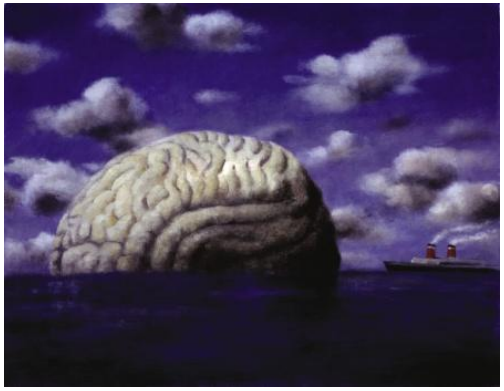
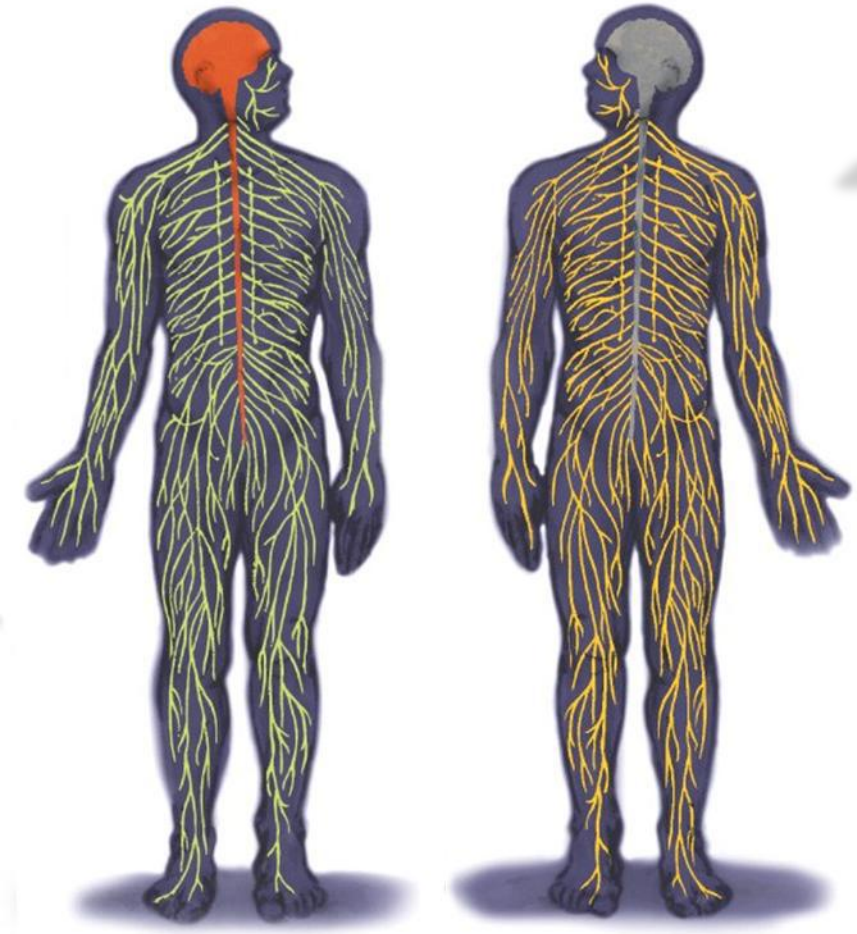


심리학의 생물적 기초: 신경과학과 행동

신경계(Nervous System)

중추신경계

뇌와 척수에 있는 모든 신경



말초신경계

뇌와 척수를 신체의 다른 부분과 연결하는 신경

Neuroscience and Behavior

신경의 의사소통 (Neural Communication)

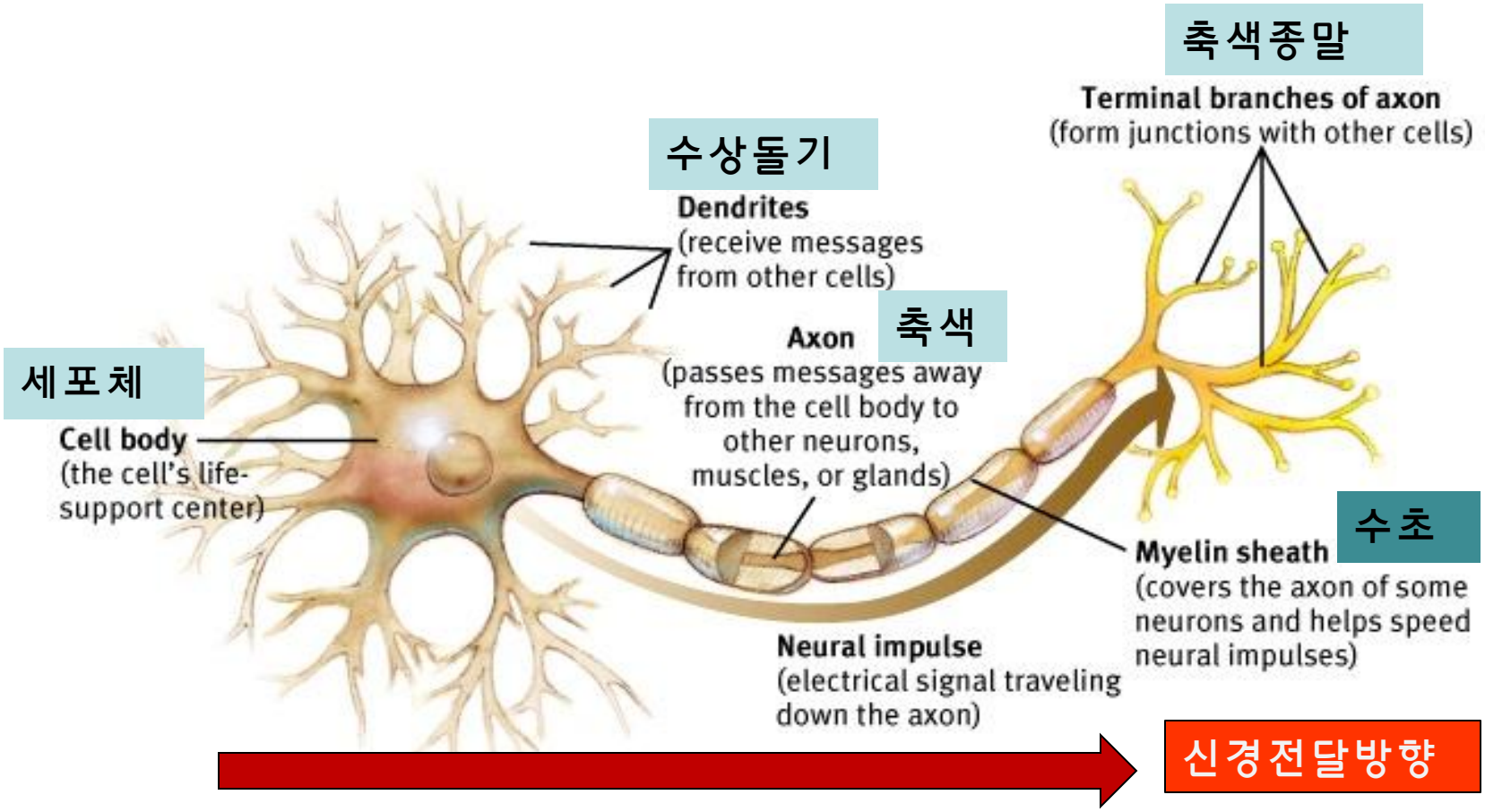
- 신경계의 단위: Neurons(뉴런: 신경세포)
- 뉴런은 어떻게 소통하는가?
- 신경전달물질의 영향

