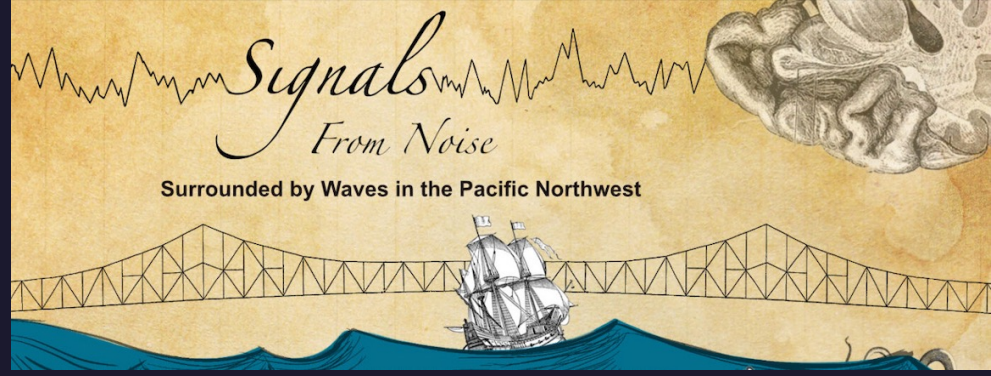
Welcome!

JOIN US TUESDAY, APRIL 18, 6 - 8pm at the Fort George Brewery to hear from Randall Olson, an OHSU neuroscientist conducting research on brainwaves, Mark Hails, a Columbia River bar pilot, and Tom Hernandez, a PA cardiologist from Columbia Memorial Hospital - people who attend to wave energy to safely navigate the Columbia River, diagnose heart conditions and explore the rhythmic activity of our own brains.

Northwest Noggin (nwnoggin.org)



We are immersed in WAVES!

Signal From Noise:

Surrounded by waves in the PNW

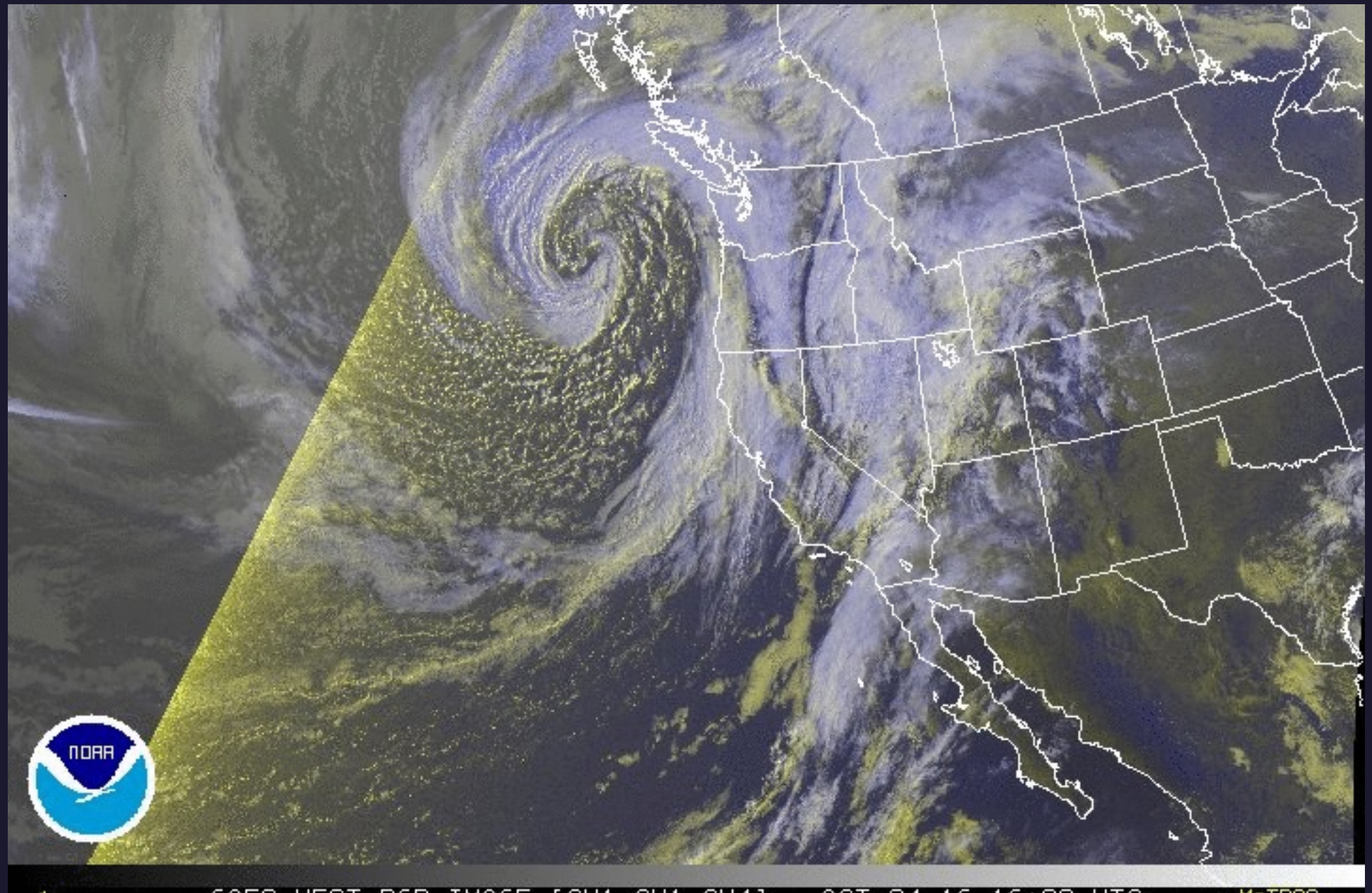
Capt. Mark Hails

Columbia River Bar Pilots

The Columbia River Bar

- The sea attacks relentlessly, marshaling the force of its powerful waves against the land's strongest points. It collects the energy of distant winds and transports it across thousands of miles of open ocean as quietly rolling swell. On nearing shore this calm disguise is suddenly cast off, and the waves rise up as angry breakers, hurling themselves against the land in a final furious assault.
    - Waves and Beaches, The Powerful Dynamics of Sea and Coast

Pacific Northwest Storms



Graveyard of the Pacific

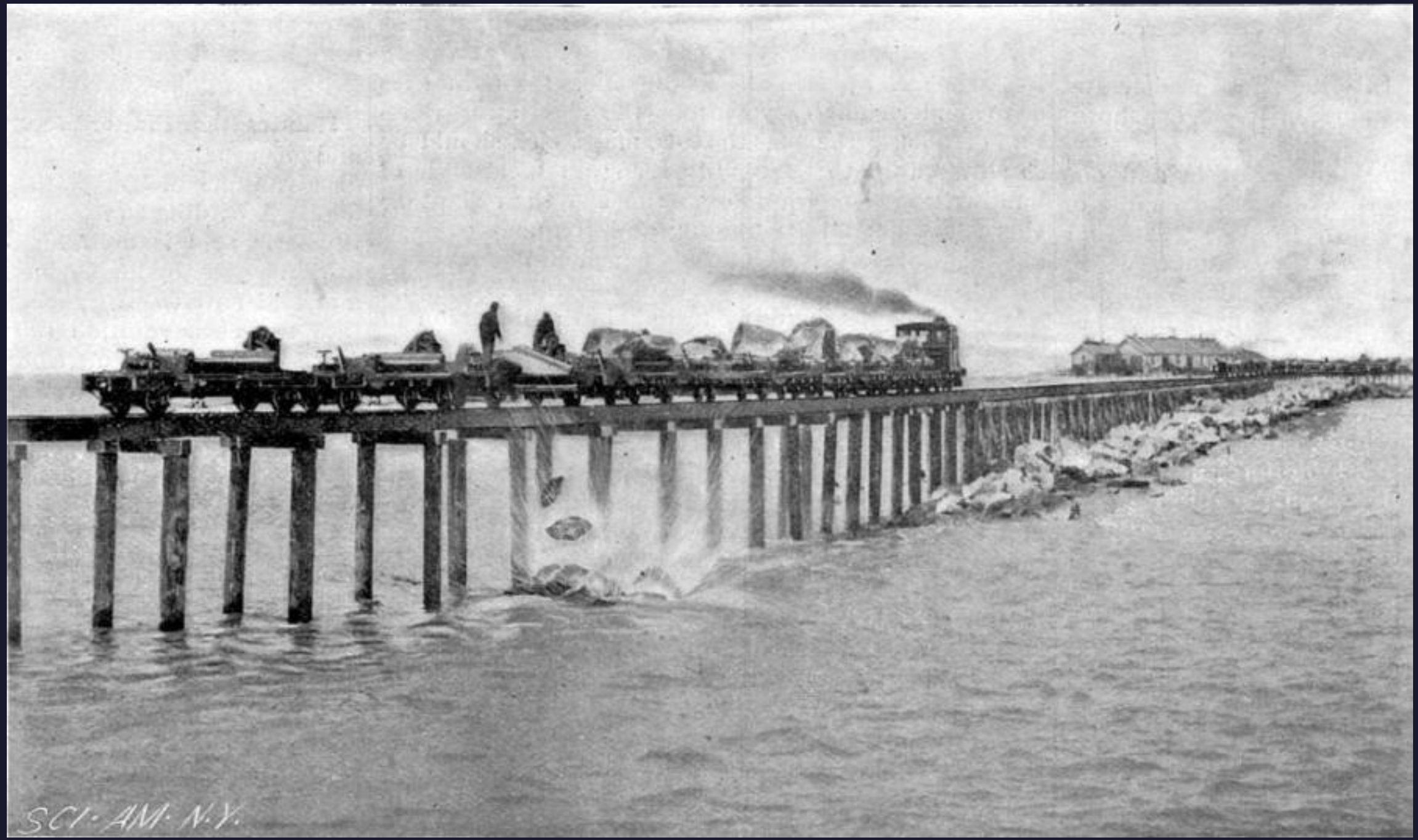
More than 2,000 shipwrecks

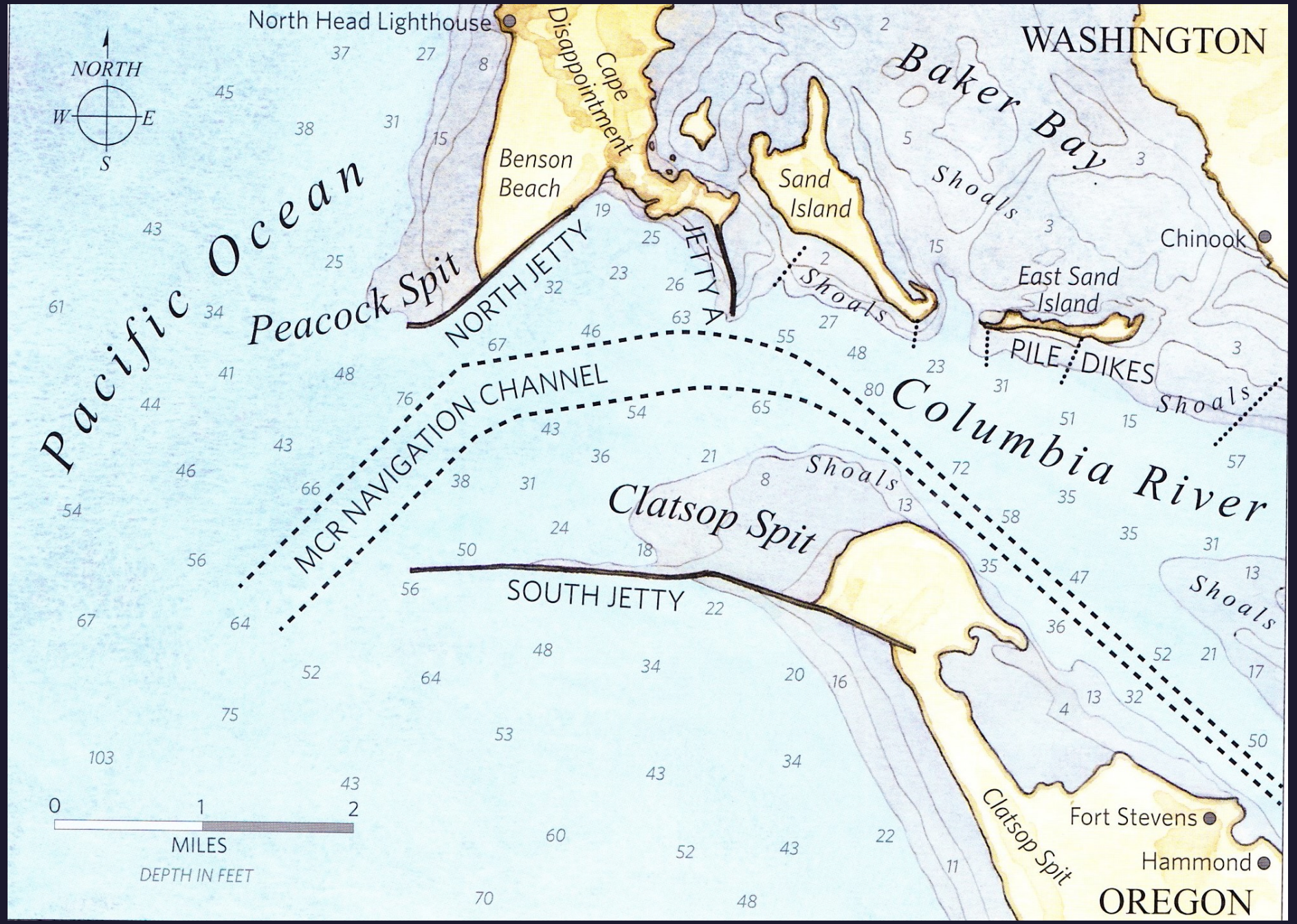
More than 700 deaths


NORTH
W
E
S
Pacific Ocean
Cape Disappointment
Peacock Spit
Shoals
Baker Bay
Shoals
Shoals
Shoals
Columbia River
Shoals
Shoals
Shoals
Clatsop Spit
Clatsop Spit
0
1
2
MILES
DEPTH IN FEET

