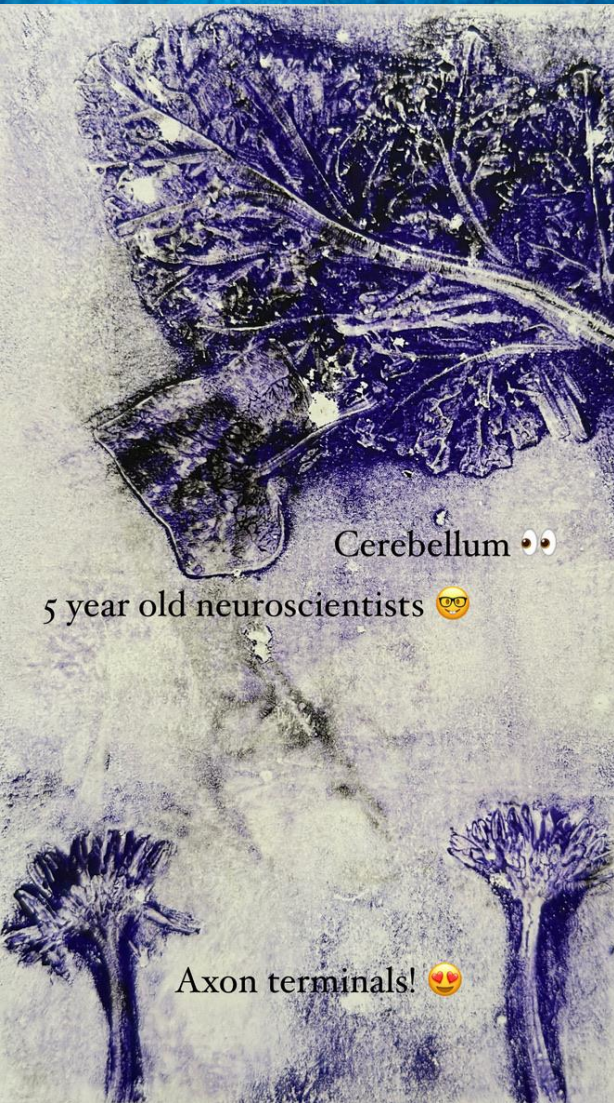


Future neuroscientists 🎨🧠❤️🤖



**GO PLACES
EXAMINE BRAINS
ASK QUESTIONS
MAKE ART**

LET'S MAKE SOMETHING!



Cerebellum 🧠

5 year old neuroscientists 🧐

Axon terminals! 🧡