  Neurotransmitters Influence Us

뇌의 기능(The Brain)

신경계의 기본 단위:Neuron

신경세포(A nerve cell) 또는 뉴런(neuron)



활동전위(Action Potential): neural impulse

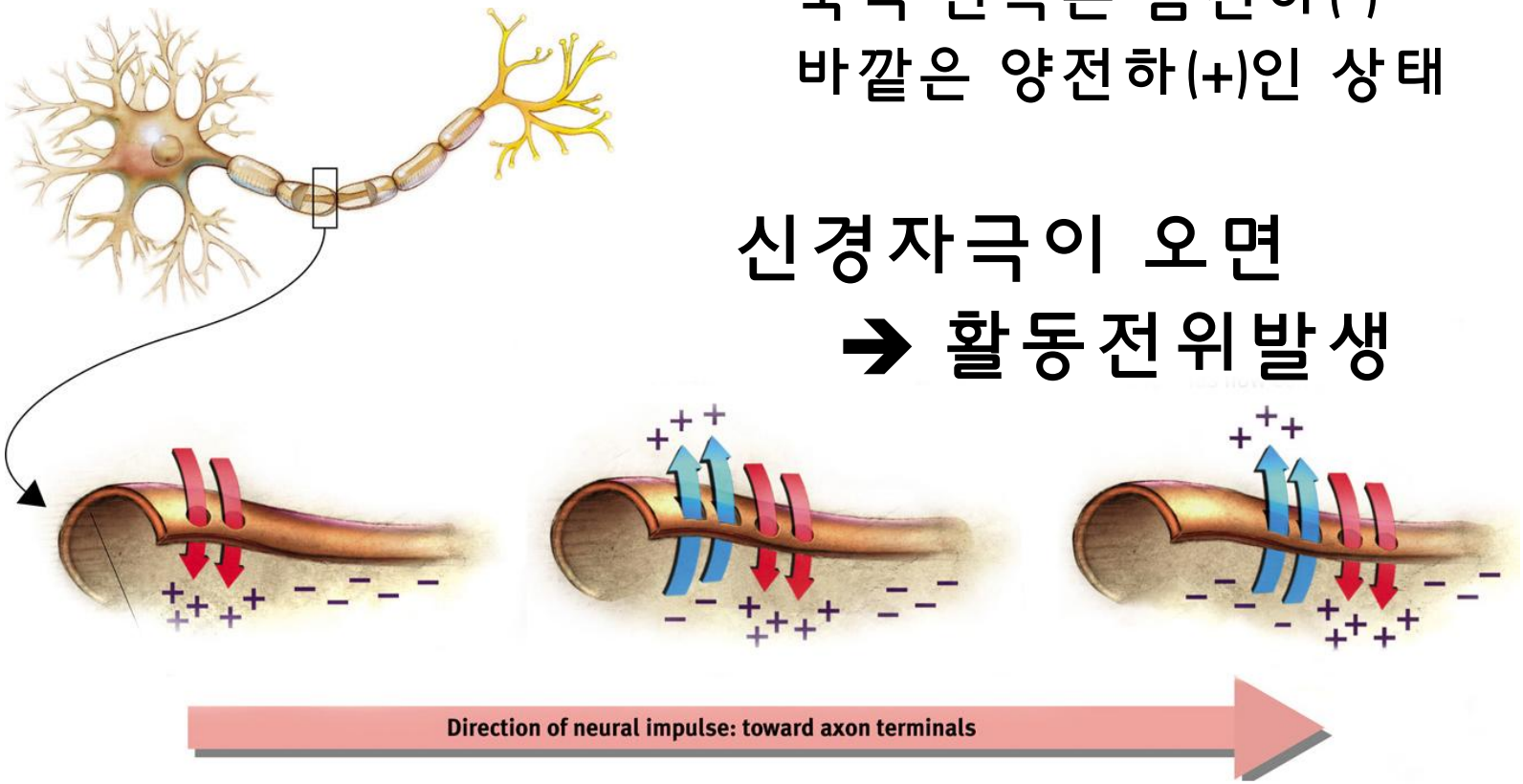
안정전위:

축색 안쪽은 음전하(-)

바깥은 양전하(+)인 상태

신경자극이 오면

➔ 활동전위발생



역치(Threshold)

