



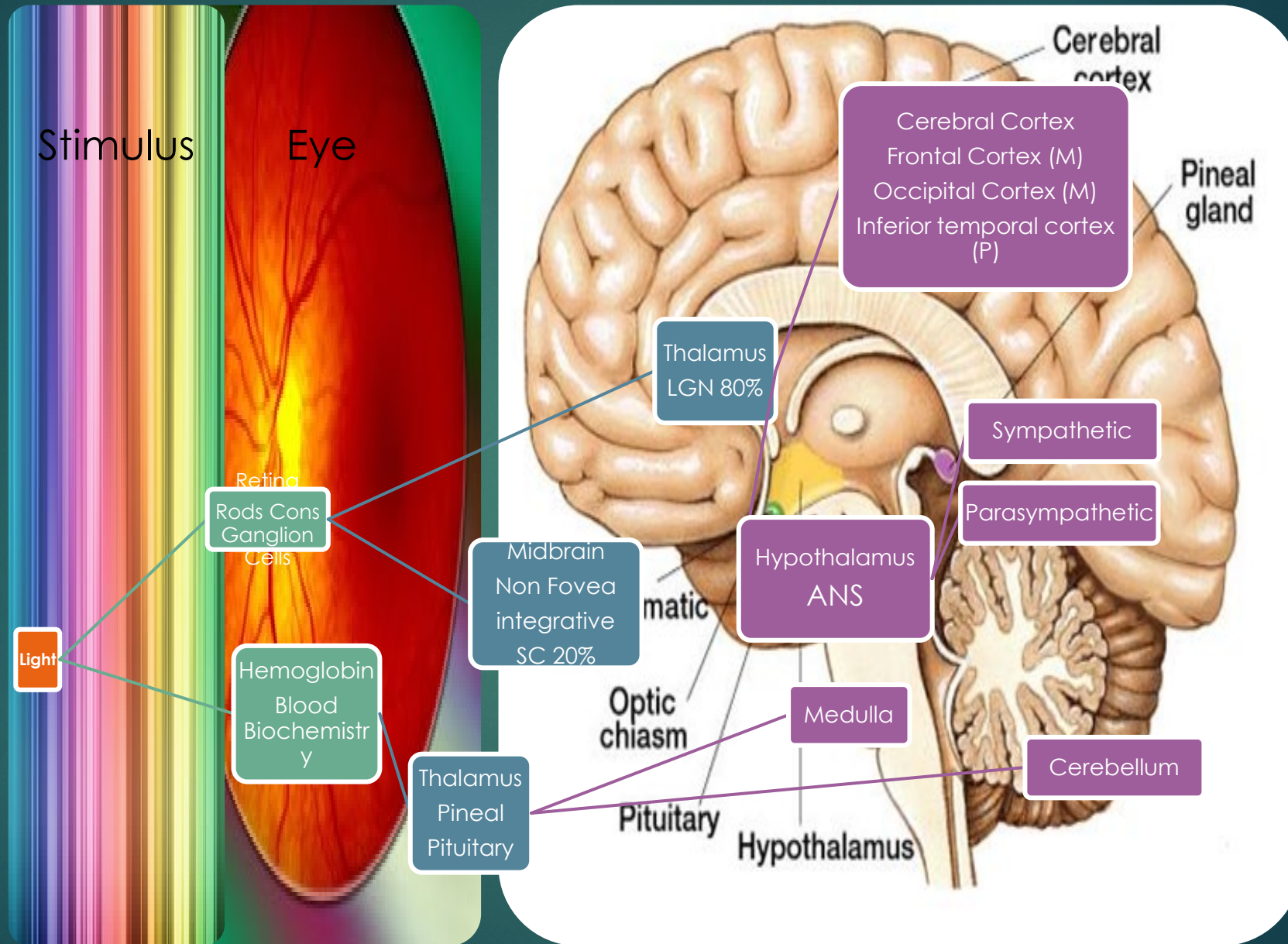
# Visual Training Leveraging the ANS

LENSES AND LIGHT



# A review of systems: Brain and Light

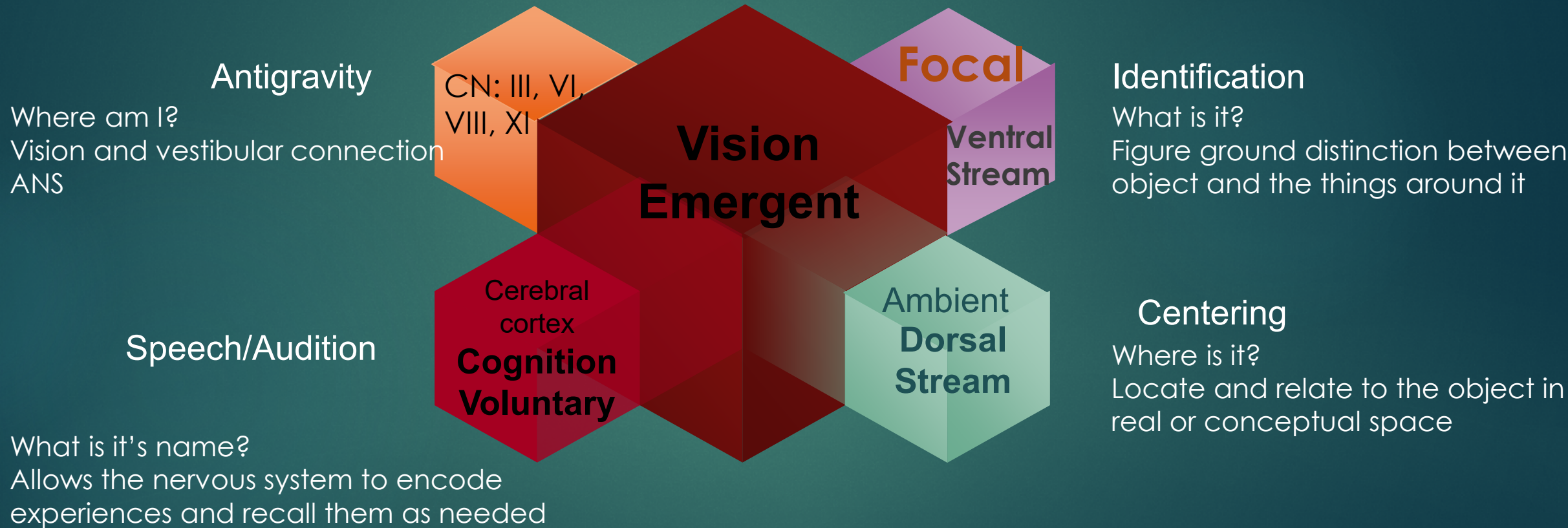
HOUR 1



Skeffington Four Circles



# A New Look at Skeffington's Four Circles

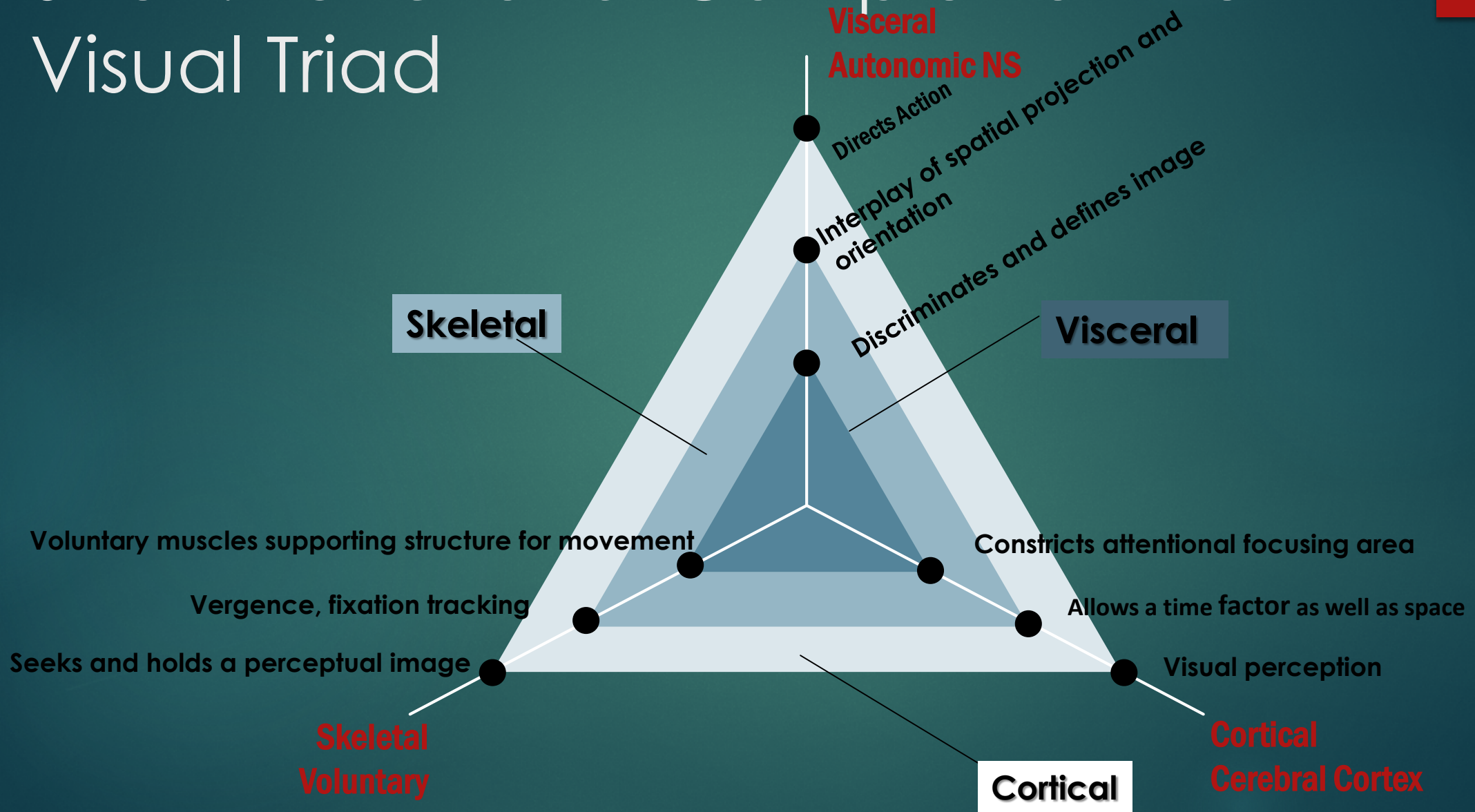


# Streff: Functional Complex of the Visual Triad

## Functional Area

<b>Skeletal</b>	builds a relationship with the world	muscles supporting structure for movement
Seeks and holds a perceptual image	directs action defines external structure and spatial environment	receptors for localization of external energies
<b>Voluntary NS</b>	body's action toward external function	<b>vergence, fixation tracking</b>
<b>Visceral</b>	contact and engagement with stimuli interplay of spatial projection and orientation	Makes the world a personal and actual possession
discriminates and defines image	attitude, feeling adjustments in instinctive field	focusing mechanisms and control visual attending changing skeletal and visceral relations
<b>ANS</b>		<b>accommodation</b>
<b>Cortical</b>	constricts attentional focusing area process information slowly and sequentially	Basis for intellectual function allows a time factor as well as space
Unifies and interprets the image	projects ahead in time and space allows abstraction, visualization codes for possible memory	relates action and language creativity unifies contributions of the visual system
<b>Cortical NS</b>		<b>Visual perception</b>

# Streff: Functional Complex of the Visual Triad



# Streff: Visceral Function

**“The focusing of the eye to establish contact, interaction and engagement”**

- ▶ When under tension or stress the ANS functions to dampen it  