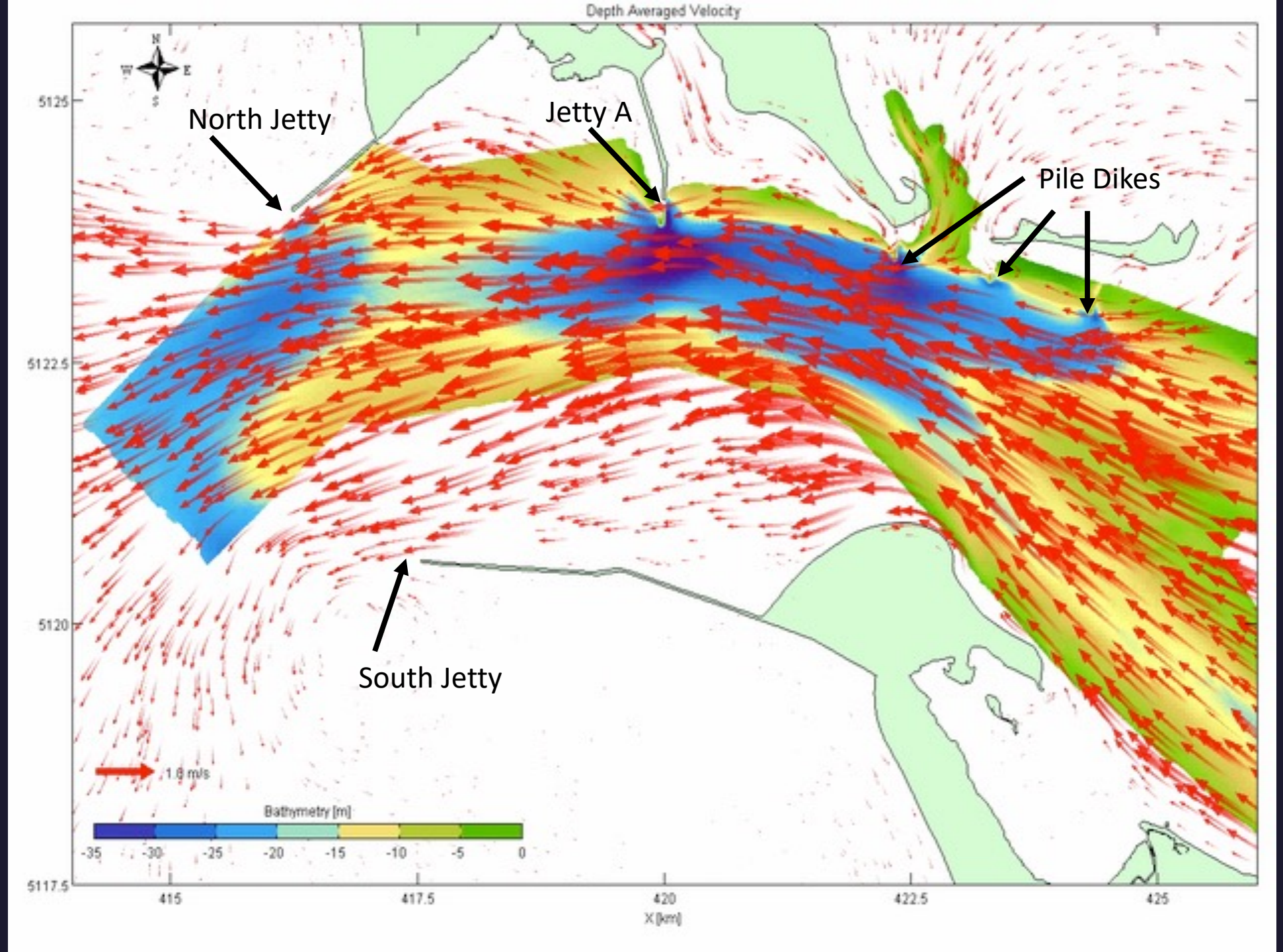

31
18 Ton Rock
Columbia River Jetty

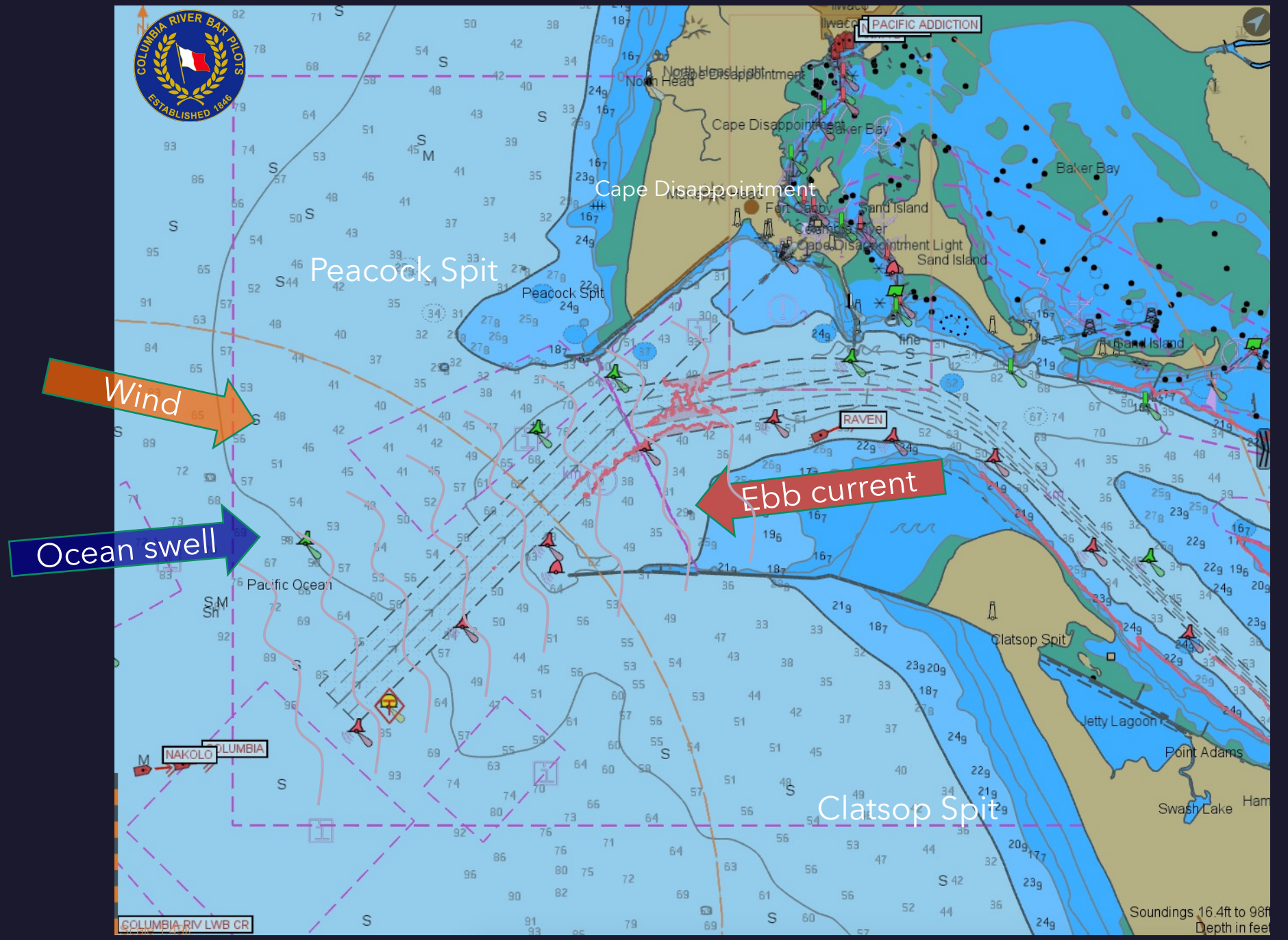

Building N. Jetty 1916
Near Seaview & Ilwaco, Wash.


SCI·AM·N.Y.


North Head Lighthouse
NORTH
W
E
S
Pacific Ocean
Peacock Spit
Cape Disappointment
Benson Beach
NORTH JETTY
JETTY A
Sand Island
Baker Bay
WASHINGTON
Shoals
Chinook
East Sand Island
PILE DIKES
MCR NAVIGATION CHANNEL
Columbia River
Clatsop Spit
SOUTH JETTY
Fort Stevens
Hammond
OREGON
0 1 2
MILES
DEPTH IN FEET

How the Jetties changed everything…


Depth Averaged Velocity
N
W
E
S
North Jetty
Jetty A
Pile Dikes
South Jetty
1.0 m/s
Bathymetry [m]
-35
-30
-25
-20
-15
-10
-5
0
5125
5122.5
5120
5117.5
415
417.5
420
422.5
425
X [km]


Peacock Spit
Cape Disappointment
Clatsop Spit
Wind
Ocean swell
Ebb current
PACIFIC ADDICTION
RAVEN
NAKOLO
COLUMBIA RIV LWB CR
Pacific Ocean
Baker Bay
Sand Island
Clatsop Spit
Jetty Lagoon
Point Adams
Swash Lake
Soundings 16.4ft to 98ft
Depth in feet

Weather Buoys


FR 106
3TSWBT 4TSWBT
CH3 CH4

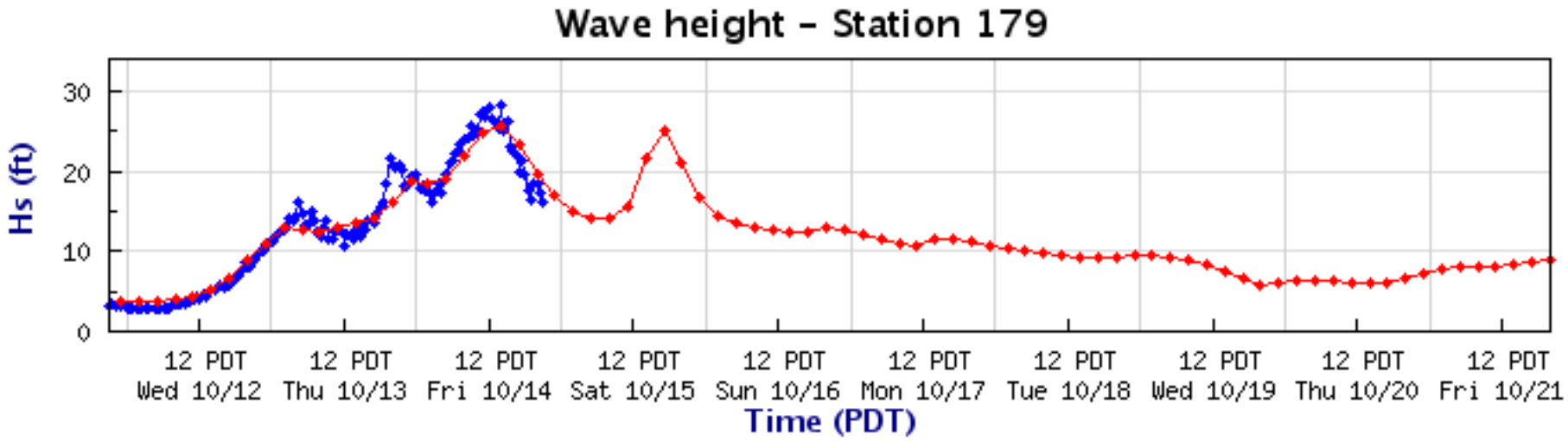
Back to Waves!

Weather considerations

- Swell and sea height
- Swell period
- Current – flood or ebb
- Wind speed and direction
- Storm timing

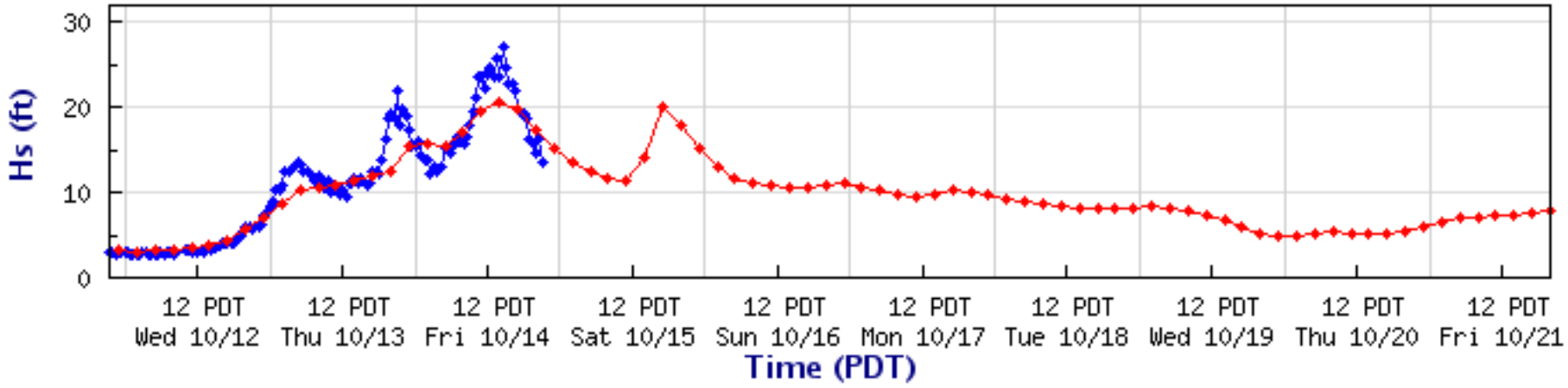
Astoria Canyon, OR Conditions + Forecast