역치: 인식할 수 있는 최소 강도

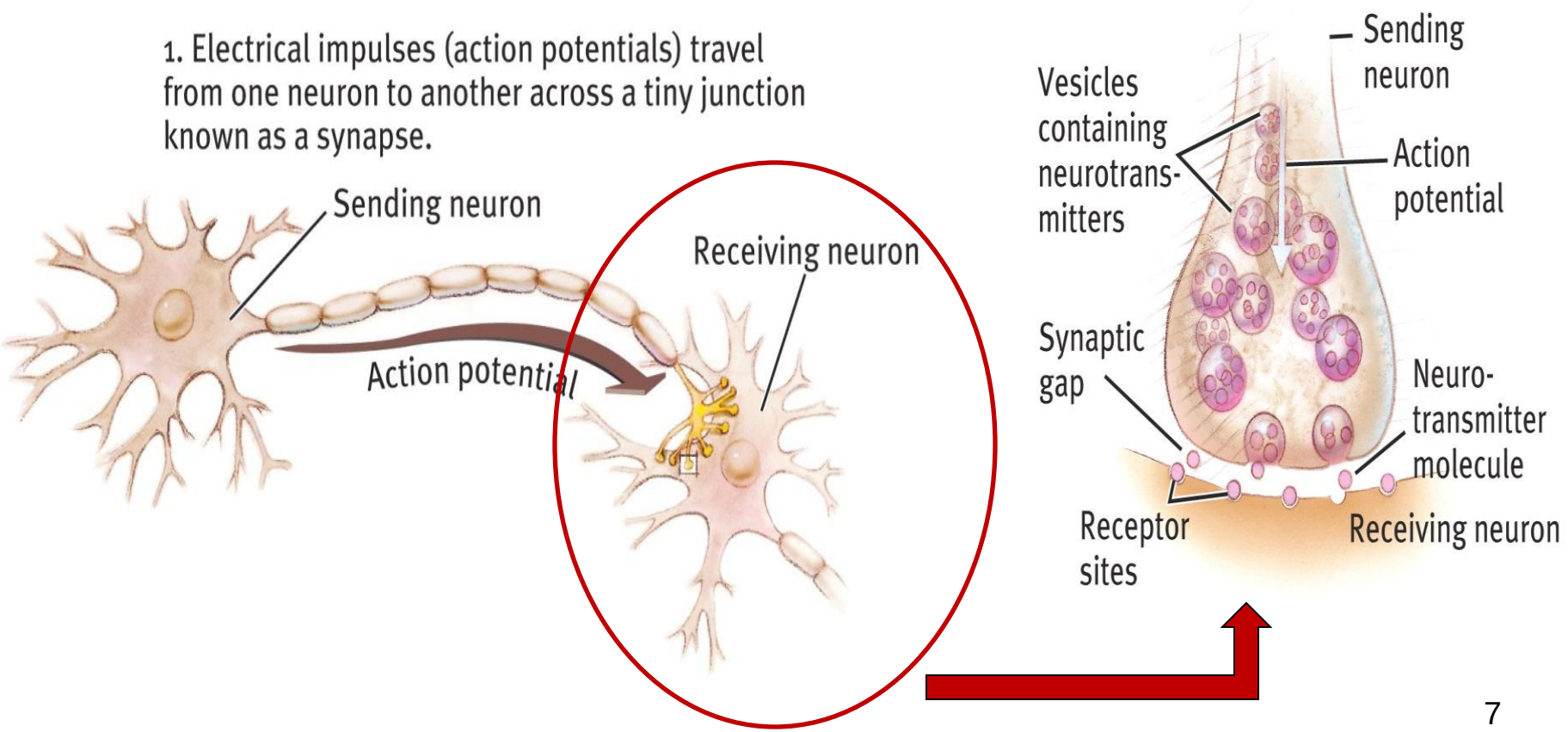
흥분성신호 – 억제성신호 > 최소강도 (역치),

➔ 신경은 흥분

neuron fires an action potential.

시냅스(Synapse) :뉴런 간의 연결

Synapse. 뉴런과 뉴런의 연결 부분
시냅스 공간(*synaptic gap* or *cleft*).

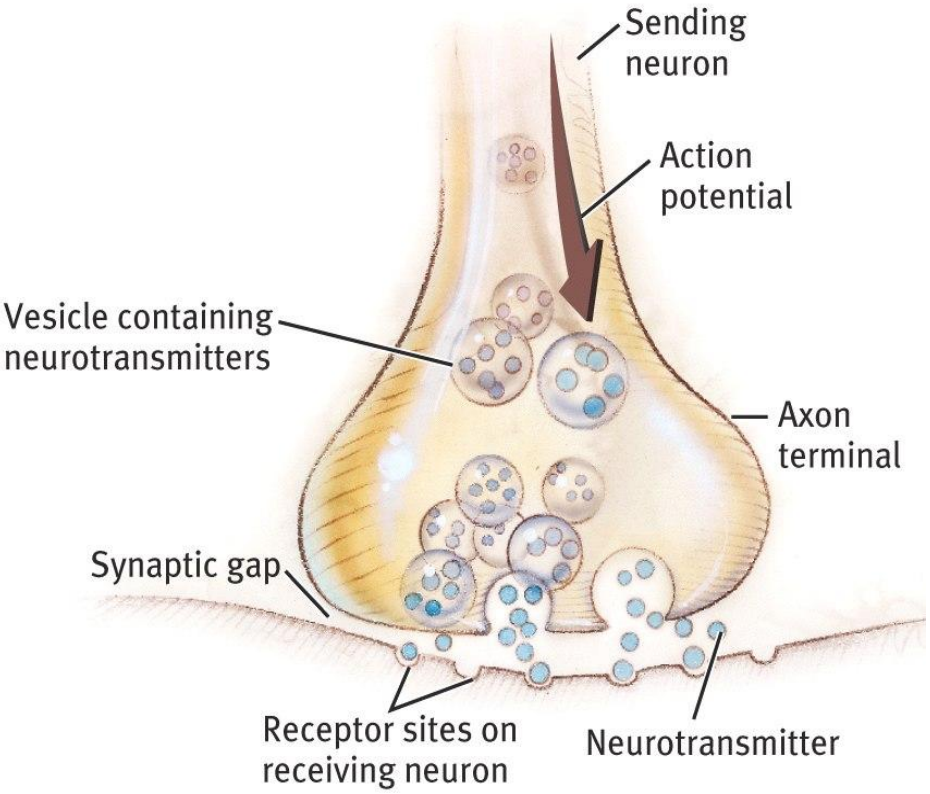


신경전달물질(Neurotransmitters)

보내는 뉴런에서
분비되는 화학물질

➔ 시냅스공간에 발산

➔ 수용뉴런에 퍼져
흥분시키면 신경전달



신경전달물질(Neurotransmitters) 종류와 기능

SOME NEUROTRANSMITTERS AND THEIR FUNCTIONS

Neurotransmitter	Function	Examples of Malfunctions
Acetylcholine (ACh)	Enables muscle action, learning, and memory.	With Alzheimer's disease, ACh-producing neurons deteriorate.
Dopamine 도파민	Influences movement, learning, attention, and emotion.	공급과다➔ 정신분열병 ed to e brain produces the tremors and decreased mobility of Parkinson's disease.
Serotonin 세로토닌	Affects mood, hunger, sleep, and arousal.	공급부족➔ 우울 ression; Prozac ssant drugs raise serotonin levels.
Norepinephrine	Helps control alertness and arousal.	Undersupply can depress mood.
GABA (gamma-aminobutyric acid)	A major inhibitory neurotransmitter.	Undersupply linked to seizures, tremors, and insomnia.
Glutamate	A major excitatory neurotransmitter; involved in memory.	Oversupply can overstimulate brain, producing migraines or seizures (which is why some people avoid MSG, monosodium glutamate, in food).