(constricted visual field)
- ▶ Retinoscopy quality, color, dynamics, and light distribution
- ▶ Means to assess quality of visual contact, engagement and interaction
- ▶ Defines central and peripheral relationships
- ▶ Counterbalanced by cortical and skeletal functions





# Vision Dominates for Survival

FIRST TO START DEVELOPMENT

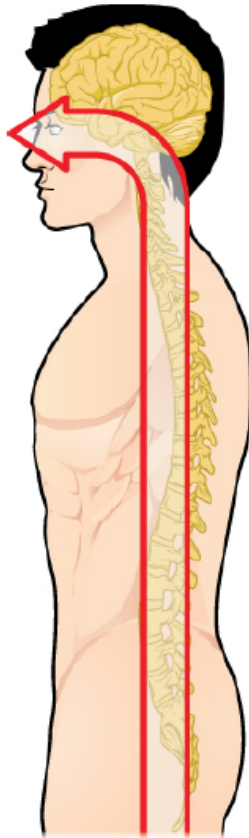
LAST TO FINISH DEVELOPMENT

# Vision Dominates from the start

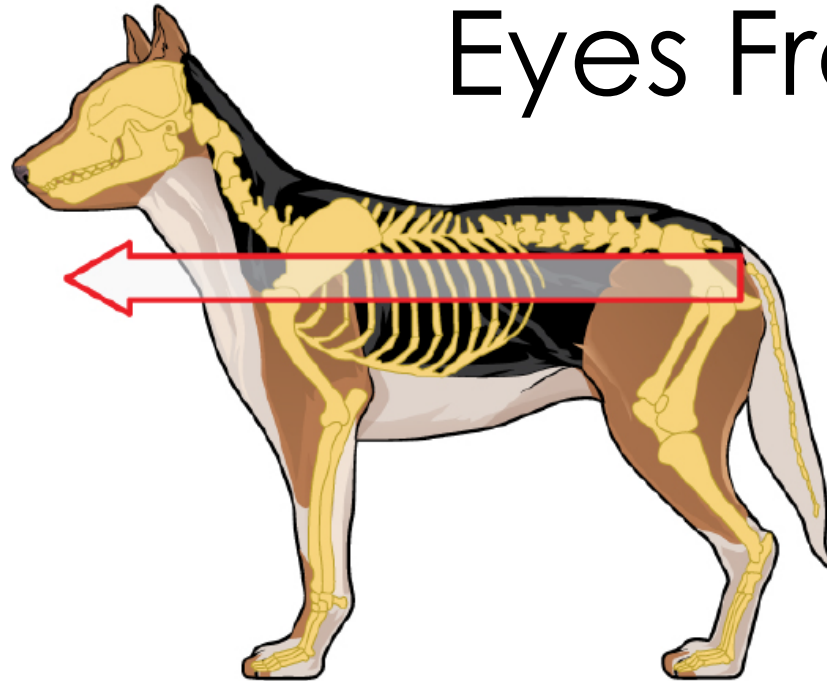
- 80% Visual Light perception  
12,00,000 optic nerve fibers
- 14% Auditory sound perception 30,000 auditory nerve fibers
- 6% smell, taste and touch perception



Human (bipedal)



Dog (quadrupedal)



# All mammals Eyes Front!

**Figure 13.4 Human Neuraxis** The mammalian nervous system is arranged with the neural tube running along an anterior to posterior axis, from nose to tail for a four-legged animal like a dog. Humans, as two-legged animals, have a bend in the neuraxis between the brain stem and the diencephalon, along with a bend in the neck, so that the eyes and the face are oriented forward.

# Vision influences taste



# McGurk Effect

▶ <https://youtu.be/2k8fHR9jKVM>



# Vision overrides Proprioception in lighted conditions

THE VISUAL INFLUENCE ON CORTICAL MOTOR REGION OCCURRED EVEN WHEN THE PROPRIOCEPTIVE INPUT RELATED TO THE REAL OPPOSITE EFFECTOR WAS NOT ALIGNED ON THE VISUAL FEEDBACK OF THE HAND GIVEN BY THE MIRROR.



# Seeing Your Foot Move Changes Muscle Proprioceptive Feedback

ENEURO. 2019 MAR-APR; 6(2): ENEURO.0341-18.2019.