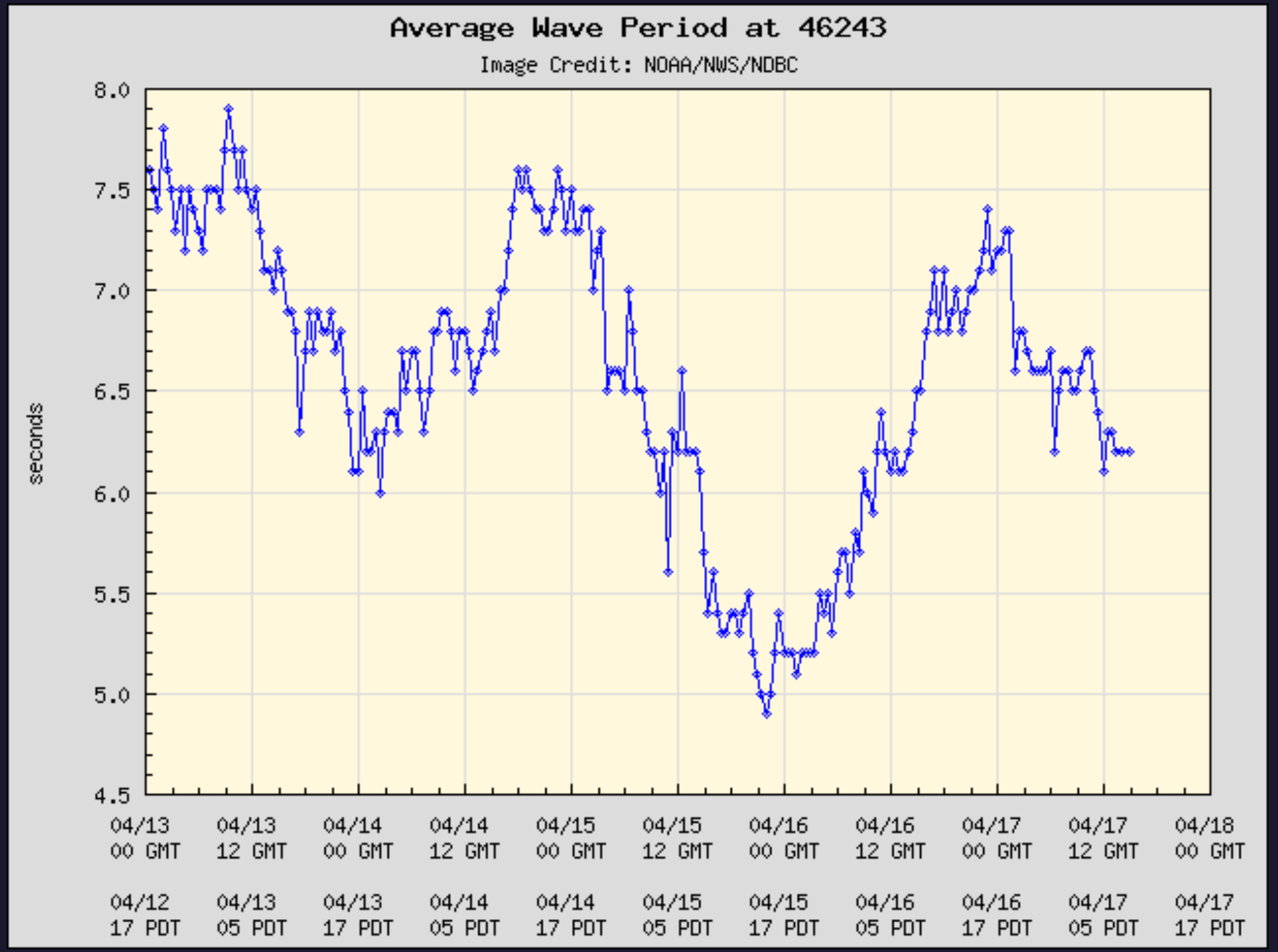
Observations: CDIP buoy 179
Forecast : NOAA WW3 46248



Clatsop Spit, OR Conditions + Forecast

Observations: CDIP buoy 162
Forecast : NOAA WW3 46243




Average Wave Period at 46243
Image Credit: NOAA/NWS/NDBC
seconds
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
04/13 00 GMT
04/13 12 GMT
04/14 00 GMT
04/14 12 GMT
04/15 00 GMT
04/15 12 GMT
04/16 00 GMT
04/16 12 GMT
04/17 00 GMT
04/17 12 GMT
04/18 00 GMT
04/12 17 PDT
04/13 05 PDT
04/13 17 PDT
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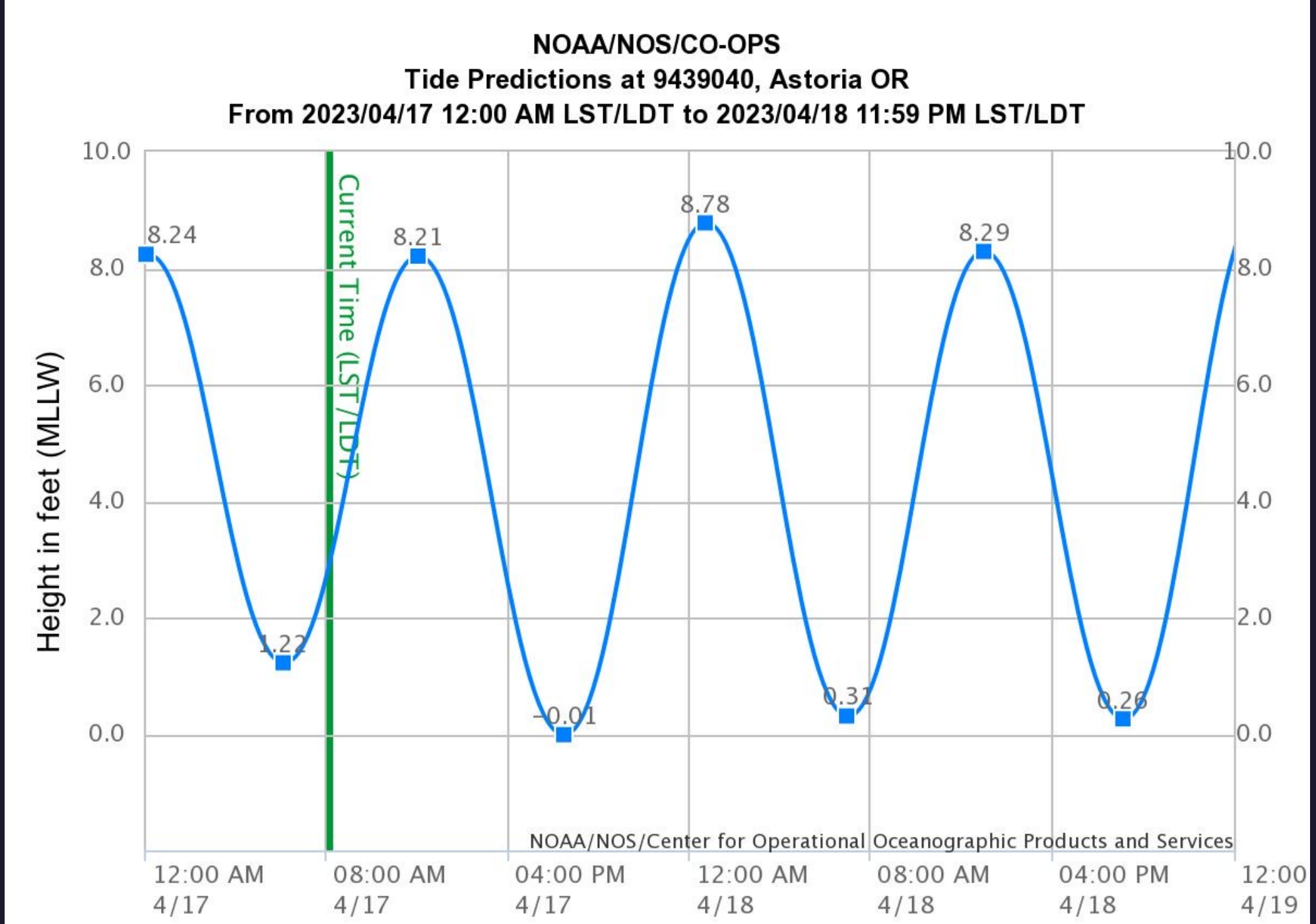
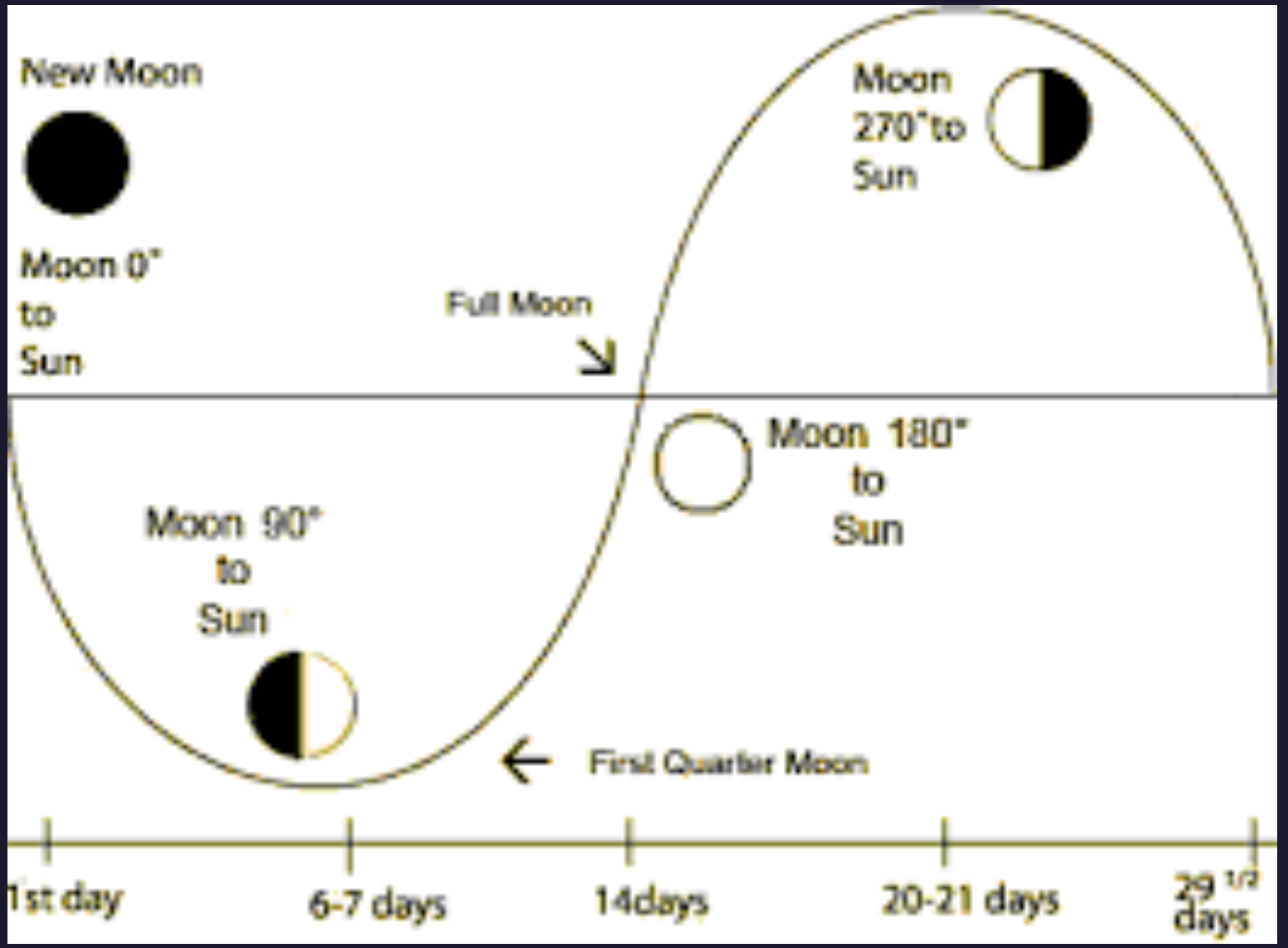
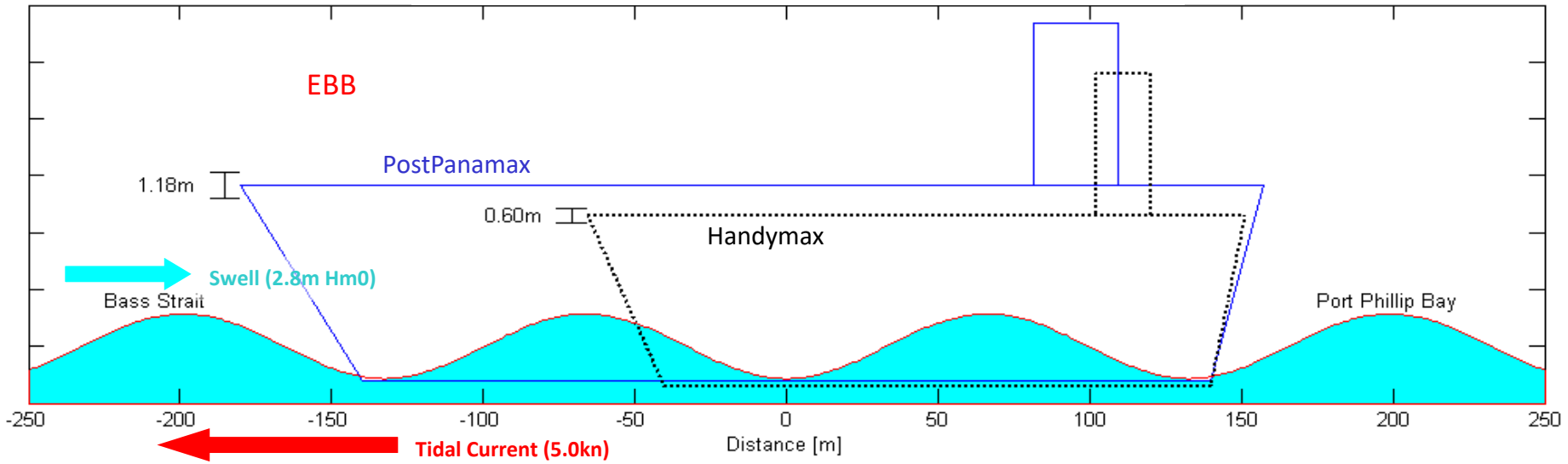
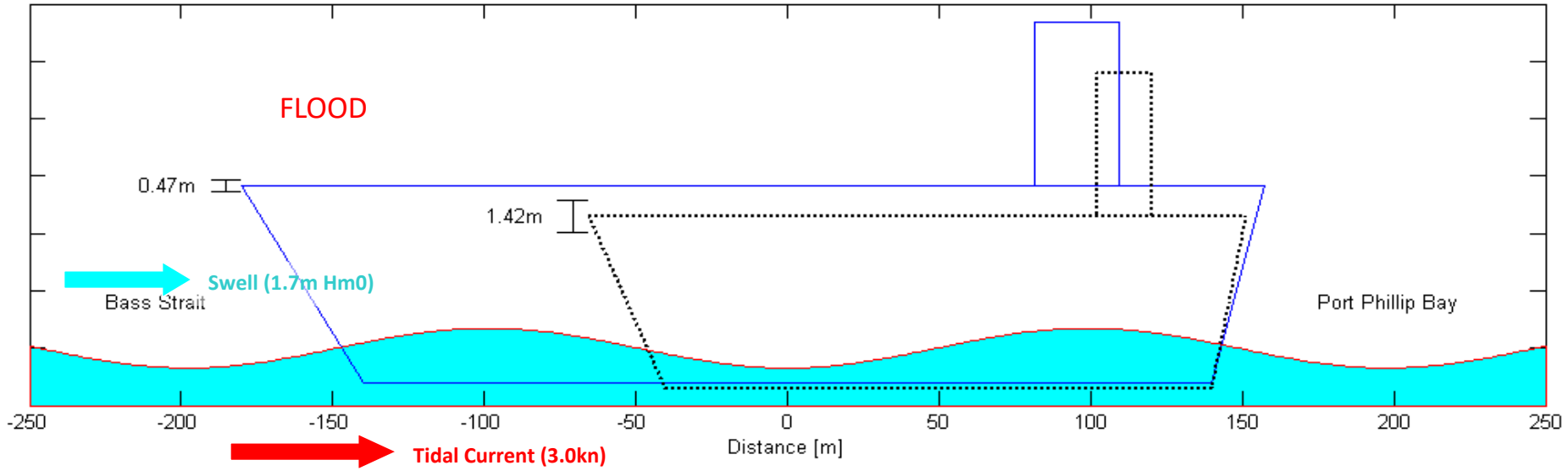