시냅스에서 정보 전달의 원리

- 신경전달물질과 수용기 부위는 조각그림 맞추기 (열쇠-자물쇠 일치)의 이치

- 신경전달물질에 따라 다음 뉴런을 흥분시키기도 하고, 억제하기도 함

  흥분성 전달물질

  억제성 전달물질

뇌를 연구하는 방법들

행동과 연계된 뇌의 기능을 알아내기

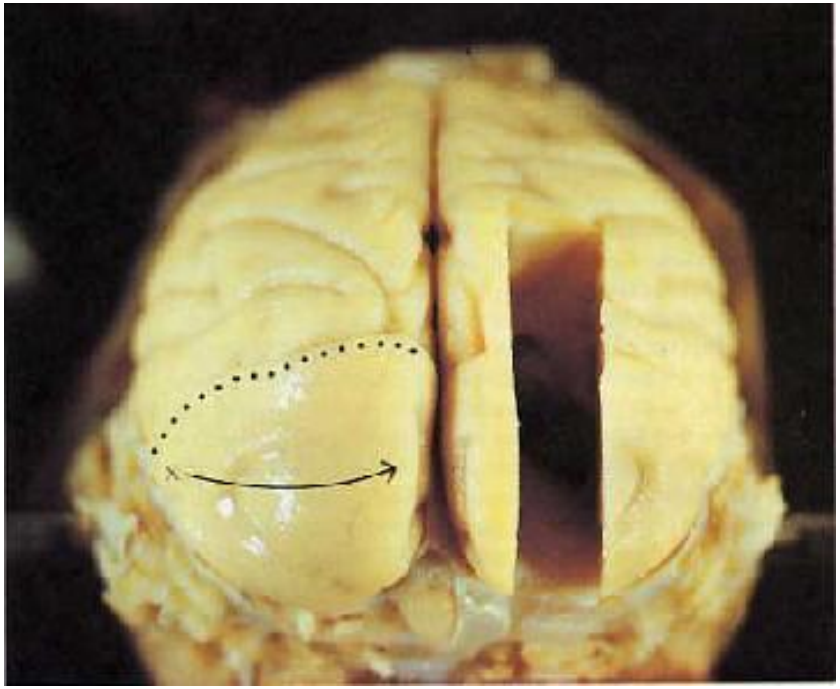
1) 뇌절제
2) 뇌손상에 대한 임상적 관찰
3) EEG(두뇌 전기활동 기록)
4) PET Scan (양전자 방출 단층촬영법)
5) MRI Scan (자기공명영상법)

The Brain

뇌절제(Brain lesion)

A brain lesion
experimentally destroys
brain tissue

to study animal behaviors
after such destruction.



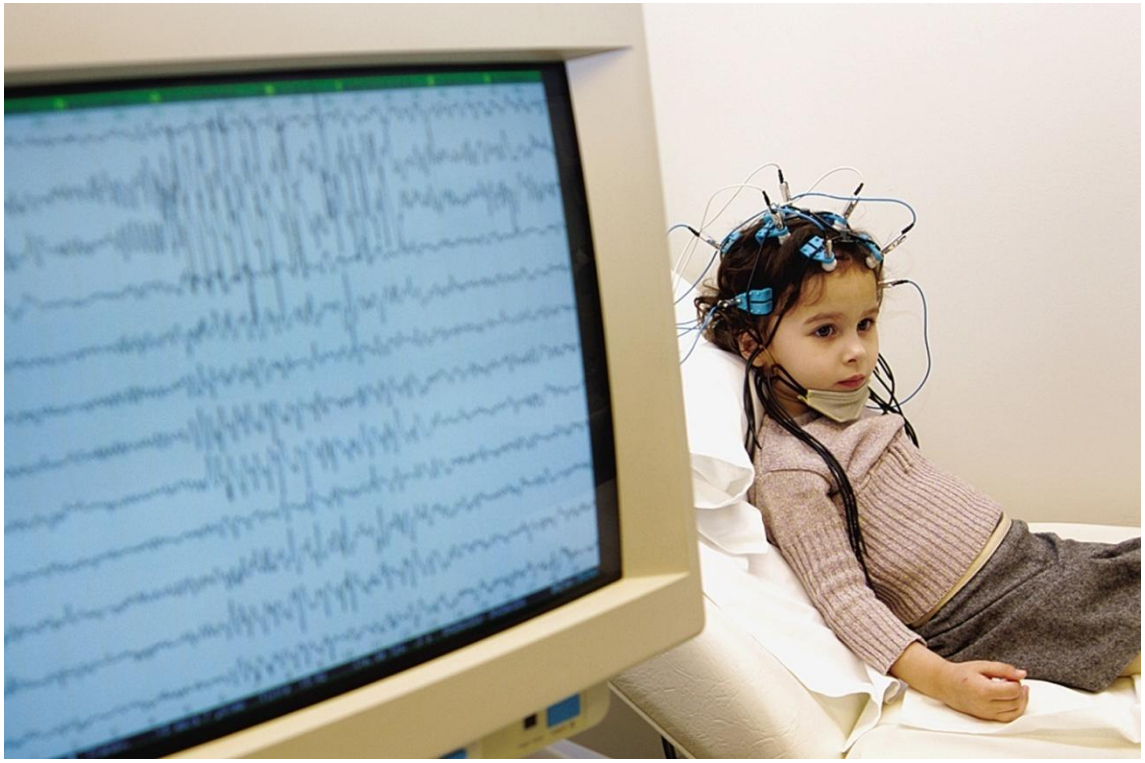
Hubel (1990)

임상적 관찰 (Clinical Observation)

Clinical observations have shed light on a number of brain disorders.

뇌전도:Electroencephalogram (EEG)

An amplified recording of the electrical waves sweeping across the brain's surface, measured by electrodes placed on the scalp.



AJ Photo/ Photo Researchers, Inc.

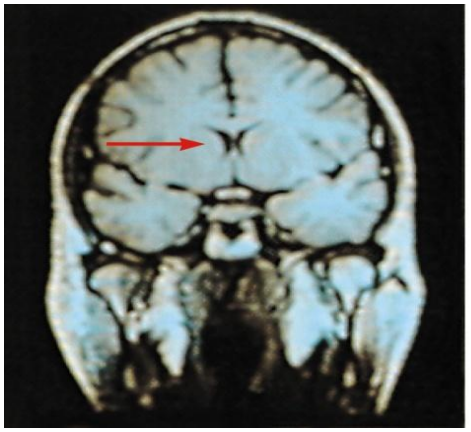
양전자 방사 단층 촬영:PET Scan

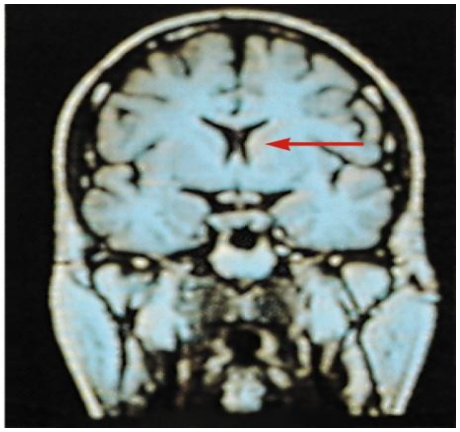
PET (positron emission tomography) Scan is a visual display of brain activity that detects a radioactive form of glucose while the brain performs a given task.