PUBLISHED ONLINE 2019 MAR 22. REPUBLISHED ONLINE 2019 MAR  
4. DOI: [10.1523/ENEURO.0341-18.2019](https://doi.org/10.1523/ENEURO.0341-18.2019)



# Our Super Power: We Know Lenses in the Training Room Change The potency of the activity

- LOOK FOR A LENS THAT INCREASES THE RANGE OF FUNCTION
- CHANGE THE AMOUNT OF PLUS FREQUENTLY
- WHATEVER LOW PLUS LENS YOU CHOOSE IT WILL LIKELY CAUSE A SHIFT TOWARD MORE FLEXIBILITY





# Vision All Over The Brain

MULTIPLE PATHWAYS

INTEGRATED

DOMINATES

# Vision and Frontal Lobe



Dopamine tends to limit and select Sensory information arriving from the thalamus

- Executive function (Attention and memory, planning, inhibition, problem-solving)
- Language
- Mood
- Personality
- Self-awareness
- Social and moral reasoning

Projections to spinal cord and trunk –

**Planning movement, in the spatial guidance of movement, in the sensory guidance of movement (Eye Movements)**

# Posture

- Slouching will decrease visual memory and decreases reading comprehension
- Slant board
- Lenses

# Vision and Temporal lobe

- sensory input
- Pain
- Auditory stimuli
- Understand language
- Retain visual memories
- Process and remember emotions.





# Careful use of auditory support

Can overwhelm or support

Music in the training room

The verbal processor – tie up verbal rather than suppress verbal

# Vision and Parietal Lobe

- Sensation and perception
- Integrating sensory input to form a single perception (cognition)
- While also forming a spatial coordinate system to represent our world
- **Spatial relations primarily with the visual field**



# Visual Spatial

- Functional fields
- Activities should be concerned with what is happening both centrally and peripherally
- Lenses
- Monocular prism
- Loose minus lenses
- Parquetry Blocks, tricky fingers, geo boards etc
- The eso patient might have a non-focal central target while being aware of peripheral, while the exo patient might have a sensory/language rich central target while being aware of peripheral

# Occipital Lobe



- Visual acuity, assessing size, depth, and distance
- Determining color information
- Object recognition
- Face recognition
- Mapping the visual world
- Movement
- Meaning to visual information
- Storing memories
- **Responding to external stimuli in the world**
- Transmit visual information to the temporal lobes
- Receive input from other brain regions.



# Carefully chosen target

Facial expressions and familiar faces light up the occipital lobe

Color associations for words and numbers

Edges and outlines

Where is it – locate the target then make it clear

The whole shebang – the occipital lobe projects to or receive from all parts of the brain.

# Vision and cerebellum

Monitor and regulate motor behavior (not initiate it)

Receives Visual input for balance and spatial attention

controlling balance and reflexes of the eyes

Coordination of voluntary movement.

Balance

Posture

Motor-learning

Sequence learning

Reflex memory

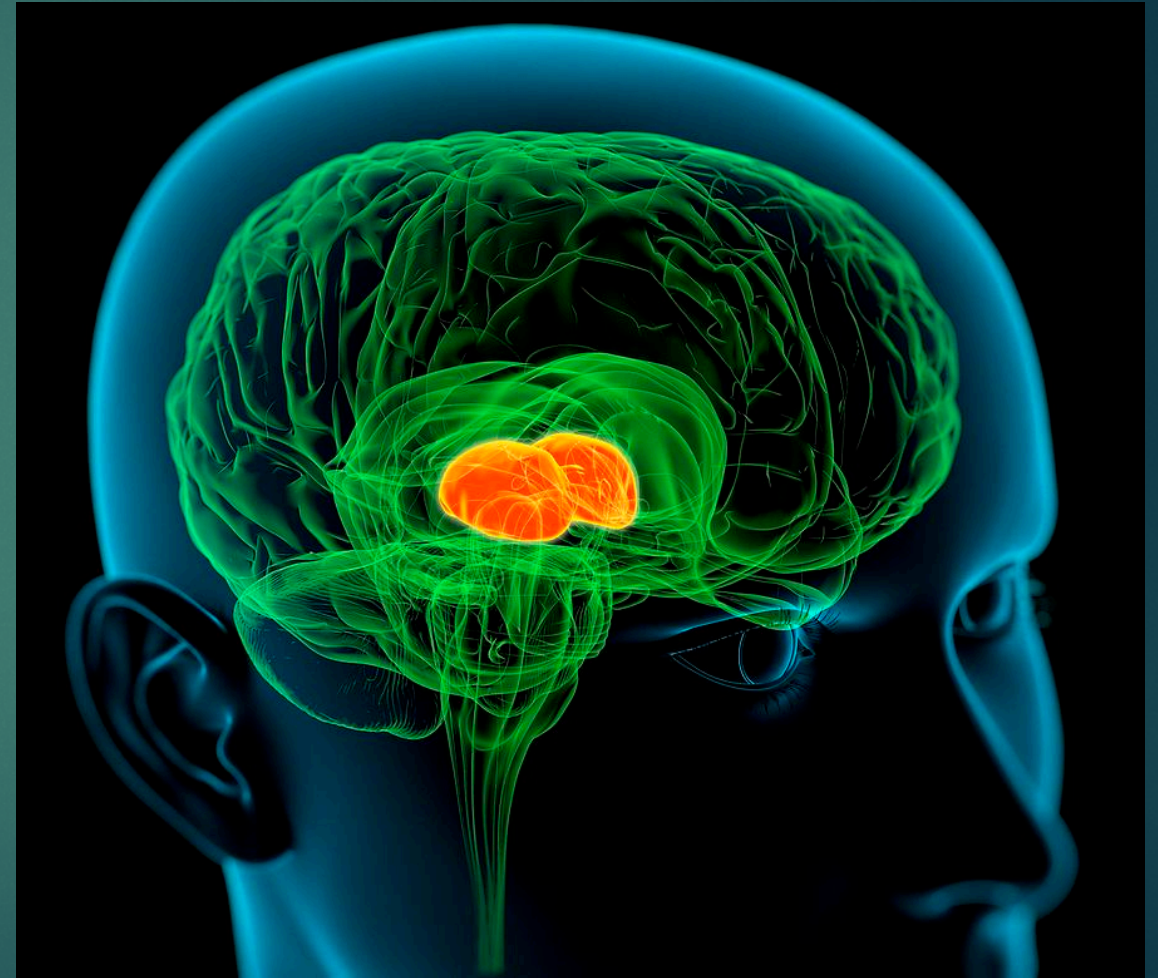
Mental function

Emotional processing



# Thalamus

- Where sensory and motor information is integrated
- **Vision and Auditory**
- Taste and smell
- **Consciousness and alertness**
- Sensory information with emotions
- Motor control (ataxia)
- Pain





# Reflexive responses

Ball play

Snowballs

Planets

Response to things coming at the patient

Pitch back

Acts as the connector between the endocrine and nervous systems to achieve homeostasis

by releasing hormones into the bloodstream: ANS

- Body temperature
- Thirst
- Appetite and weight control
- Emotions
- Sleep cycles
- Sex drive
- Childbirth
- Blood pressure
- Heart rate
- Digestion
- Balancing bodily fluids

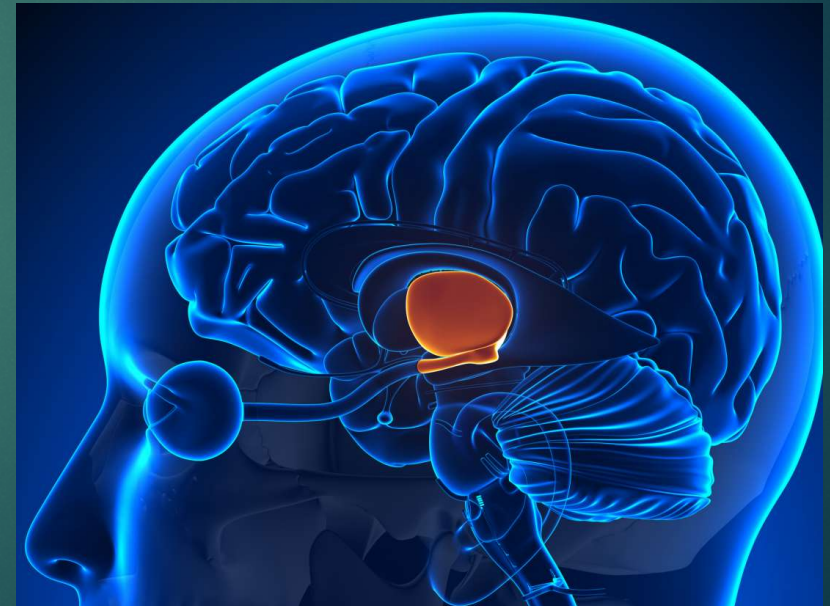
All sensory information travels through the thalamus except olfaction.