NOAA/NOS/CO-OPS
Tide Predictions at 9439040, Astoria OR
From 2023/04/17 12:00 AM LST/LDT to 2023/04/18 11:59 PM LST/LDT
Height in feet (MLLW)
10.0
8.0
6.0
4.0
2.0
0.0
Current Time (LST/LDT)
8.24
1.22
8.21
-0.01
8.78
0.31
8.29
0.26
NOAA/NOS/Center for Operational Oceanographic Products and Services
12:00 AM 4/17
08:00 AM 4/17
04:00 PM 4/17
12:00 AM 4/18
08:00 AM 4/18
04:00 PM 4/18
12:00 4/19


New Moon
Moon 0°
to
Sun
Full Moon
Moon
270°to
Sun
Moon 180°
to
Sun
Moon 90°
to
Sun
First Quarter Moon
1st day
6-7 days
14days
20-21 days
29 1/2
days

Wave Response

Offshore Swell height = 2m, period = 14 seconds





Signal From Noise:

Jugular venous waveform and the heart

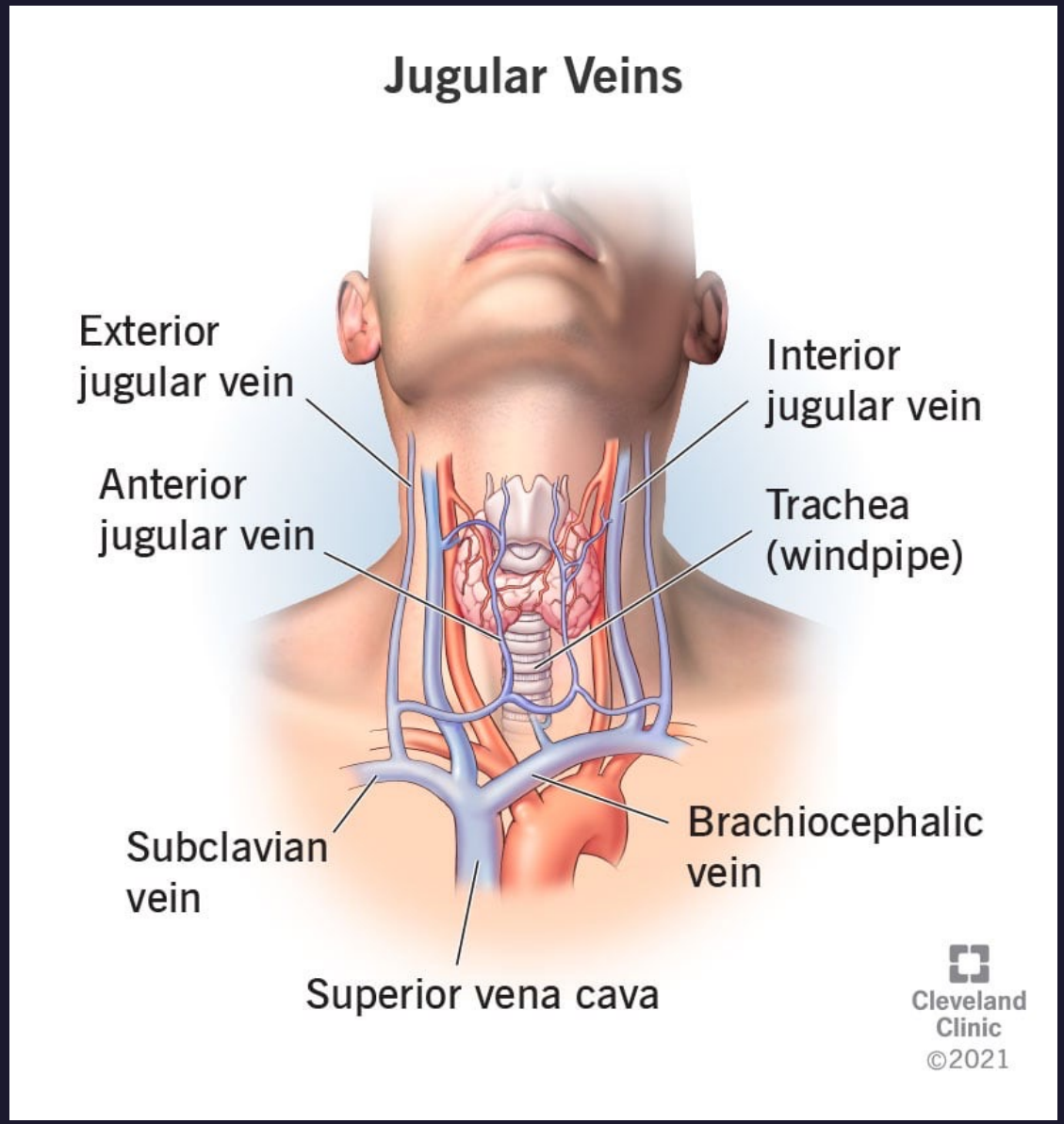
Tom Hernandez

Cardiology, PA-C

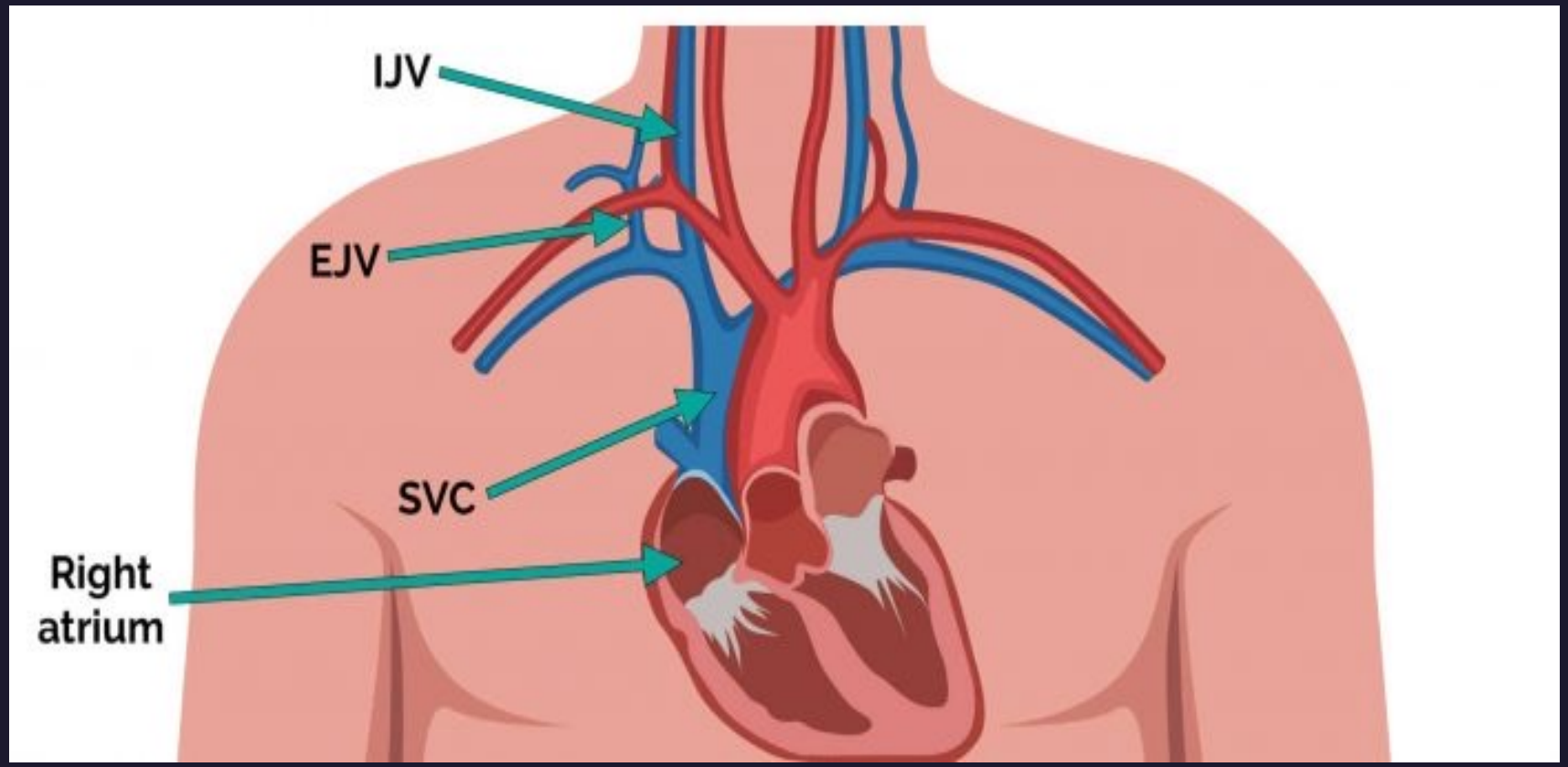
Columbia Memorial Hospital

Agenda

Review	Review Jugular Venous Pressure (JVP) Cardiology tutorial authored by Dr. Andre Mansoor
Define	Define anatomy
Define	Define what the jugular venous waveform is
Recognize	Recognize that these wave patterns can diagnose certain heart diseases
Review	Review how the waveforms in your veins correspond to pressure in the heart and see for yourself

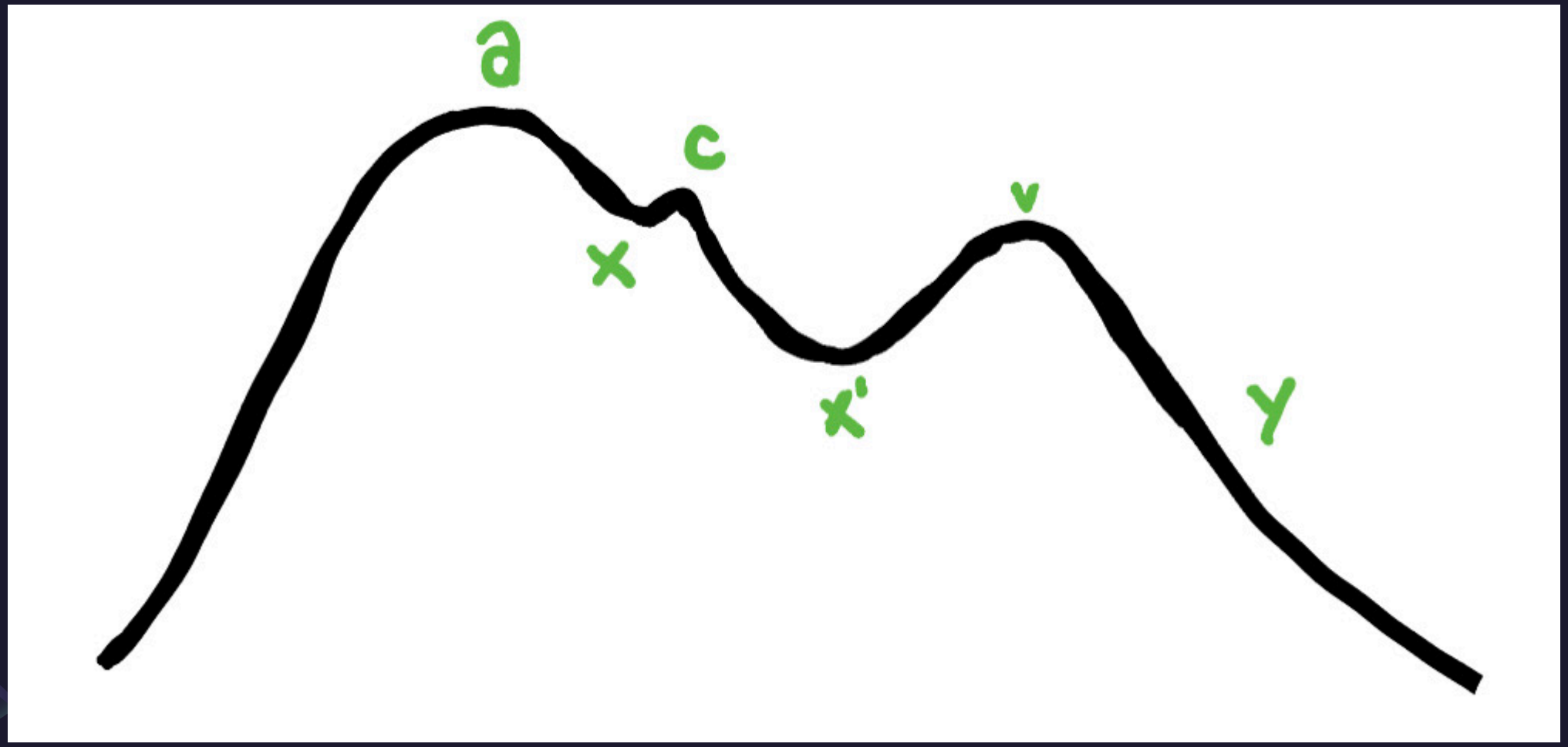


Cleveland Clinic. "Jugular Veins." My.clevelandclinic.org, 05/29/22, https://my.clevelandclinic.org/health/body/23148-jugular-vein. 03/17/23

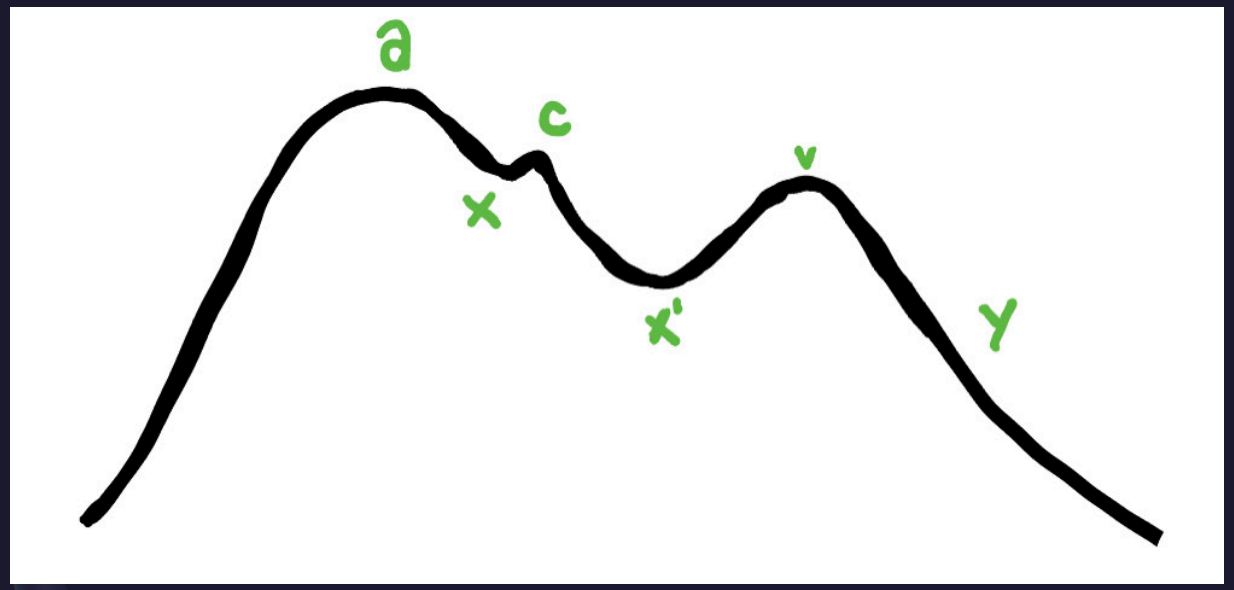


Geeky Medics. “Anterior view of the SVC, EJV and IJV.” Geekymedics.com, 12/19/22, https://geekymedics.com/jugular-venous-pressure-jvp/. 03/17/23