Courtesy of National Brookhaven National Laboratories

자기공명 영상법:MRI Scan

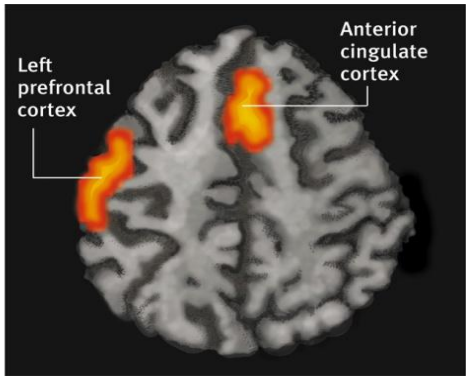
MRI (magnetic resonance imaging) uses magnetic fields and radio waves to produce computer-generated images





Both photos from Daniel Weinberger, M.D., CBDB, NIMH

James Salzano/ Salzano Photo



Lucy Reading/ Lucy Illustrations

거짓말할때의 뇌 흥분 부위

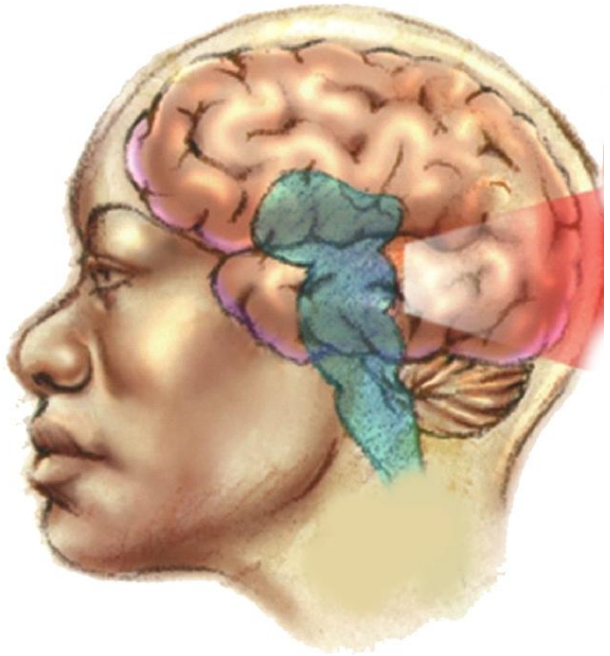
뇌의 분류

- 뇌의 위치에 근거한 분류
  후뇌(hindbrain),
  중뇌(midbrain),
  전뇌(forebrain)

- 뇌의 기능에 근거한 분류
  중심핵 – 원시적인 행동 조절
  변연계(limbic system) – 정서 조절
  대뇌(cerebrum) – 고등 지적 과정 조절

Older Brain Structures

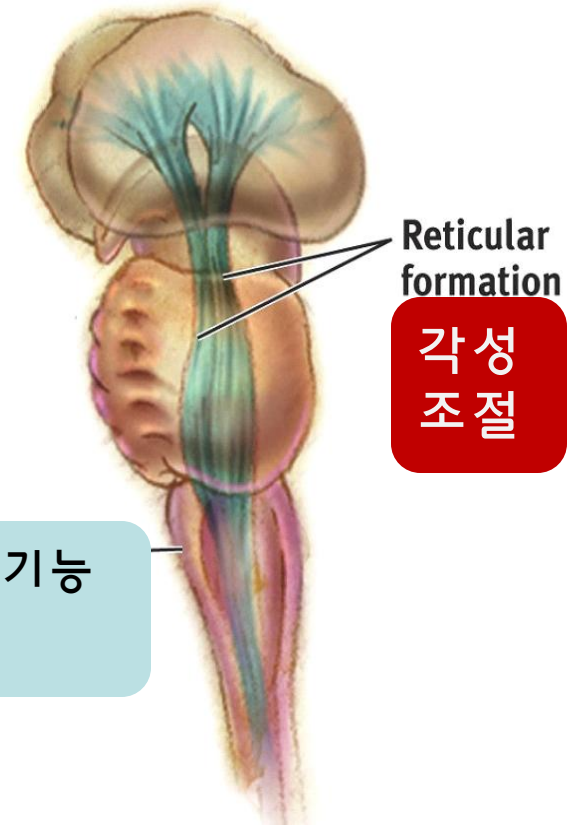
The 뇌간(Brainstem) is the oldest part of the brain, beginning where the spinal cord swells and enters the skull. It is responsible for automatic survival functions.



뇌간(Brain Stem)