In the hypothalamus the visual system selects for attention, what visual stimuli are important (Figure ground)

Interacting with the basal ganglia to direct motion, speech and memory

# Hypothalamus

**Retino-hypothalamic tract the non visual portion of the optic nerve traveling from the ganglion cell layer to influence the production of melatonin**





# Light and Figure Ground

Syntonics

Room lighting

Windows and natural light

Shifting attention within the same activity

Computer screens and ARC

# Brain Stem Controls the ANS

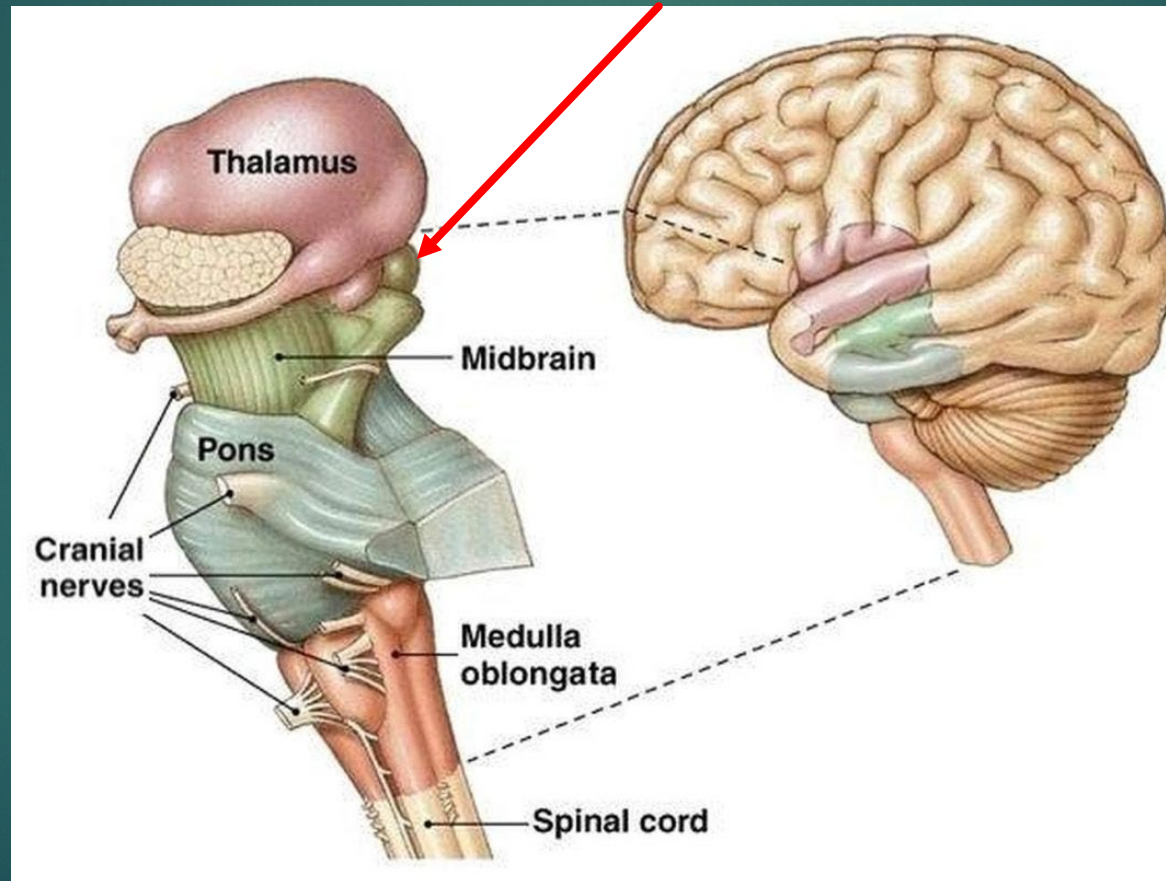
## Ten of the cranial nerves

Together, all of these sections of the brainstem and the nerves it houses relay signals for the most basic life functions from the brain to the spinal cord and on to the rest of the body.



# Brain Stem

Superior Colliculus





# Midbrain

- ▶ Arousal, consciousness, sleep-wake cycles, coordination, cardiovascular control.
- ▶ Autonomic function, and behavioral responses to fear and anxiety
- ▶ Controlling the defensive reactions associated with post-traumatic stress disorder (PTSD).
- ▶ Pain and temperature
- ▶ Motor coordination.
- ▶ Makes the neurotransmitter dopamine
- ▶ Movement and reward system

## Cranial nerve III –Oculomotor

- ▶ Pupil
- ▶ Most eye movements

## Cranial nerve IV - Superior oblique muscle

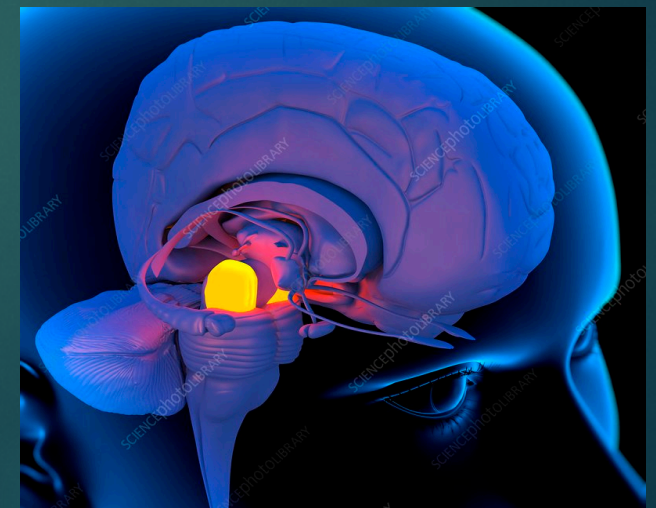
Abduct, depresses, internally rotates the eye

## The superior colliculi

- ▶ Processes vision signals from the retina of the eye to the occipital lobe responsible for generating eye movements and neck muscle activity.<sup>3</sup>

## The inferior colliculi

- ▶ Processing auditory signals to the thalamus and then to the primary auditory cortex in the temporal lobe.
- ▶ Sound localization
- ▶ Creating the startle response
- ▶ Orienting the body towards certain stimuli
- ▶ Discriminating pitch and rhythm





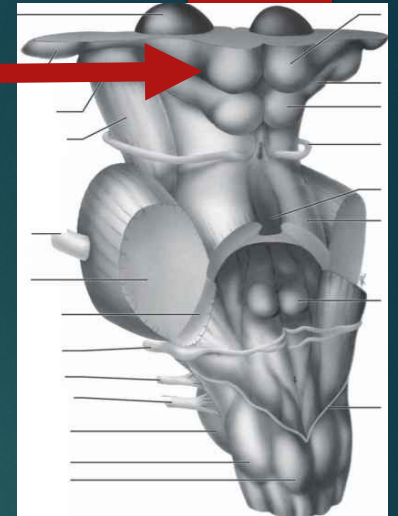
# Motor coordination - speed

Slow pursuits

Saccades are reflexive and are estimated by the functional visual field

# Superior colliculi

- ▶ Signals from the retina
  - ▶ Multiple signals from various other parts of the brain.
- 
- Orientation to the eyes and head
  - Projections from the colliculus to spinal cord helps the head to respond to different sensory stimuli
  - Movement of the eyes
  - Visual processing systems
  - With the hippocampal areas provides connect the two sides of the brain. How we get Blind Sight