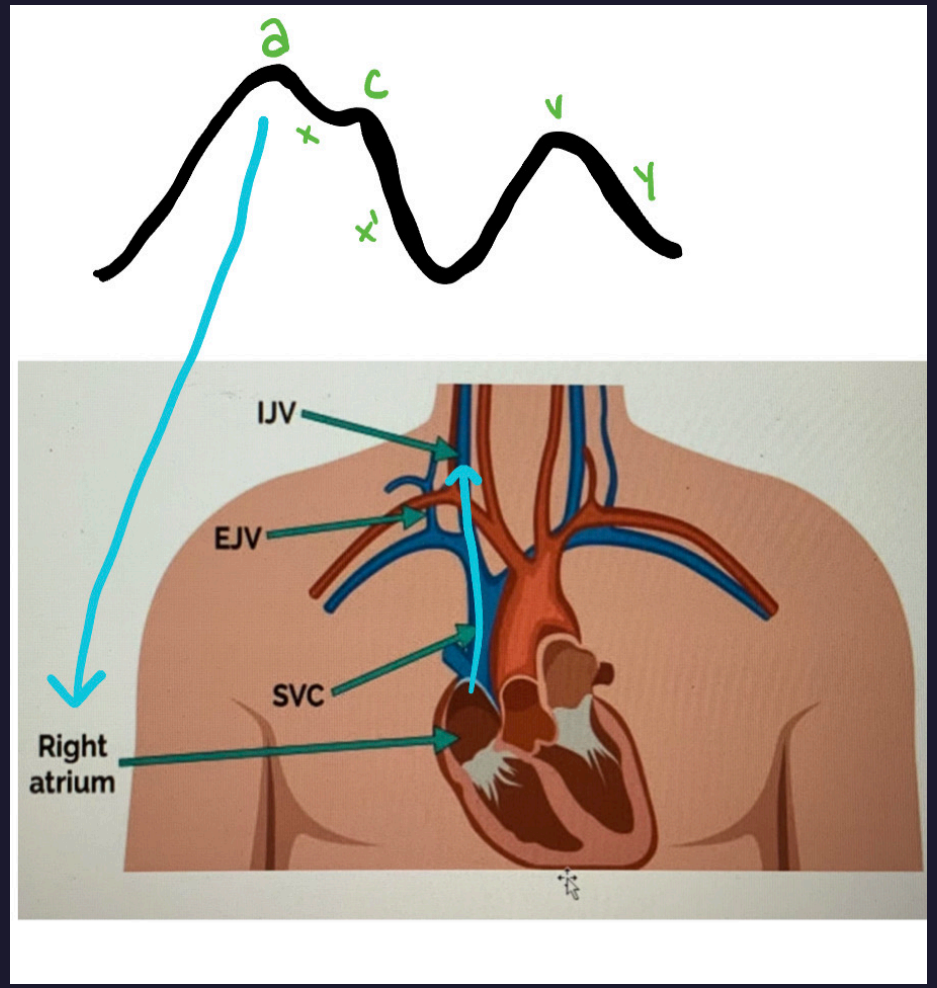
Jugular Venous Waveform



Jugular Venous Waveform

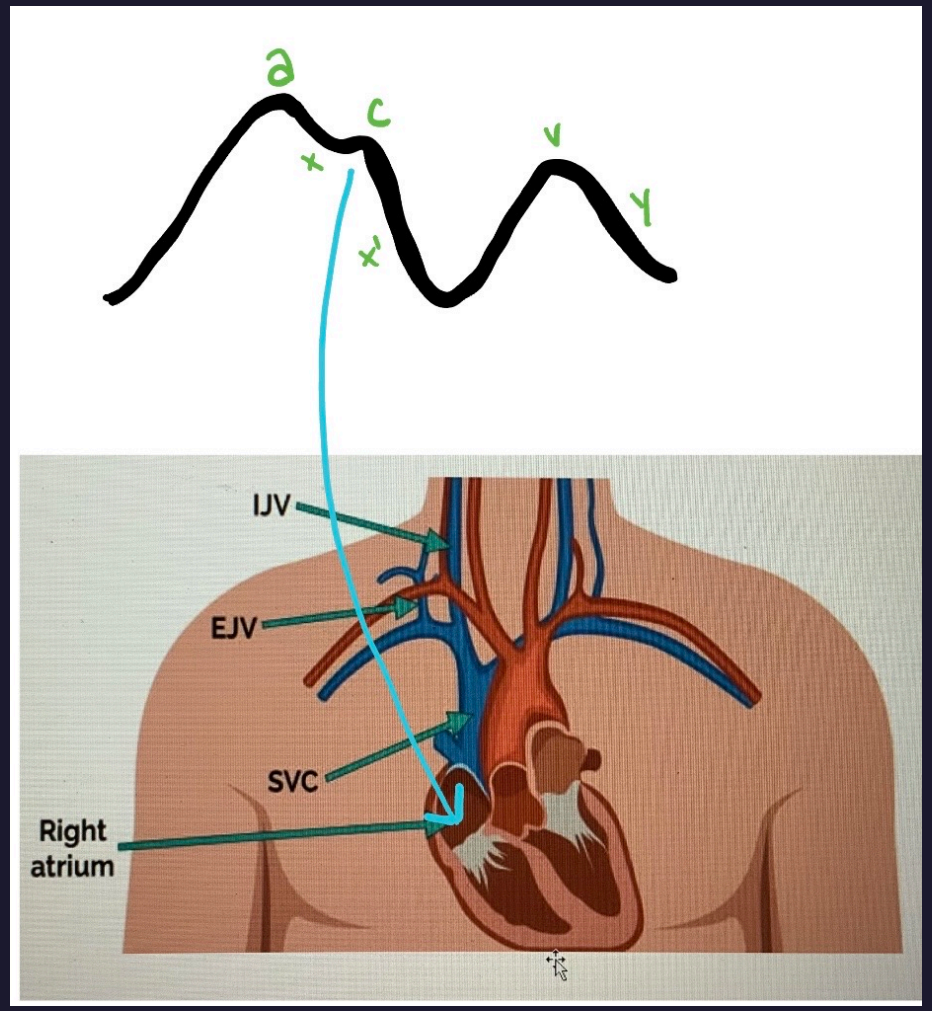


- **A wave** → Atrial contraction (Upper heart chamber)
- **X descent** → Atrial relaxation
- **C wave** → Bulging of the heart valve with ventricular contraction (Lower heart chamber)
- **X' descent** → Downward movement of the valve with ventricular contraction
- **V wave** → Passive filling of the atrium
- **Y descent** → Atrial emptying when the valve opens



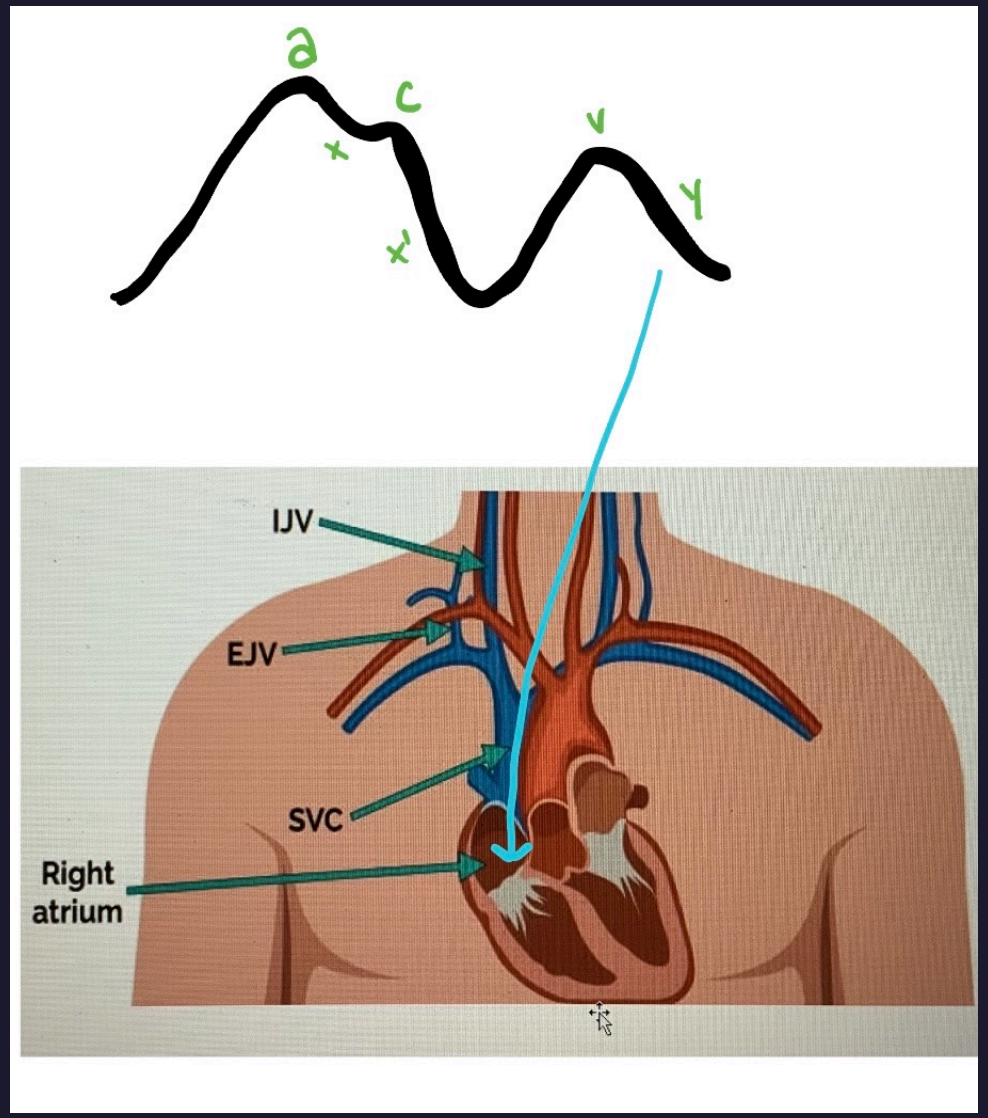
- **A wave** → Atrial contraction (Upper heart chamber)

- **X descent** → Atrial relaxation



- **C wave** → Bulging of the heart valve with ventricular contraction (Lower heart chamber)

- **X' descent** → Downward movement of the valve with ventricular contraction



- **V wave** → Passive filling of the atrium

- **Y descent** → Atrial emptying when the valve opens

Let’s take a moment to watch a jugular venous pulsation in a healthy individual

- https://physicaldiagnosispdx.com/cardiology-multimedia-new/jugular-venous-pressure-right/

Let’s look at how the waveform changes in certain diseases e.g., atrial fibrillation.

- Atrial fibrillation is defined as uncoordinated atrial activation leading to ineffective atrial contraction
- The “a wave” is a result of the right atrium contracting
- Atrial fibrillation does not allow for coordinated atrial contraction
- Consequently the “a wave” disappears in atrial fibrillation

Cont.

- Atrial fibrillation prevents adequate atrial relaxation which leads the x descent to be smaller

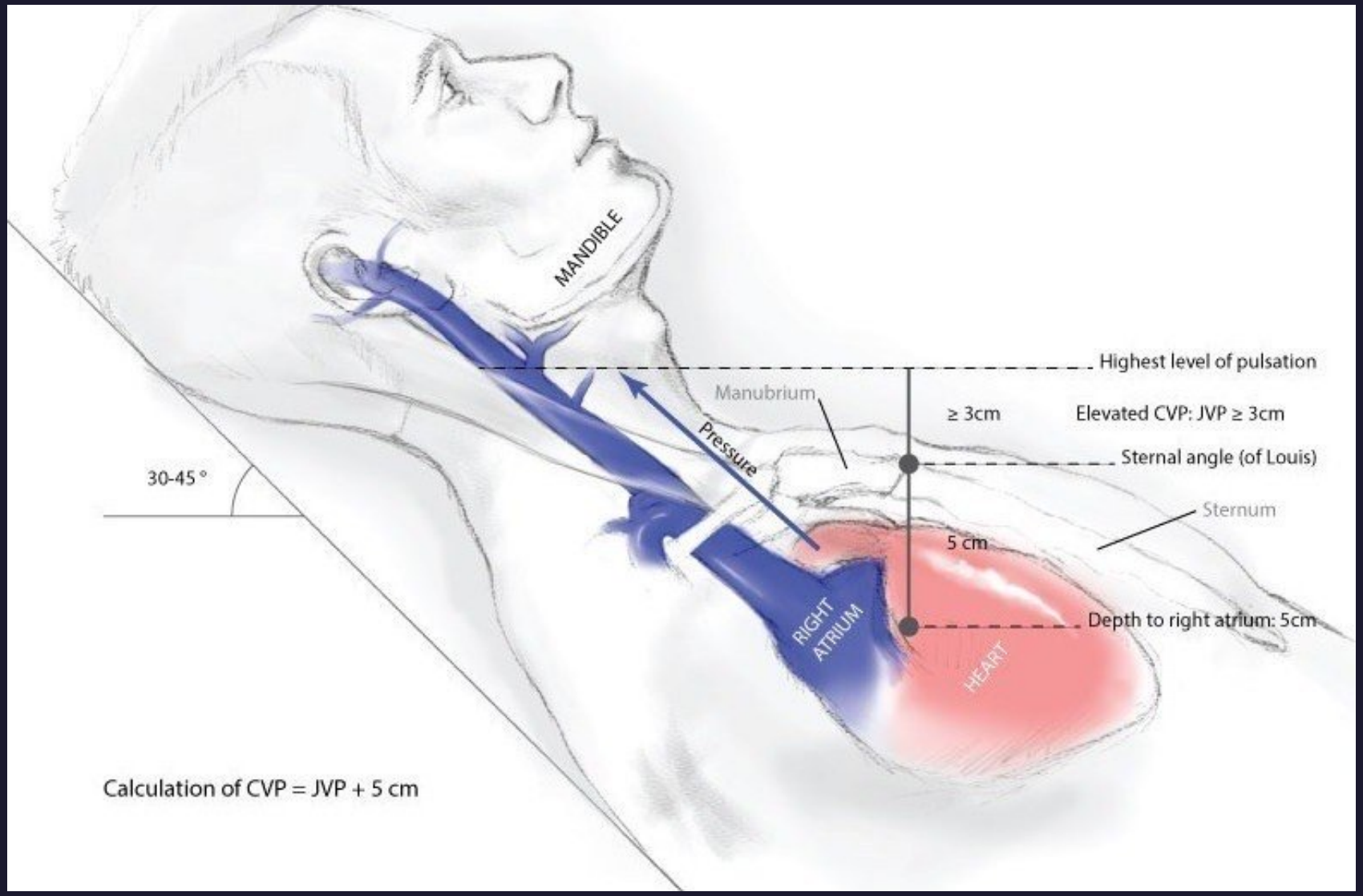
- The wave pulsation is also irregular due to the atrial fibrillation