감각통로

뇌와
연수에
감각
정보 전달

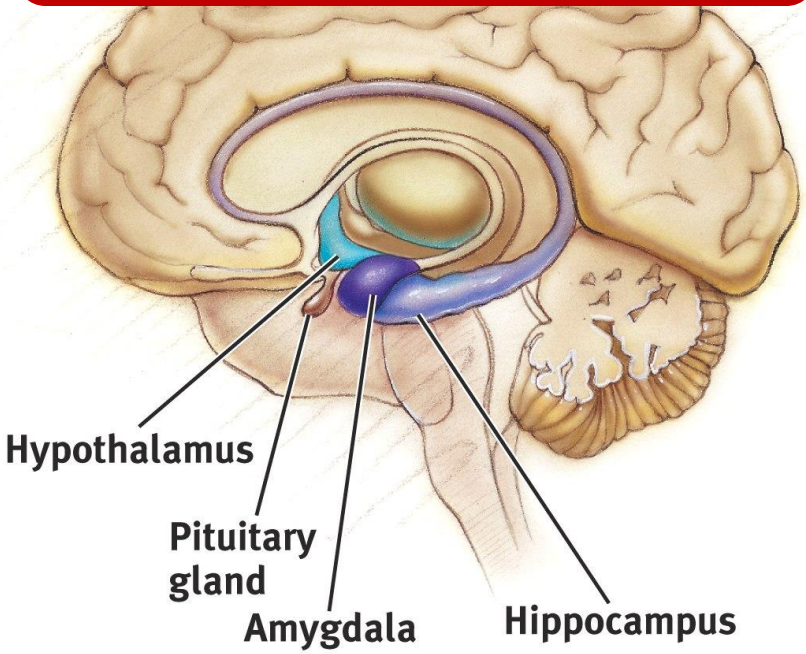


각성
조절

생존기능
담당

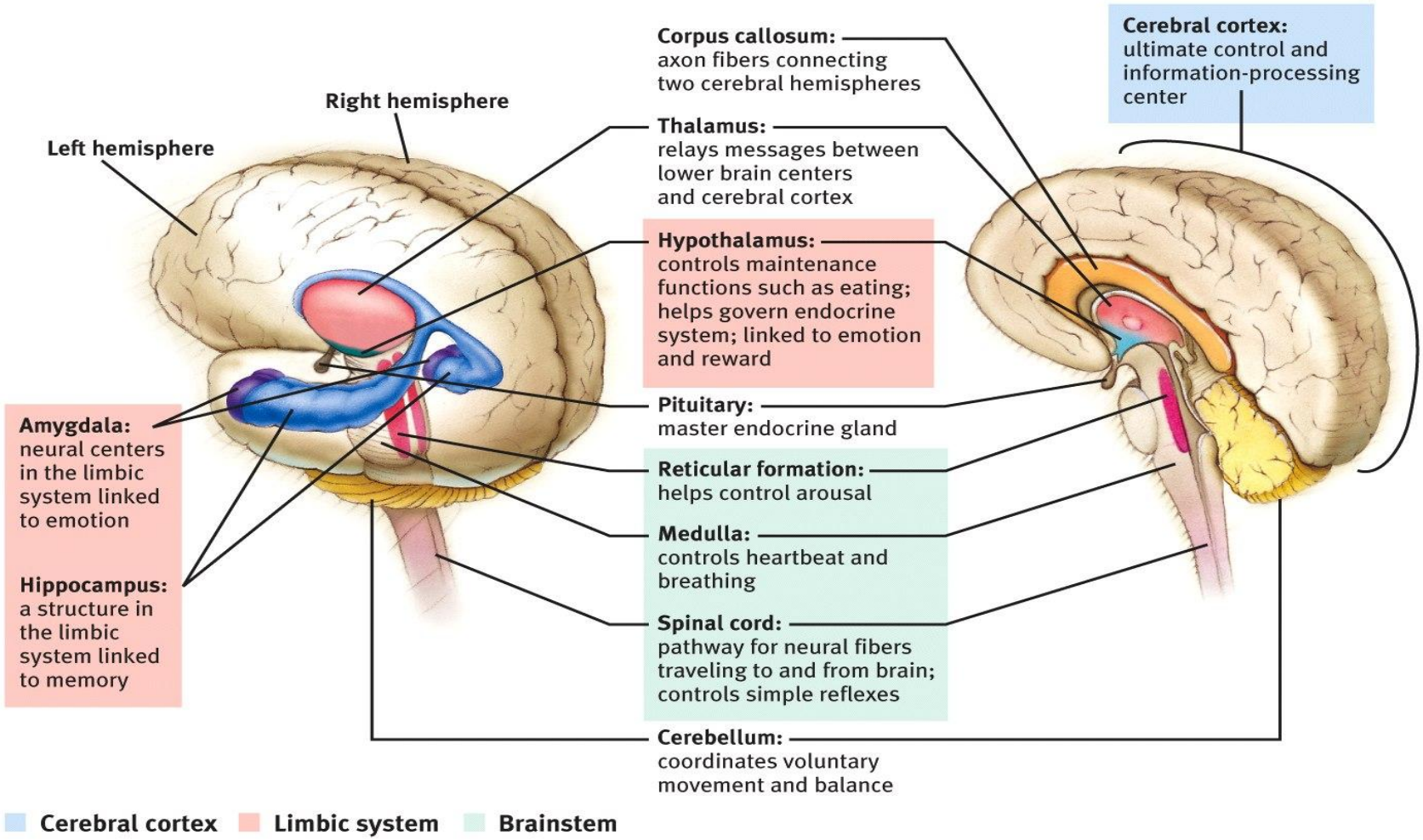
변연계 (The Limbic System)

공포, 공격성 관련 부위
섭식행동과 성행동 관여



대뇌피질(The Cerebral Cortex)

the body's ultimate control and information processing center.