# Eyes moving integrated with other systems

Trampoline

Walking rail

Yoked prism

Head posture

Dissociating prism

# Pons “The Bridge”

## Connection between the cerebrum and cerebellum

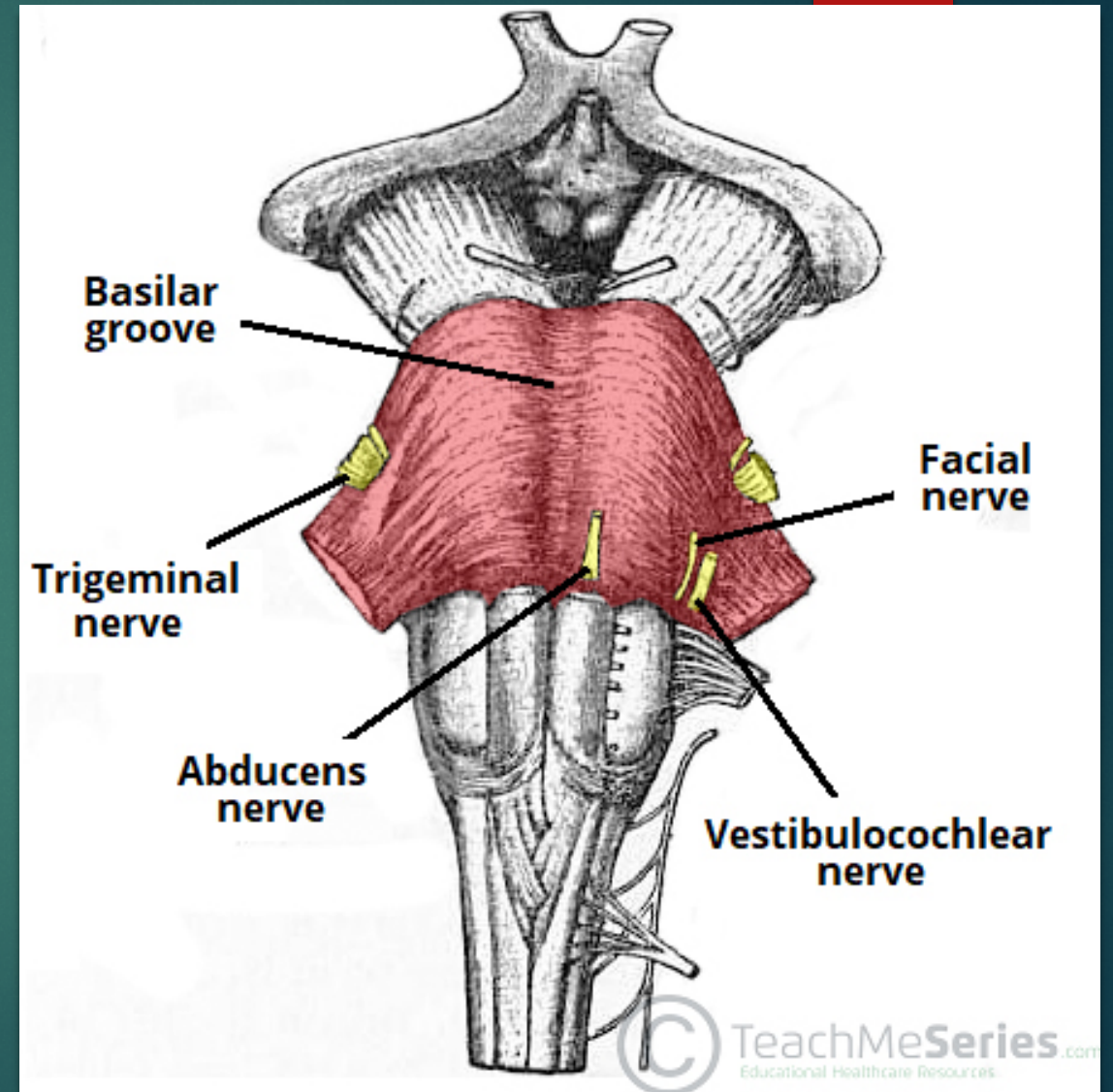
- Conveys information about position sense (proprioception), vibration, and discriminatory touch
- Sensations of pain, temperature, and light touch
- Voluntary movement of the body, head and neck

**Cranial nerve V: trigeminal**

**Cranial nerve VI: abducens**

**Cranial nerve VII: facial**

**Cranial nerve VIII: vestibulocochlear**



# Head Posture and Head Movement

Trapezius

Mirror activities

Wide Binasal – motion not alignment

Yoked prism especially BR and BL

The visual horizon

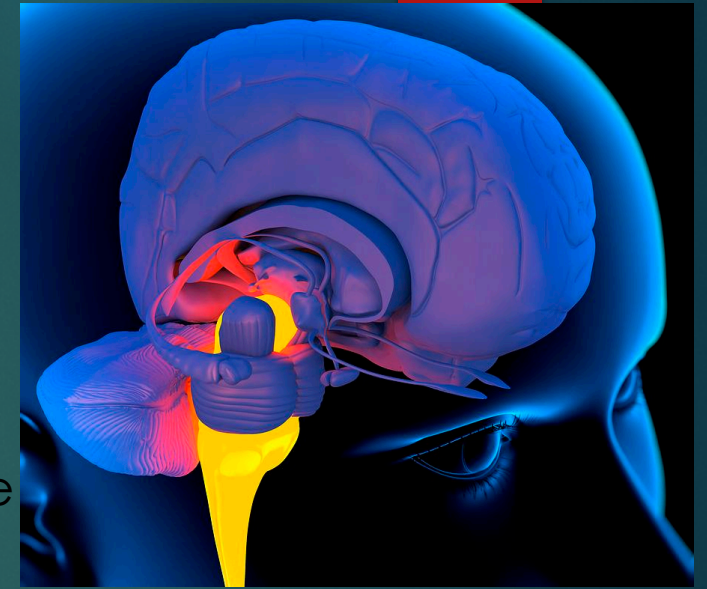
Trapeze shoulder and core stabilization

BI BO – SILO, SOLI

Plus lenses – size and location

# Medulla

- **Cranial nerve 9** - Glossopharyngeal
    - controls swallowing, taste, and saliva production.
  - **Cranial nerve 10** - Vagus nerve
    - breathing, heart function, and digestion.
    - source for parasympathetic stimulation, which controls hormone
  - **Cranial nerve 11** - Accessory Spinal
    - controls the muscles in the upper back and neck
  - **Cranial nerve 12** - Hypoglossal nerve.
    - tongue movement for speech and swallowing
- ▶ The medulla oblongata carries signals from the brain to the rest of the body for essential life functions like breathing, circulation, swallowing, and digestion.
- ▶ houses the reticular formation which is responsible for general wakefulness and attention. Non visual light pathways



# The Limbic System = Survival

## Amygdala, Hippocampus, thalamus and Hypothalamus

- ▶ Emotions, motivations, fear and anger, feelings of pleasure from eating and sex
- ▶ Memory : Where, Which and Retrieval
- ▶ The limbic system influences both the peripheral nervous system and the endocrine system





# The Limbic System

All senses


Light

Sensory and motor regulation

# Amygdaloid Body

- ▶ Smelling,
- ▶ Motivation
- ▶ Emotional responses are made by the olfactory and limbic systems
- ▶ Assists in responses of fear and pleasure
- ▶ Where and what memories are stored





# The reflexive system – loves the familiar

I am never going to let that happen to me again...