Let’s watch an example

- https://physicaldiagnosispdx.com/cardiology-multimedia-new/atrial-fibrillation-qualitative-assessment-of-jugular-venous-pulse/

Jugular Venous Waveform and Heart Pressure

- Using the jugular venous pulse, we can accurately measure the pressure in your heart
- Normal is less than 8 cm H_2O or 6 mmHg
- It will be elevated in certain disease states where there is fluid retention e.g., heart failure
- We will demonstrate this concept together
    - Interpretation depends on a well-practiced exam technique so this is recommended to be done by a trained health professional in general



Medcrine. "Jugular Venous Pressure Examination and Interpretation." Medcrine.com, 09/03/20, https://medcrine.com/jugular-venous-pressure 04/16/23

Activity

Let’s start by watching a video demonstration: https://physicaldiagnosispdx.com/cardiology-multimedia-new/hand-vein-assessment/

Activity

1. Find the sternal angle
2. Identify hand veins that are engorged
3. Lift the hand until the veins drain and flatten
4. Then slowly lower the hands down until the moment they fill again
5. Measure the distance between the top of your hand and the sternal angle
6. Add 5 cm to that distance and you've estimated the central venous pressure of the heart*

a) For accuracy you should be reclined at 45 degrees and assessment at the neck is preferred

Citation

1. Mansoor, Andre. “Cardiology Tutorial.” Physicaldiagnosispdx.com, 2020. https://physicaldiagnosispdx.com/card-tutorial/

Thank you Dr. Mansoor!

Signal From Noise:

How brainwaves are essential to neural computation

Randall Olson

PhD. Candidate

Behavioral and Systems Neuroscience
OHSU

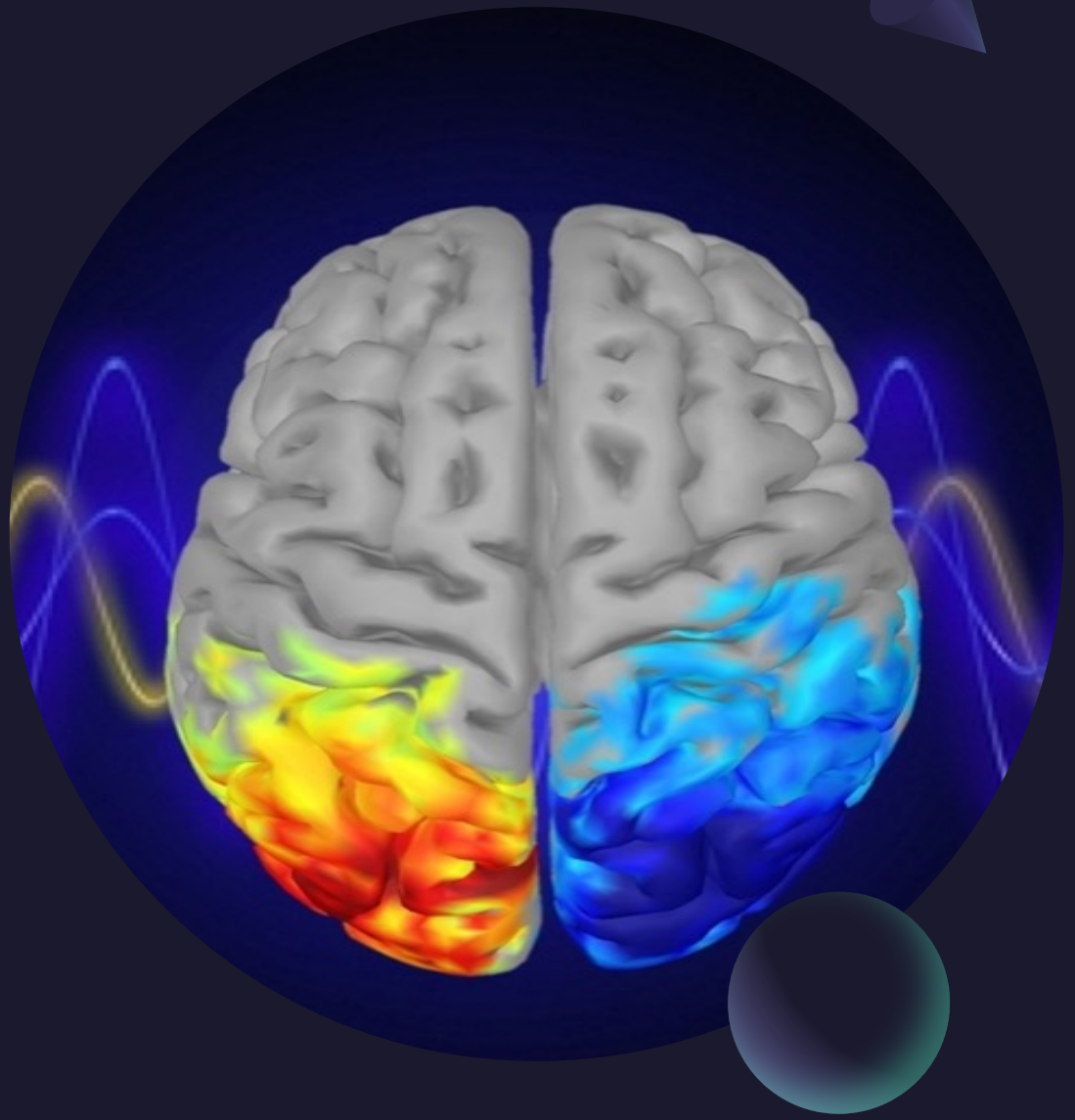
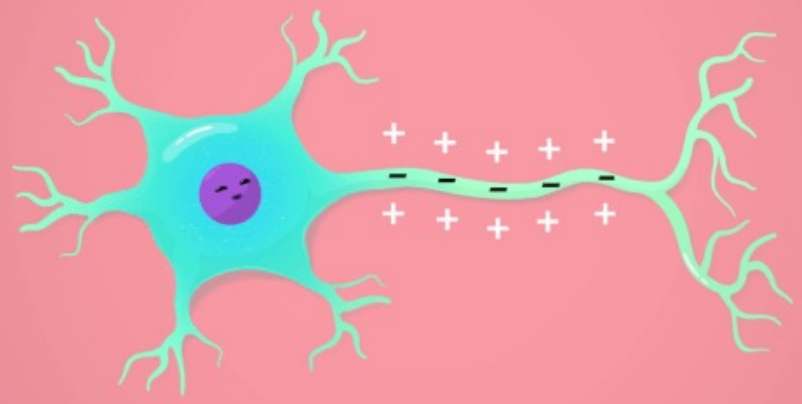


Image: Yasaman Baghezadeh

What is a Brain Wave?

- A brain wave or neural oscillation is an oscillating electric field in the brain
- ….but what is an oscillating electric field and where does it come from?
- Neurons! The fundamental computational unit of the brain