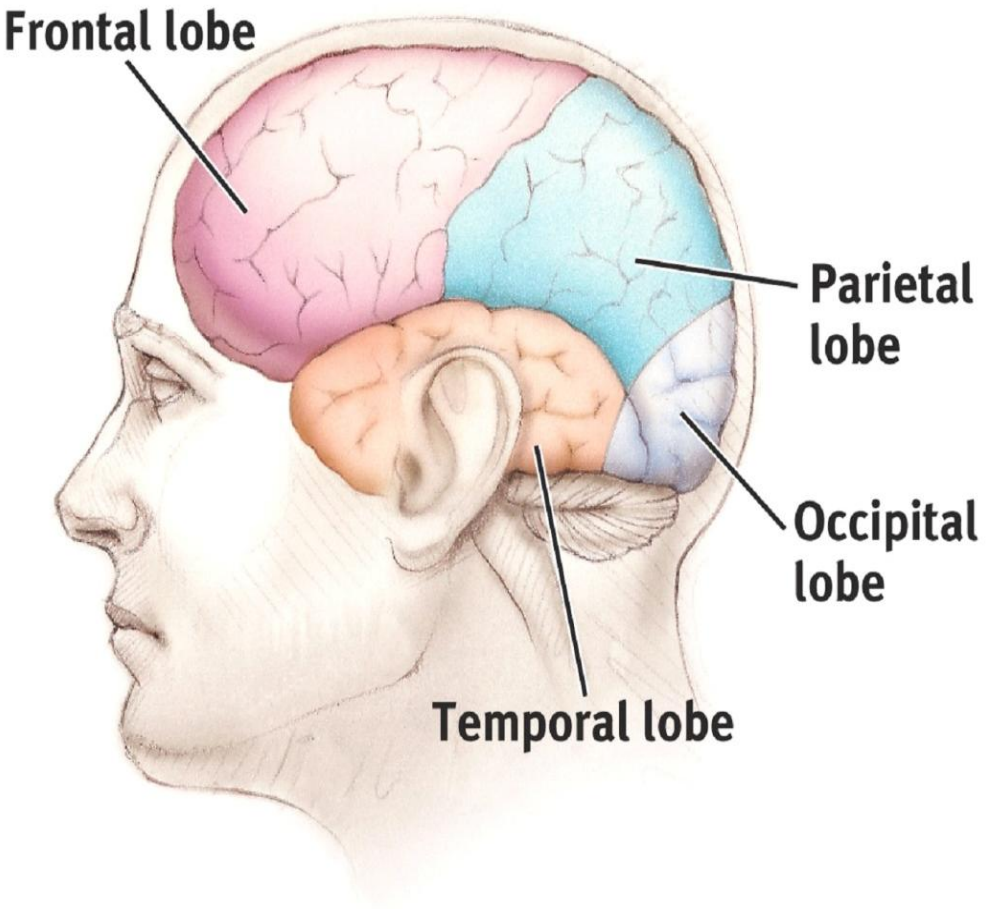
대뇌 피질의 구조

전두엽 frontal lobe

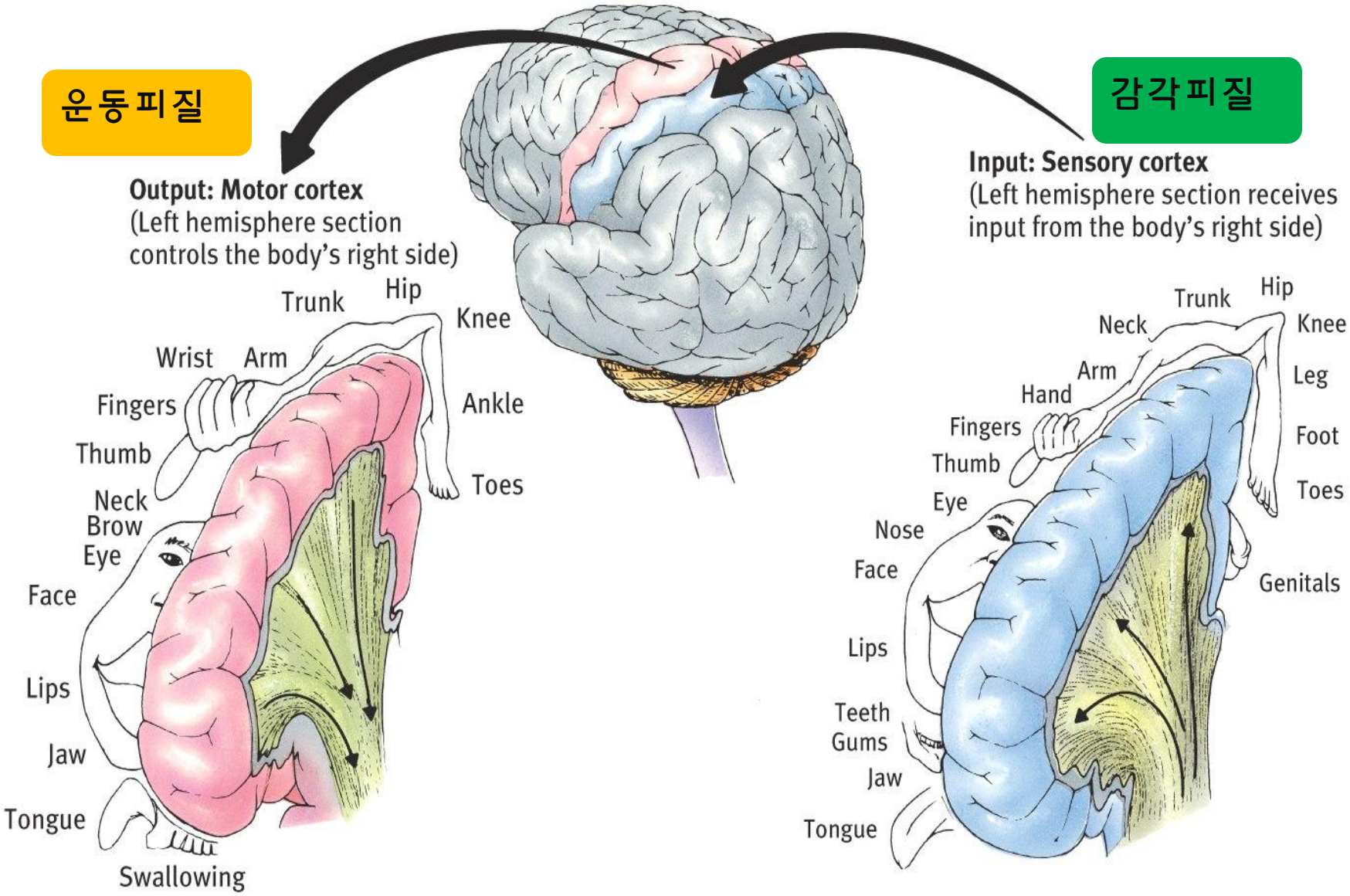
두정엽 parietal lobe
(top to rear head)