I want that to happen over and over again

How you get home when you don't remember driving there

A safe place to make mistakes

Love vs yelling and embarrassment

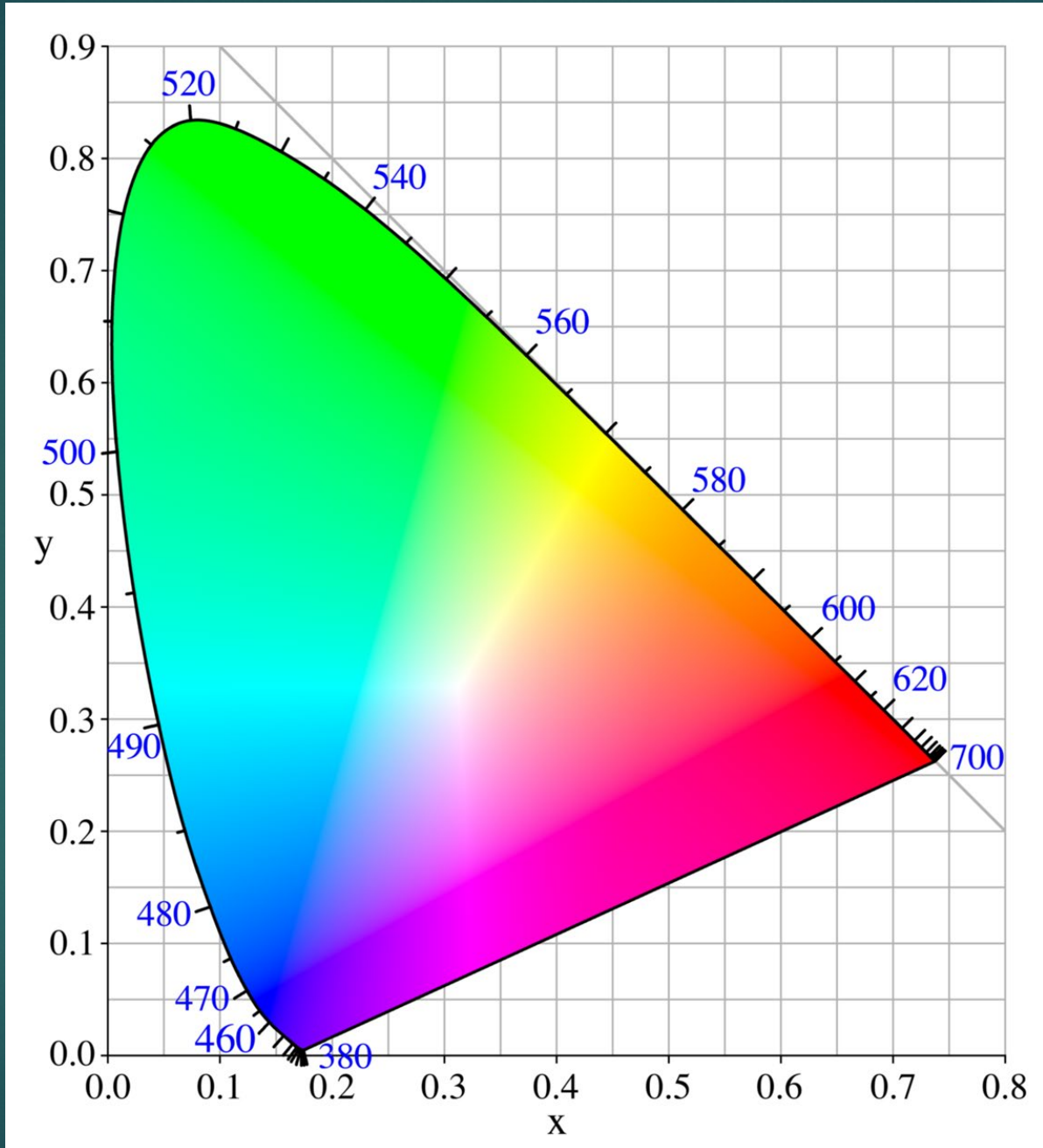
# Syntonics

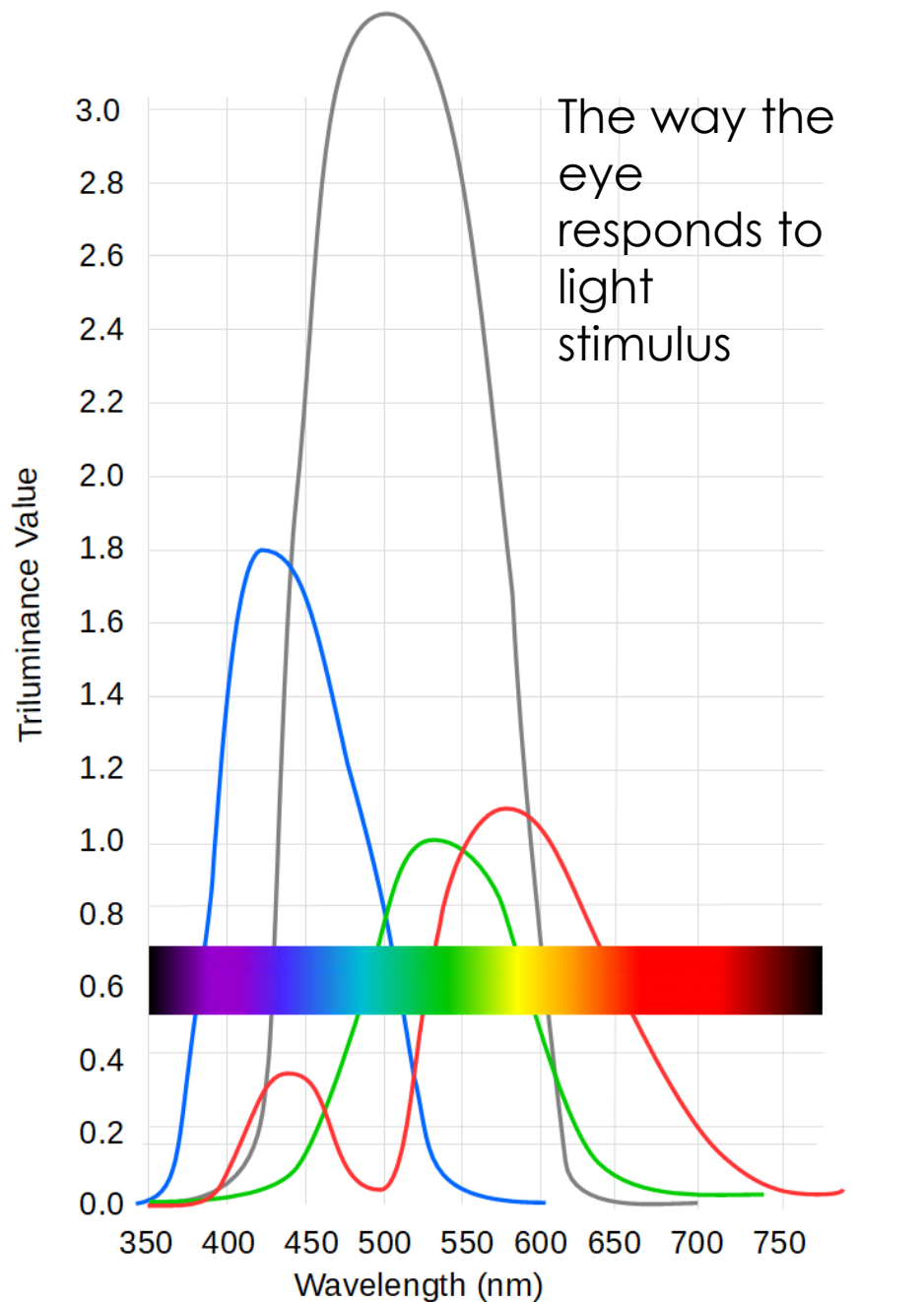


- ▶ Blue – activates the parasympathetic nervous system. Calms – often used for hyperactive children.
- ▶ Red – activates sympathetic nervous system.
- ▶ Blue-Green – heals post-traumatic tissue-injuries.
- ▶ Yellow – anti-depressive.
- ▶ Yellow/Green – liver detox.
- ▶ Magenta – brings deeply held conflicts and emotions to the surface.

# Directly from the retina to the hypothalamus - retino-hypothalamic tract

- ▶ strictly physiological effect of color on the ANS:
  - ▶ Blue stimulates the anterior hypothalamus, regulating the parasympathetic
  - ▶ Red stimulates the posterior hypothalamus and therefore the sympathetic nervous system. Red provokes anger.
  - ▶ Green mediates between both systems.
  - ▶ Magenta is a bit of a paradox. It can have an action like red, blue or green





The gray line is the response of rod cells - very sensitive, inform the brain about contrasts and movement.

The cones respond as follows:

The brain senses red when the green-yellow and the green signal is on but not the violet