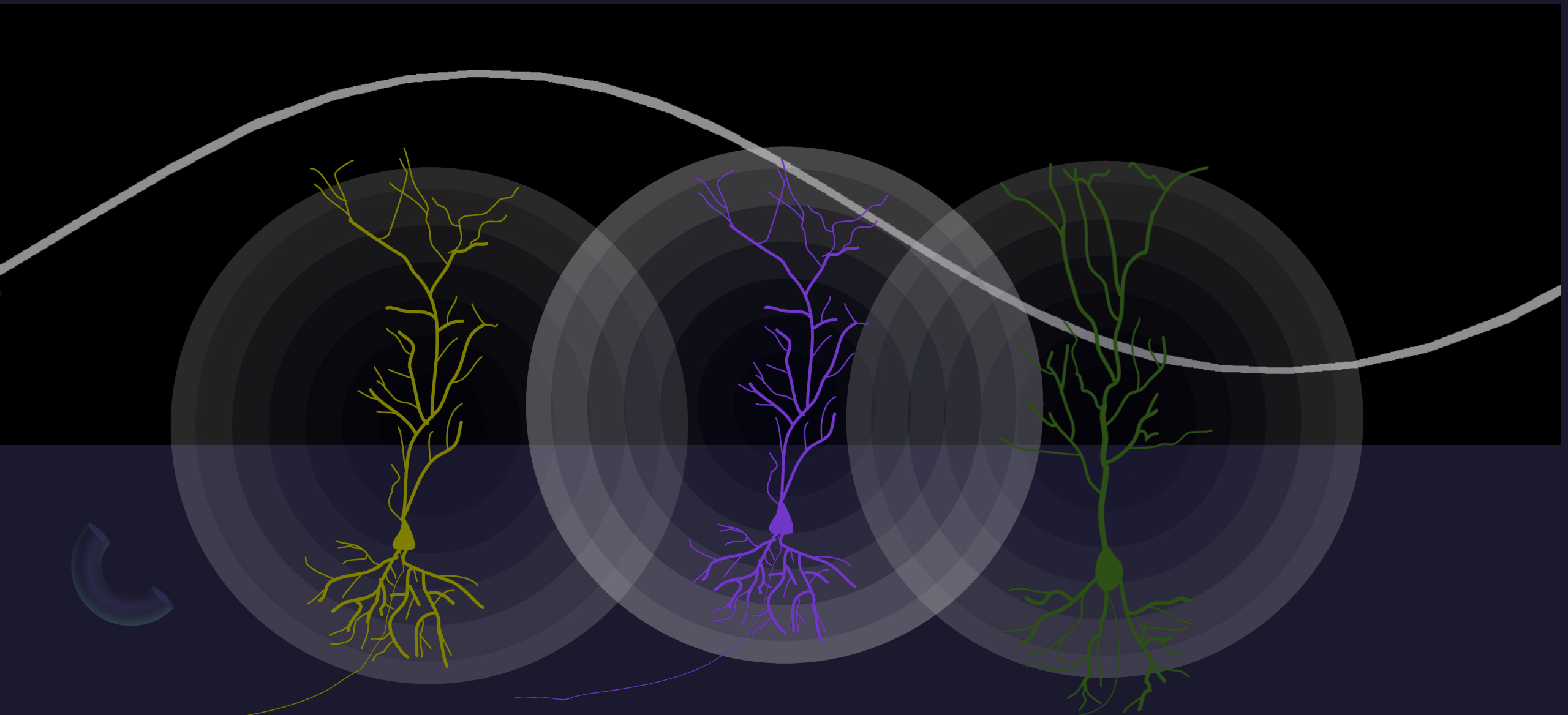
RESTING POTENTIAL



ACTION POTENTIAL

Images: eyewire:Amy sterling

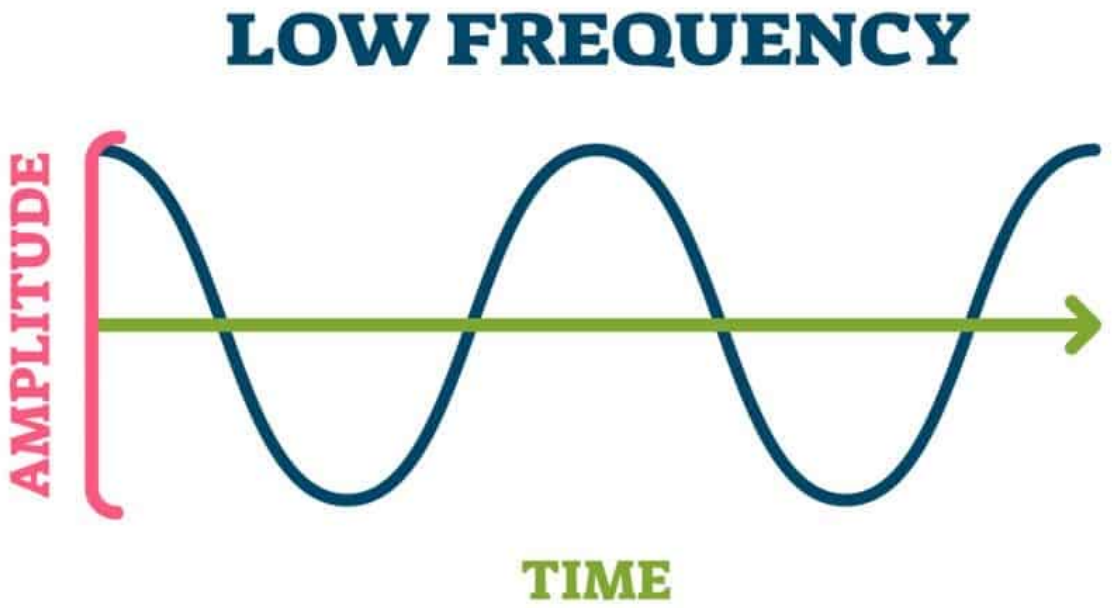
Creating a Brainwave

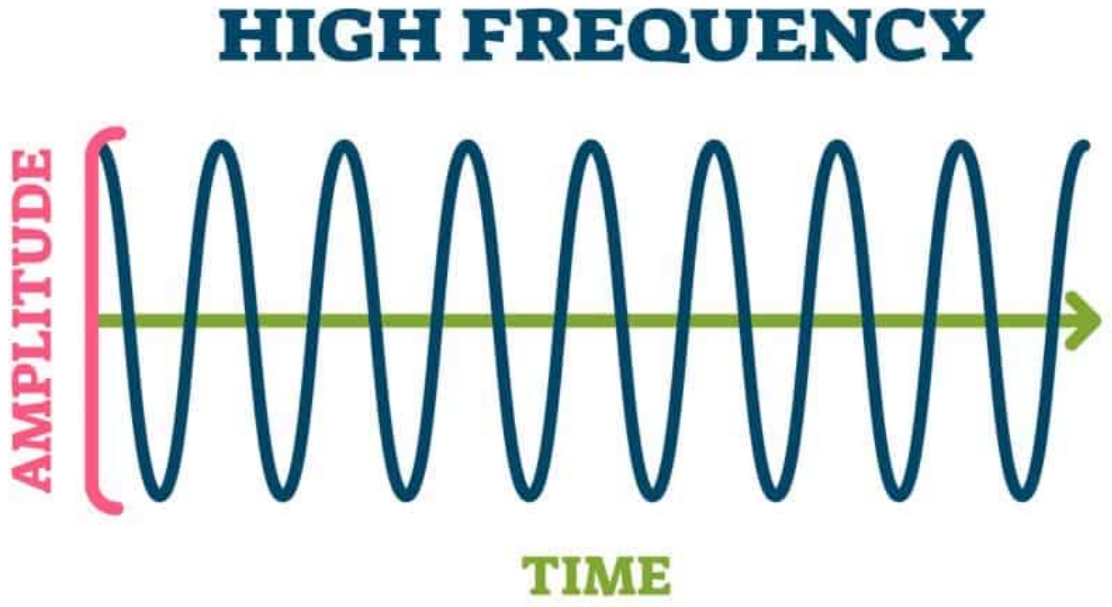


Types of Brainwaves

- A brain wave has both frequency and amplitude

Image: Ruby Cobb





Brainwaves are associated with different brain and body states

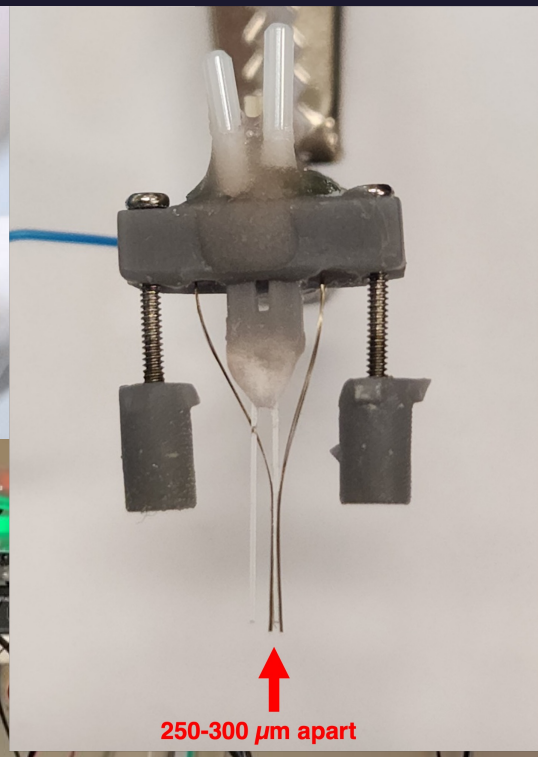
Interim Summary

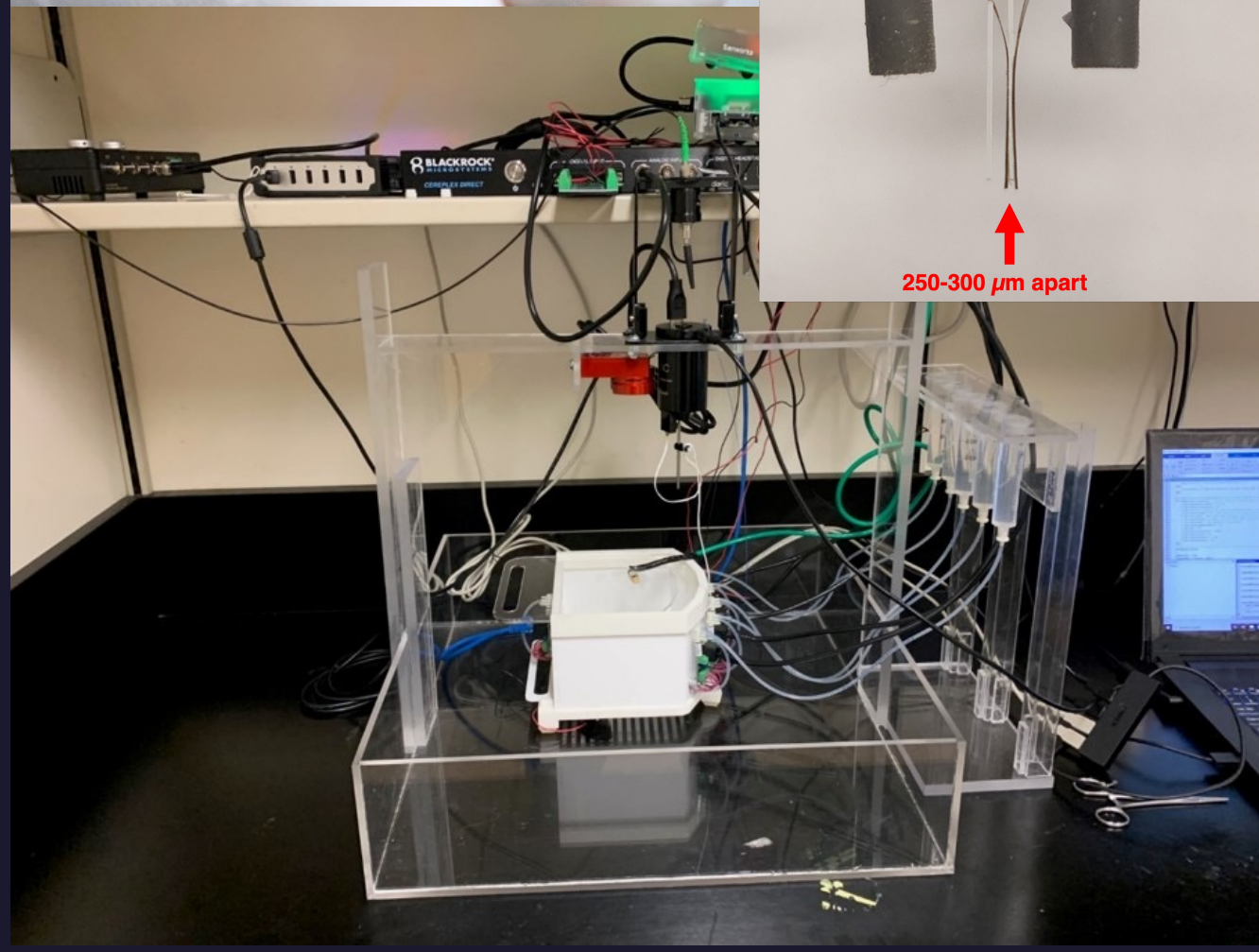
- An electrochemical gradient is created between the inside and the outside of a neuron
- This gradient allows for action potentials (an electrical wave) to propagate through the neuron , the main signaling mechanism of the the brain.
- These action potentials create electric fields, which in turn constructively and destructively interfere with each other to create neural oscillations (or brain waves) that we can record from.
- These brain waves are an emergent property of thousands of neurons firing, and have been associated with certain brain states (e.g. gamma and attention)

Investigate how brainwaves interact and synchronize in brain regions associated with the cognitive processes of attention.

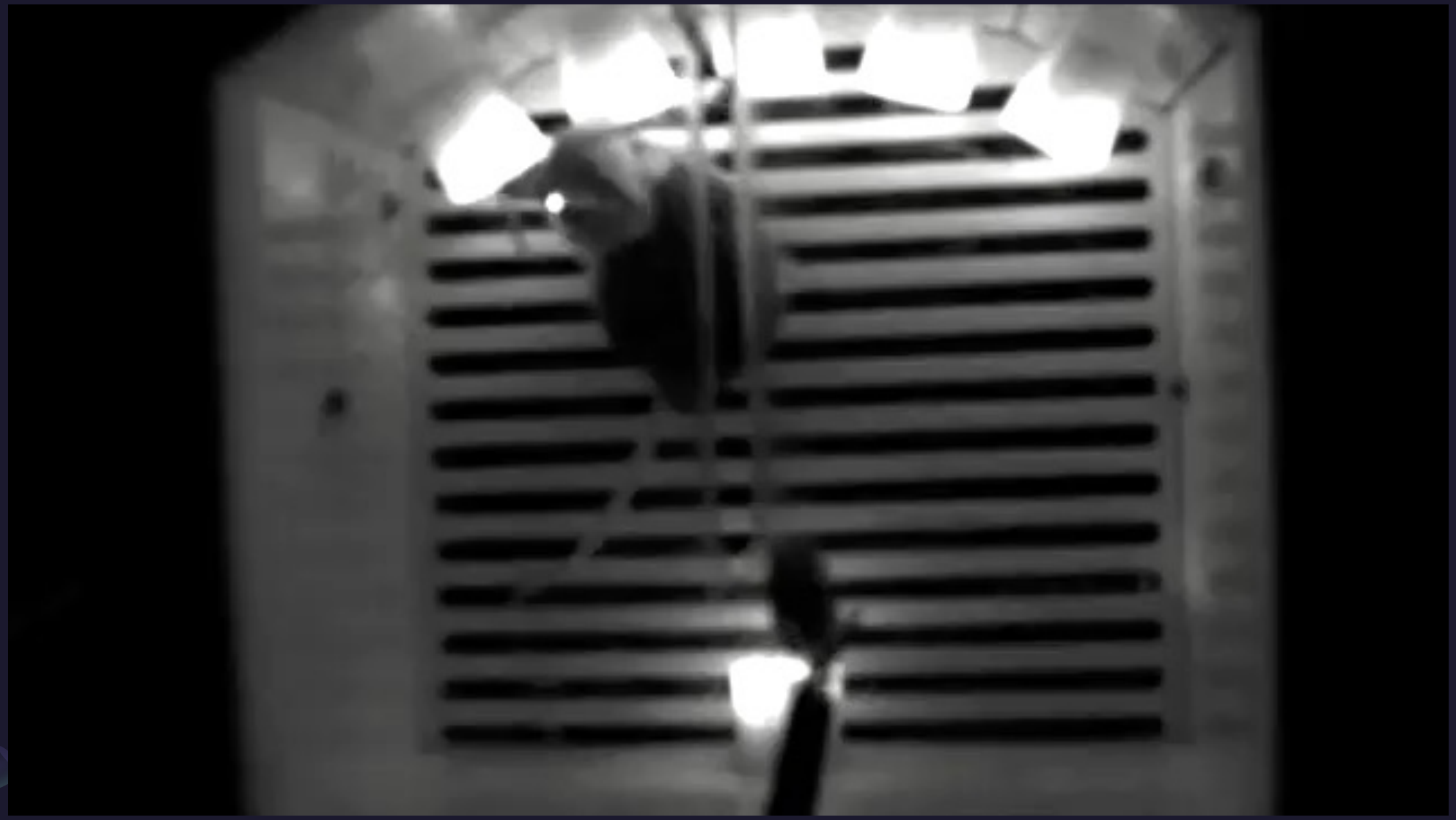
Methods

- I train mice to perform a task that we believe involves attentional processing
- I can then implant electrodes into their brains so I can see their brain rhythms during this task
- I also virally modify these mice so I can control their neurons using light





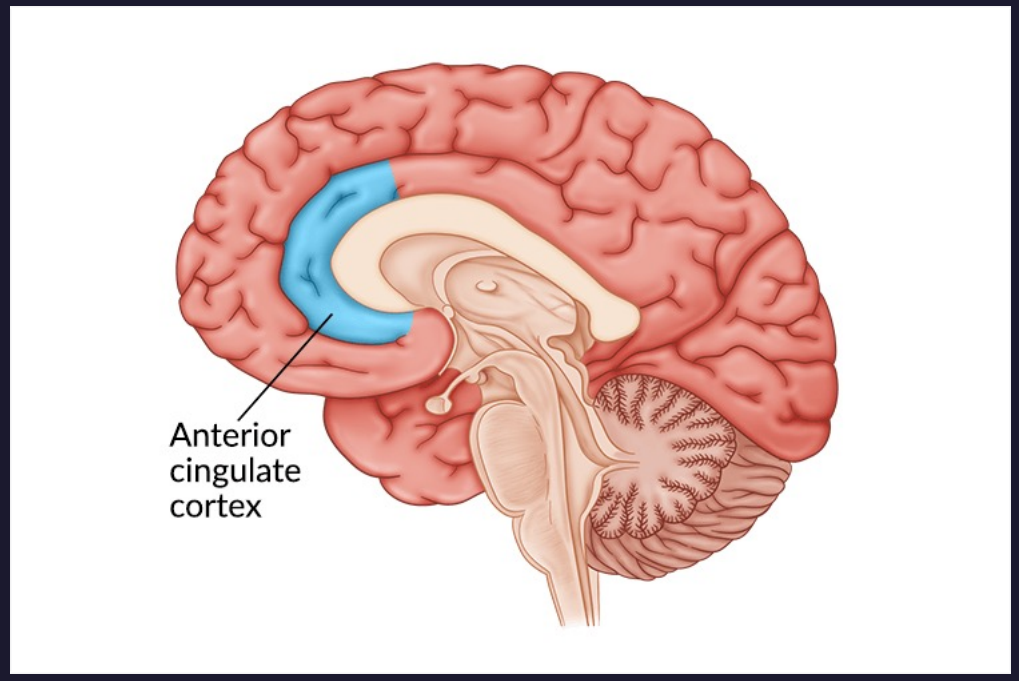
Foraging with Cued Switching (FOCUS) Task