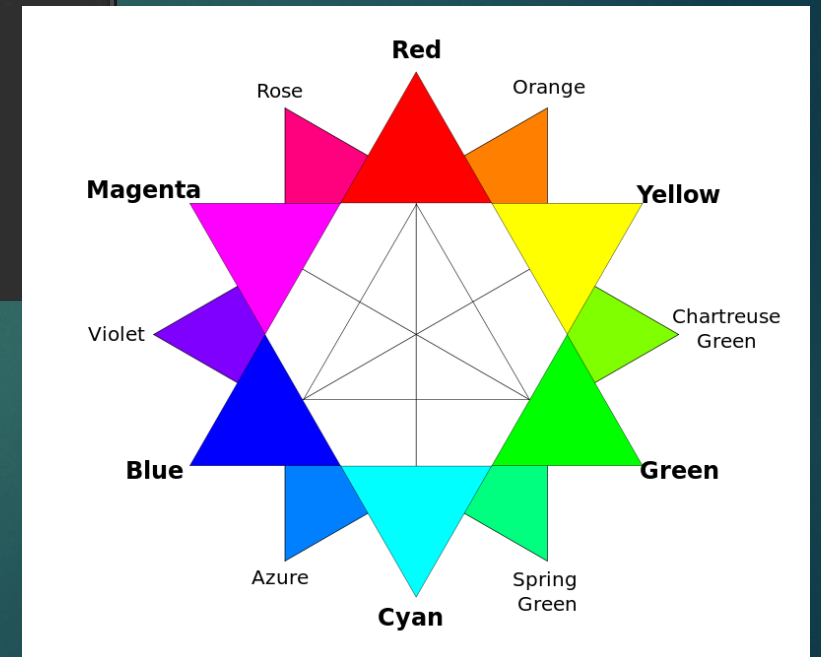
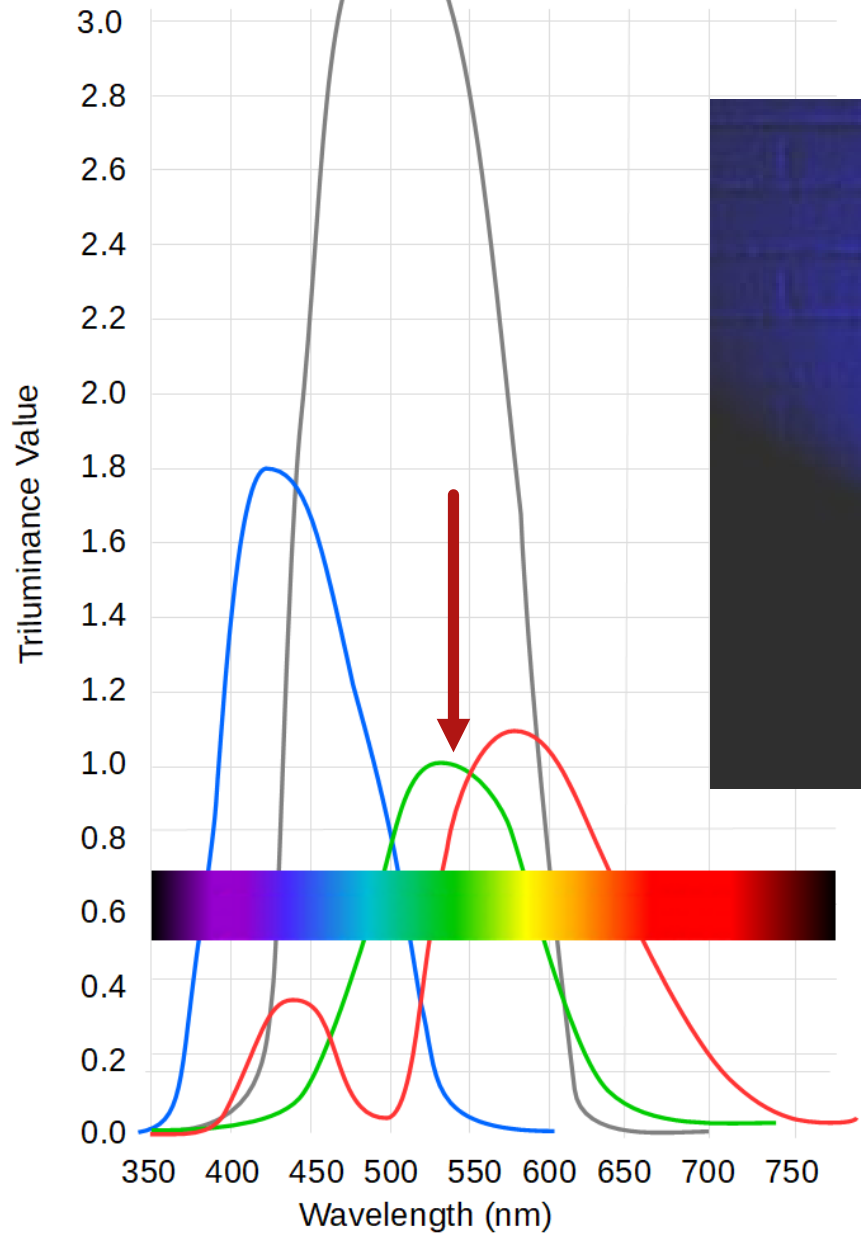
The brain sees green when the green signal is high but the other two have fallen off.

The brain sees blue and violet when the violet signal is high, green is falling off and green-yellow is minimal.

The brain separates these three signals to give you all the colors in the rainbow.

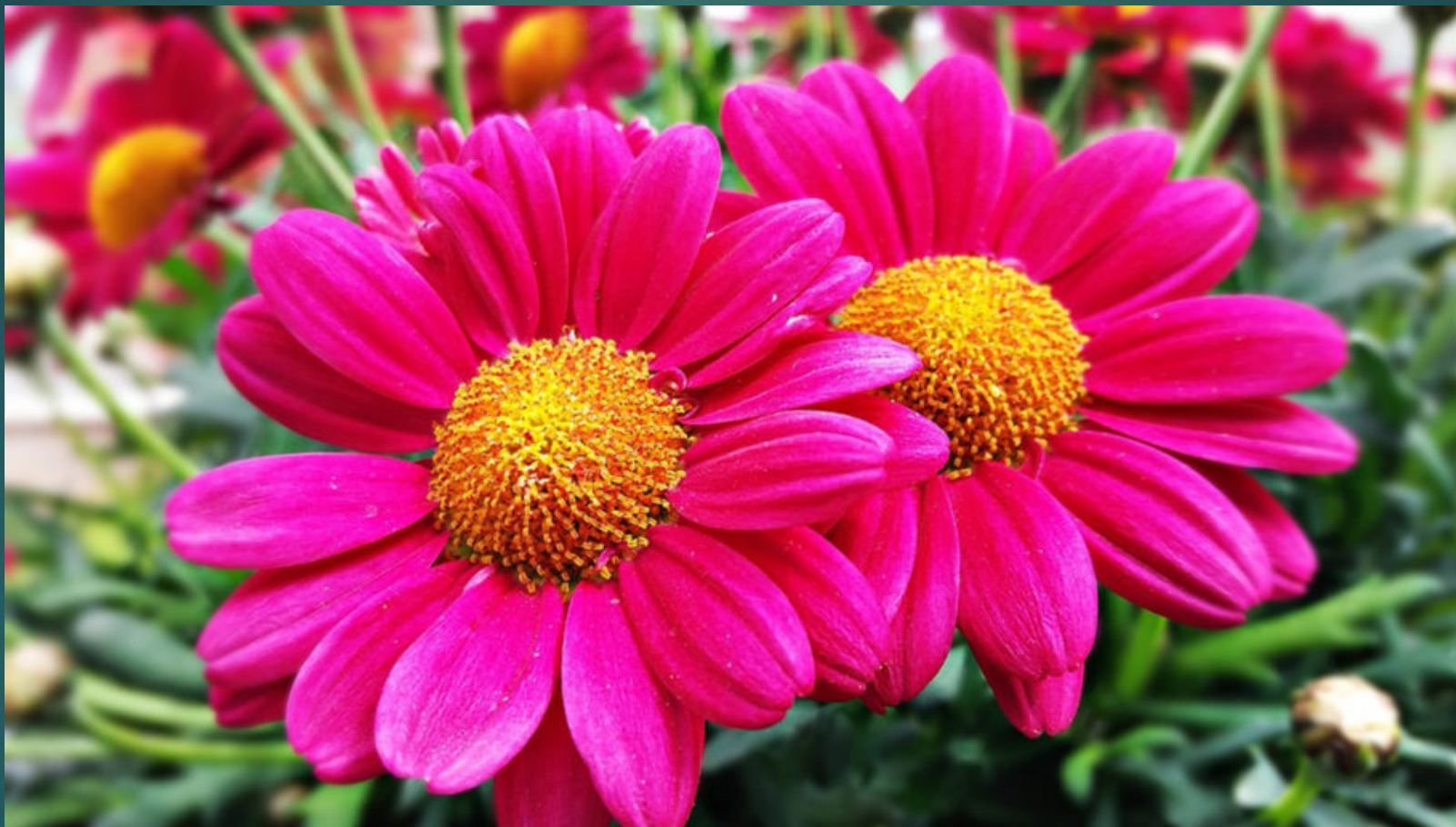
White is what you see when all three are signaling.

Halfway between red and blue but not green leads to magenta.

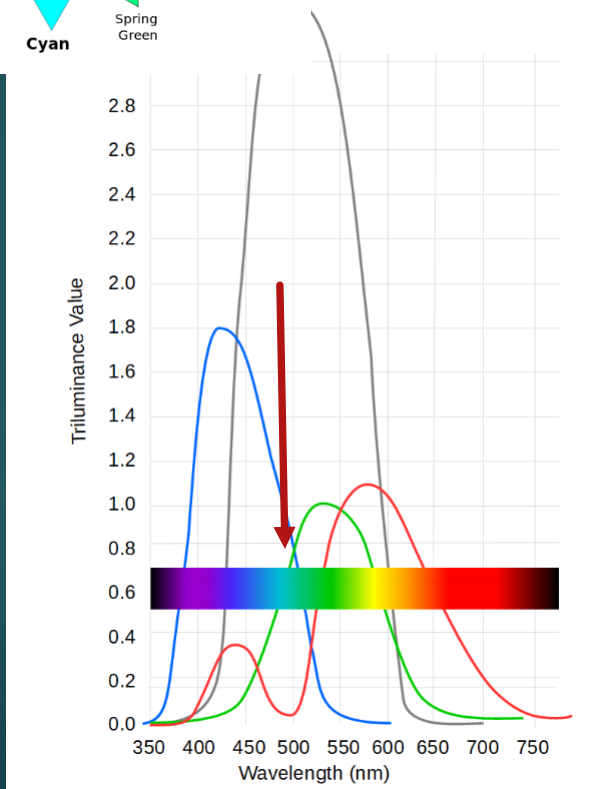
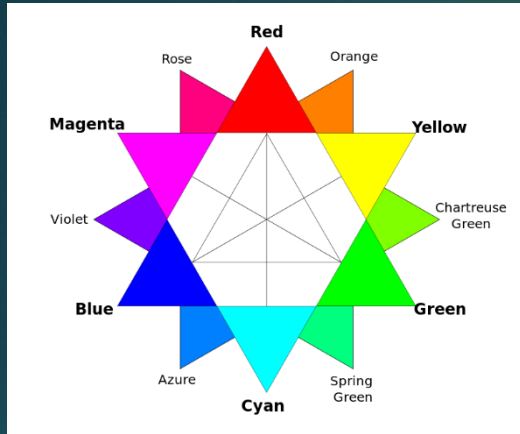




Magenta is always harmony



# Cyan between Green and Blue - Harmony





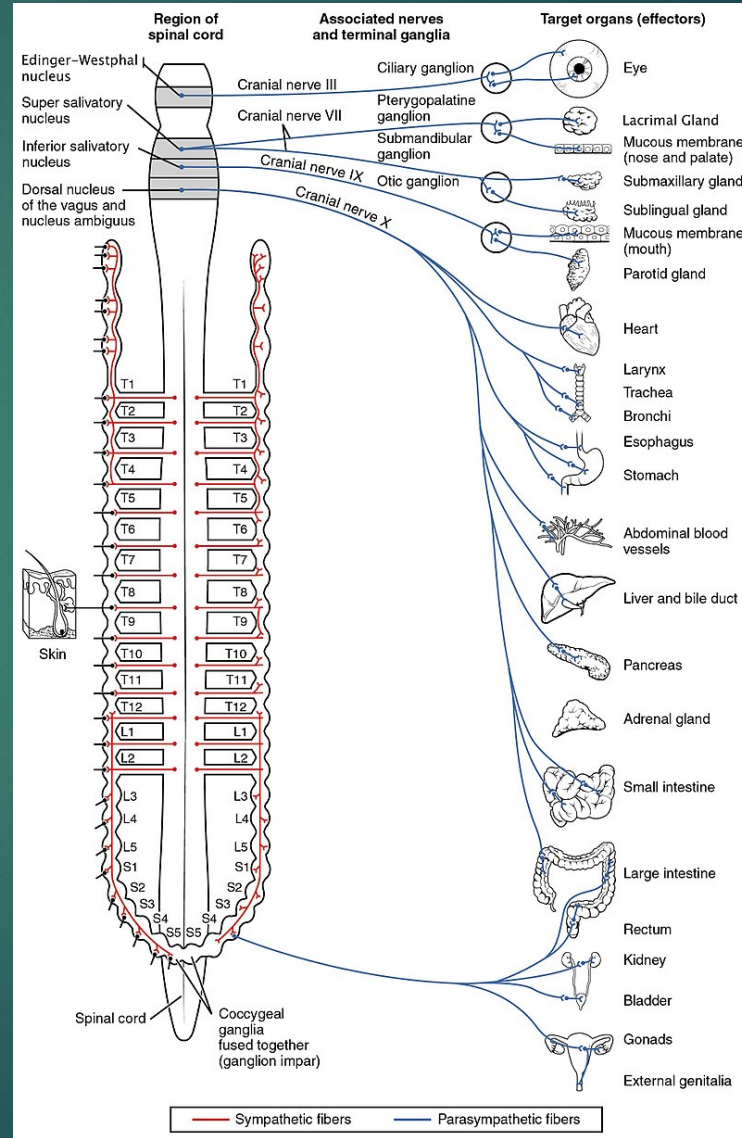
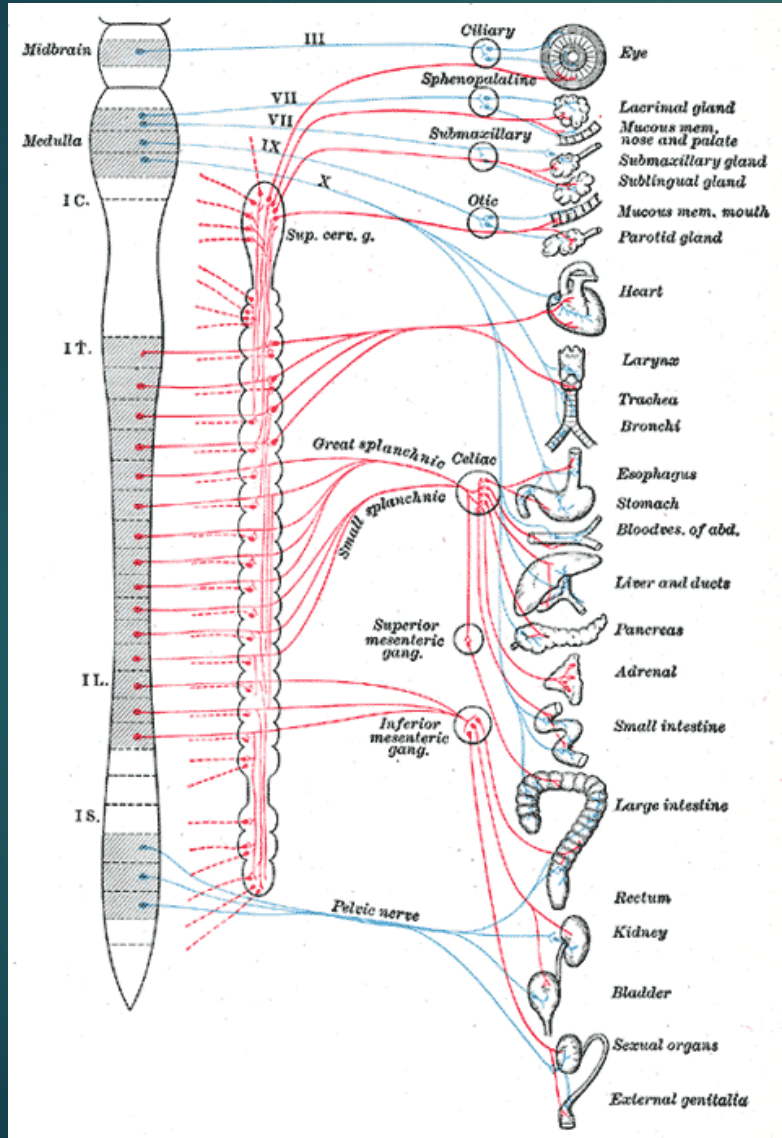
When to rest and when to wake  
When to store food  
When to reproduce



Warning



# Autonomic Nervous System



# Neurotransmitters

## Parasympathetic - Motor

All vertebrate motor neurons are cholinergic

They release acetylcholine.

Parasympathetic ganglionic neurons are also cholinergic

## Sympathetic - Sensory

Most sympathetic ganglionic neurons are noradrenergic

They release noradrenaline