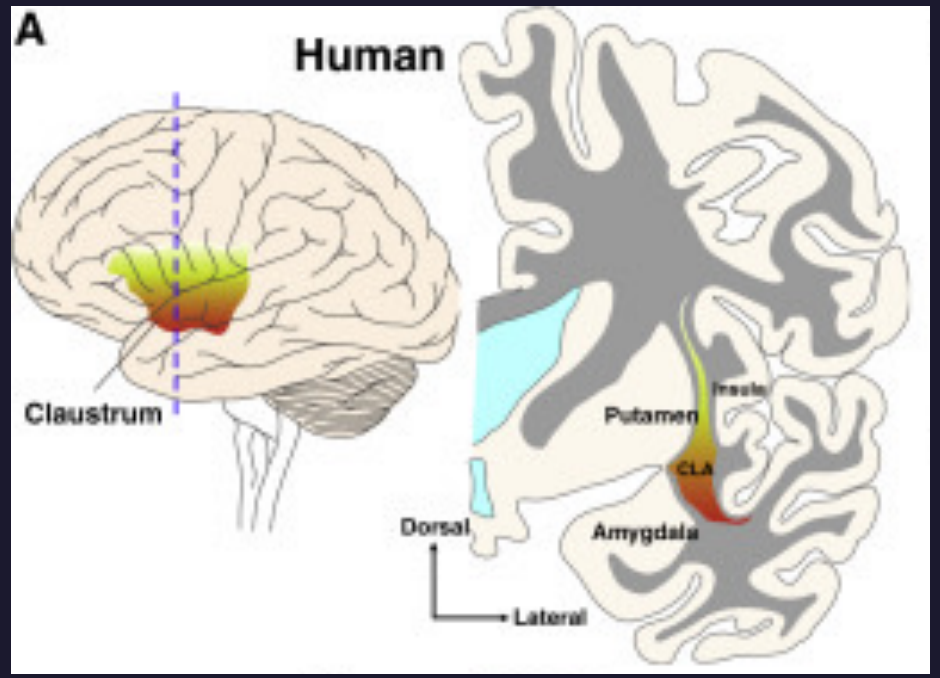
FOCUS on the Cortex and Claustrum

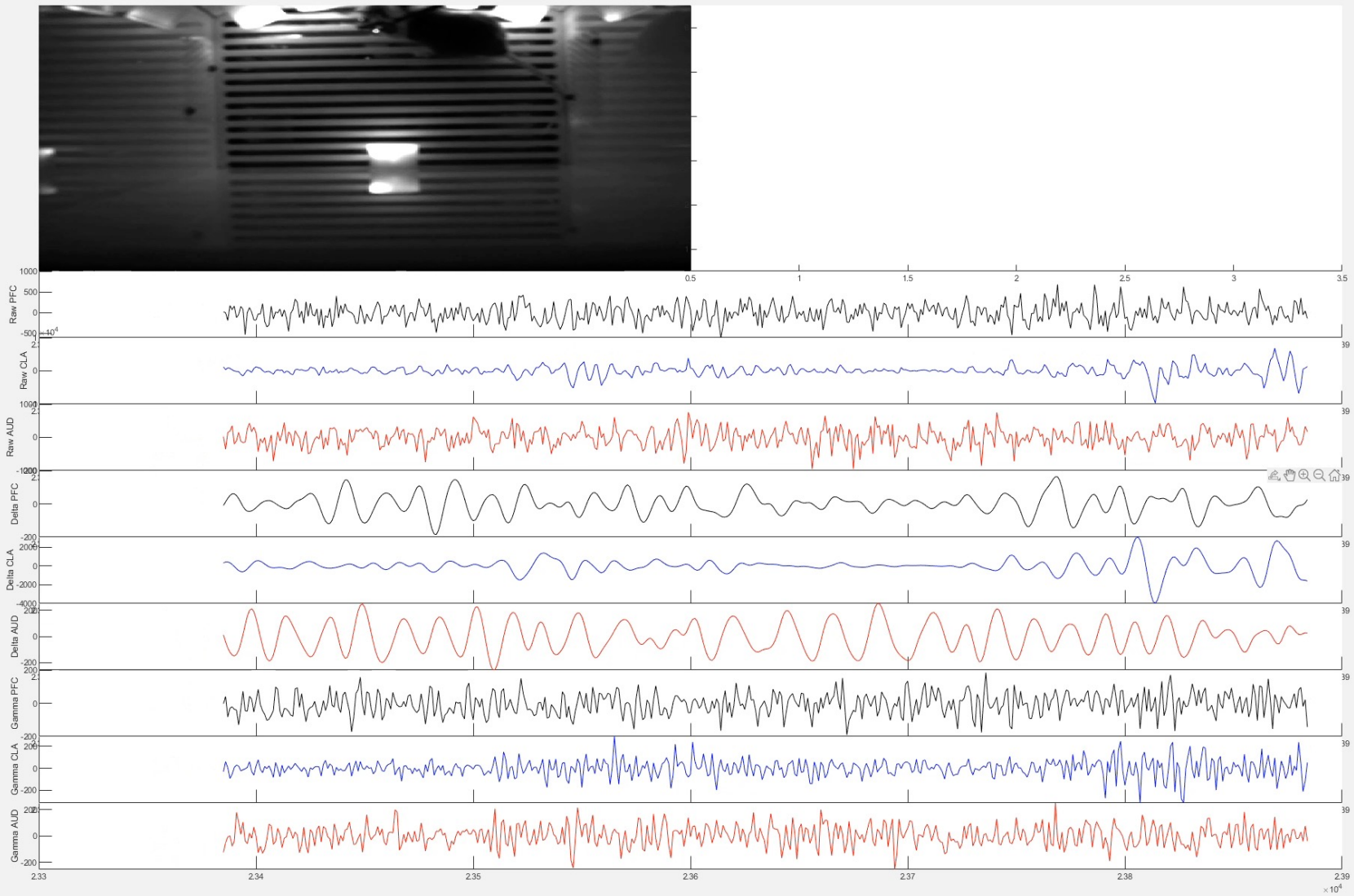
- We believe the FOCUS task involves rhythmic synchronization of brainwaves mainly between two regions: The Anterior Cingulate Cortex (ACC) and the Claustrum (CLA)

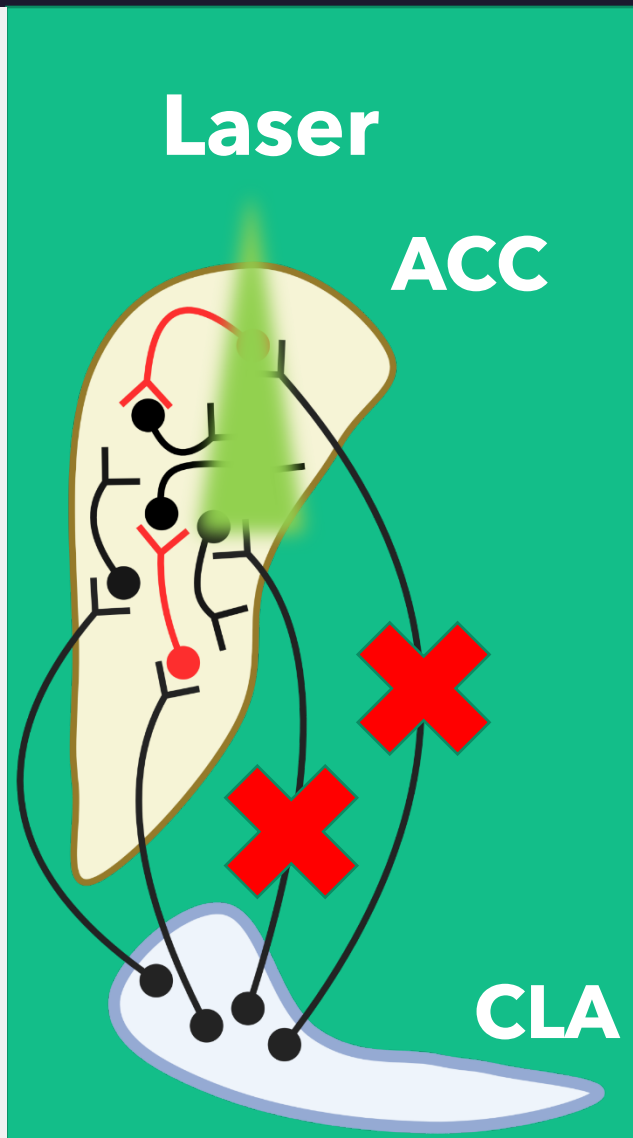
Involved when effort is needed to carry out a task



Involved in attention and conscious perception




Raw PFC
Raw CLA
Raw AUD
Delta PFC
Delta CLA
Delta AUD
Gamma PFC
Gamma CLA
Gamma AUD


Laser
ACC
CLA

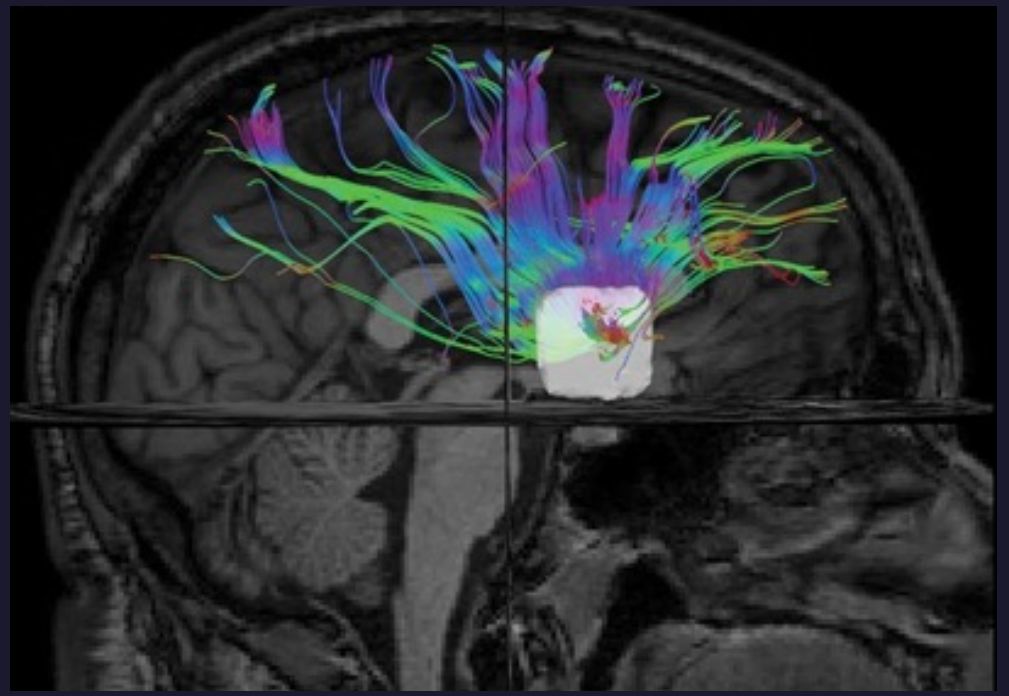
4:50= Laser

Interim Summary

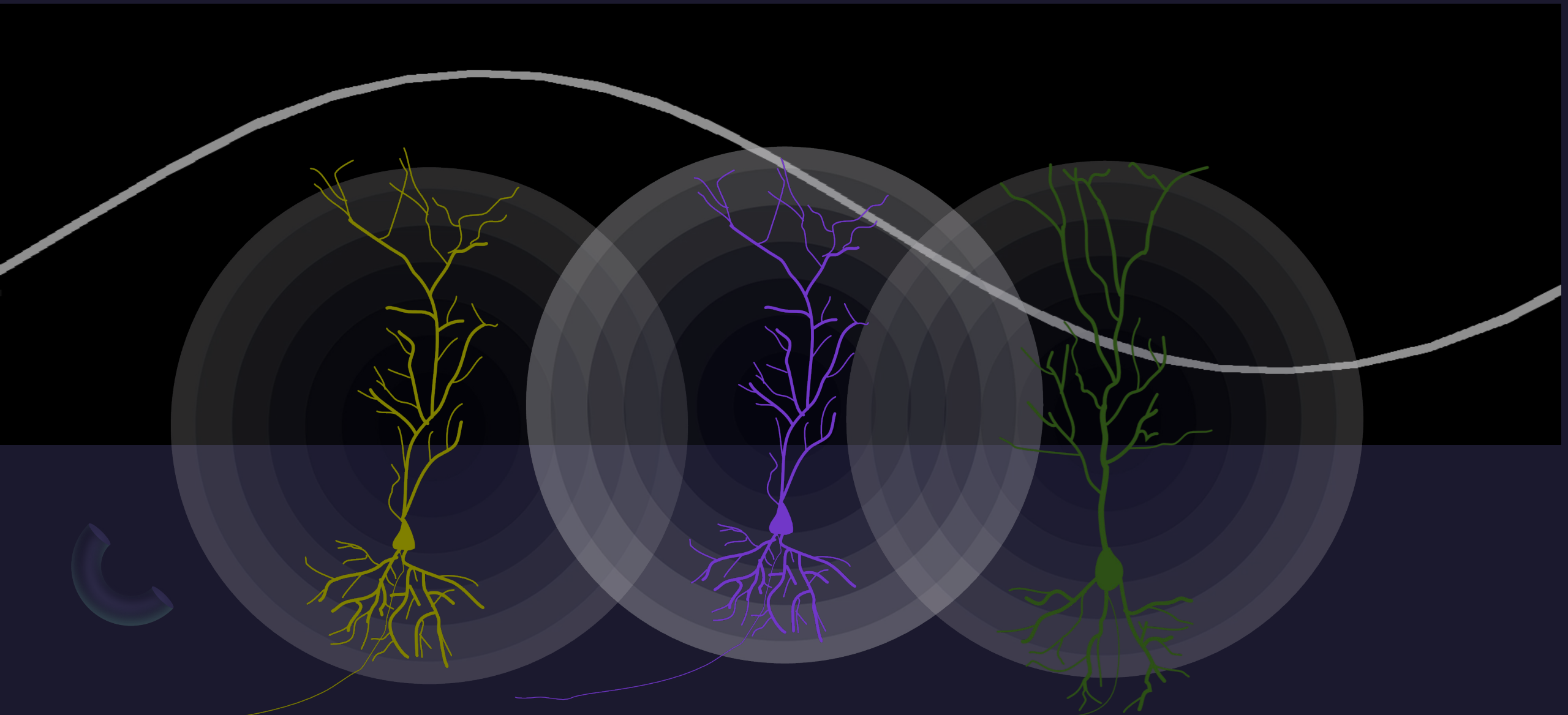
- What is the role of Brainwaves in attentional processing using a mouse model.
- Record communication between the Claustrum and Anterior Cingulate Cortex during an attentional task in a mouse.
- Preliminarily is appears the Claustrum is communicating with the ACC via delta and gamma brainwaves.
- Cutting the connection from the CLA to the ACC causes the mouse to stop performing the task and not pay attention, and also simultaneously dissolves the delta and gamma rhythms in the ACC.

The Claustrum and Consciousness

- The Claustrum is the most interconnected region in the human brain per unit volume
- In 2005, Francis Crick and Christof Koch proposed this region as the “seat of consciousness.” In which the claustrum acts as a cortical conductor not unlike a conductor of an orchestra.
- This mechanism of conducting via the claustrum may involve synchronizing brain networks using both high frequency gamma rhythms and low frequency delta rhythms.



What do brainwaves really look like?



Thank You!

FORT GEORGE BREWERY + PUBLIC HOUSE
ASTORIA, OREGON

OREGON TRIO

NW NOGGIN
nwnoggin.org

KNAPPA LOGGERS

Astoria Co-op
good. local. food.

good to GO

PETER PAN MARKET AND DELI

THE ROSEBRIAR Mansion
ASTORIA, OR