후두엽 occipital lobe

측두엽 temporal lobe

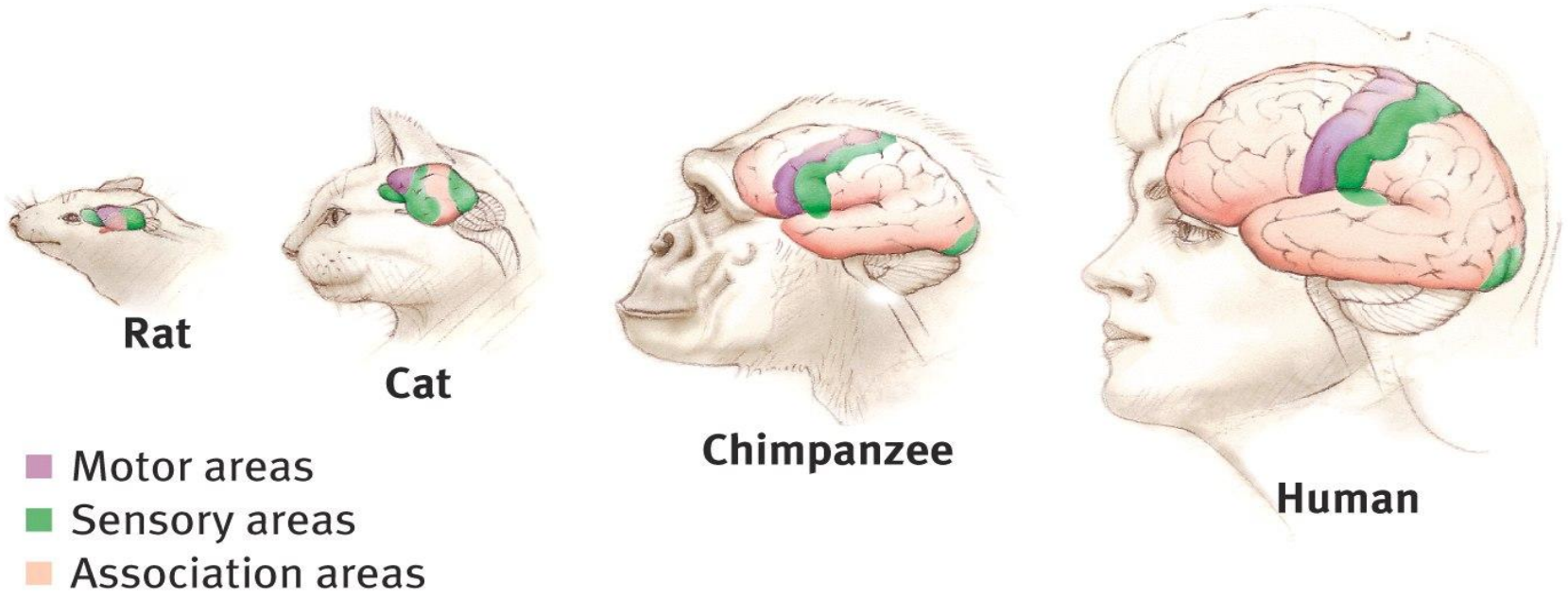


Functions of the Cortex

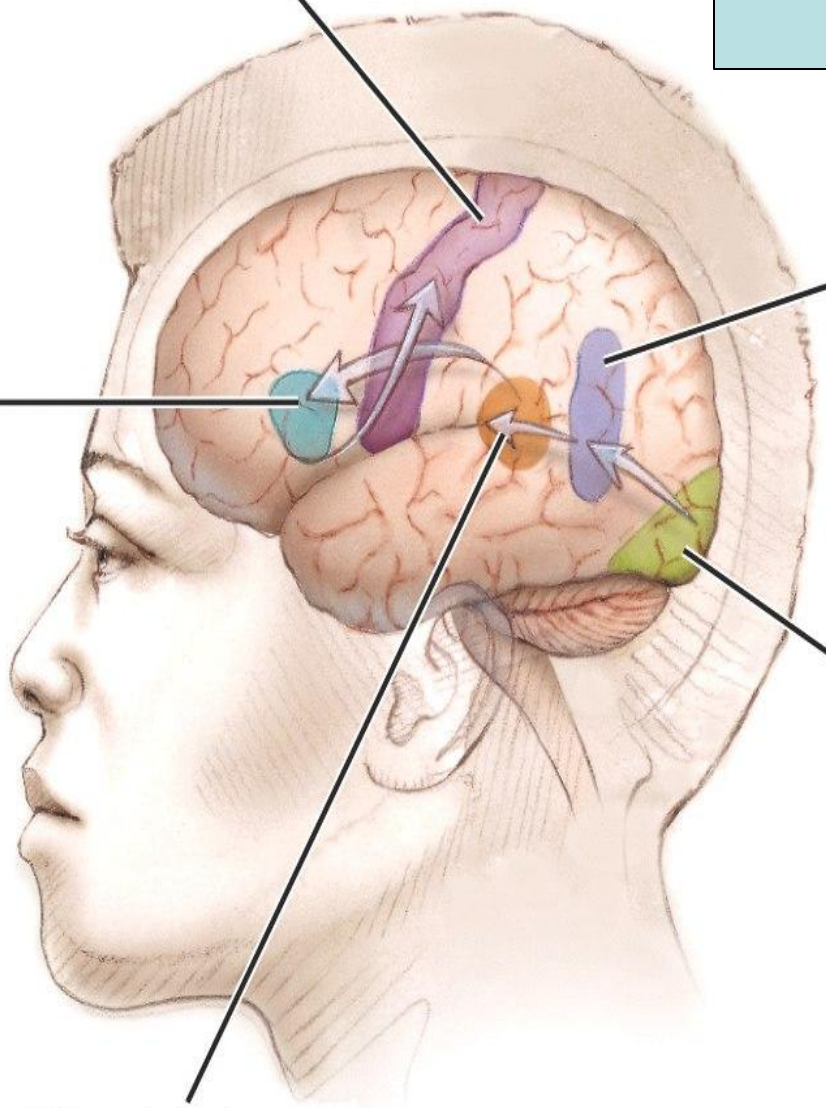


연합영역(Association Areas): 정보통합 영역

More intelligent animals have increased "uncommitted" or association areas of the cortex. 대뇌피질의 ¾ 정도



언어와 관련된
왼쪽 뇌 피질부위



5. Motor cortex
(word is pronounced)

2. Angular gyrus
(transforms visual representations into an auditory code)

4. Broca's area
(controls speech muscles via the motor cortex)

1. Visual cortex
(receives written words as visual stimulation)

3. Wernicke's area
(interprets auditory code)

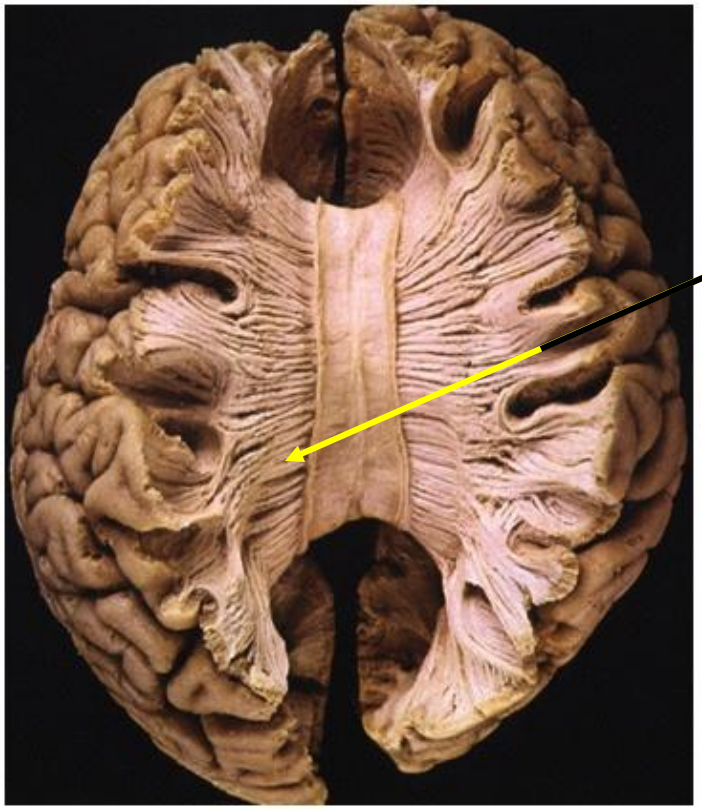
뇌의 비대칭성: Our Divided Brain

좌뇌와 우뇌의 기능이 다른가?

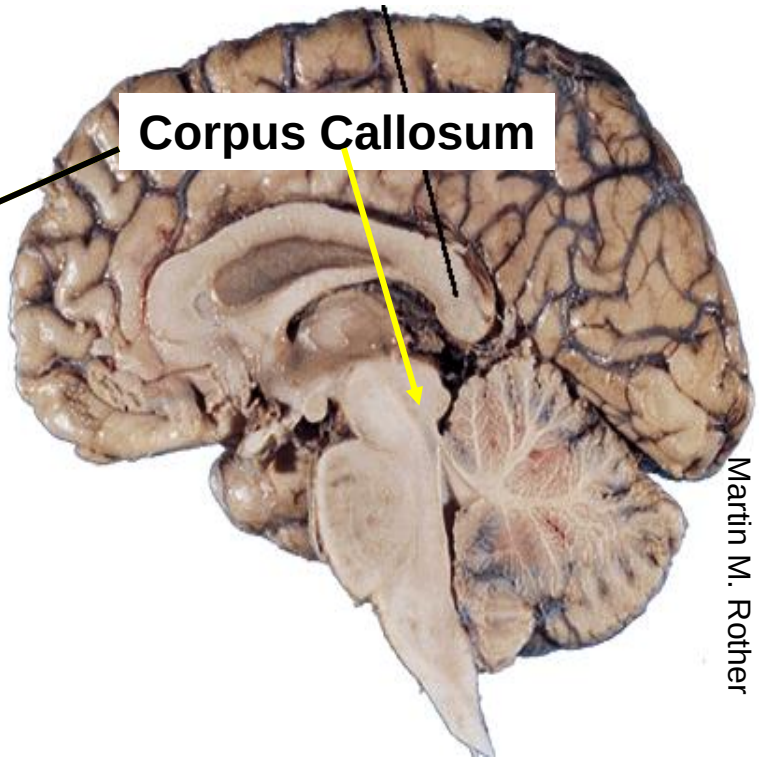
우세한 뇌: 좌뇌

The left hemisphere processes reading, writing, speaking, mathematics, and comprehension skills.
In the 1960s, it was termed as the dominant brain.

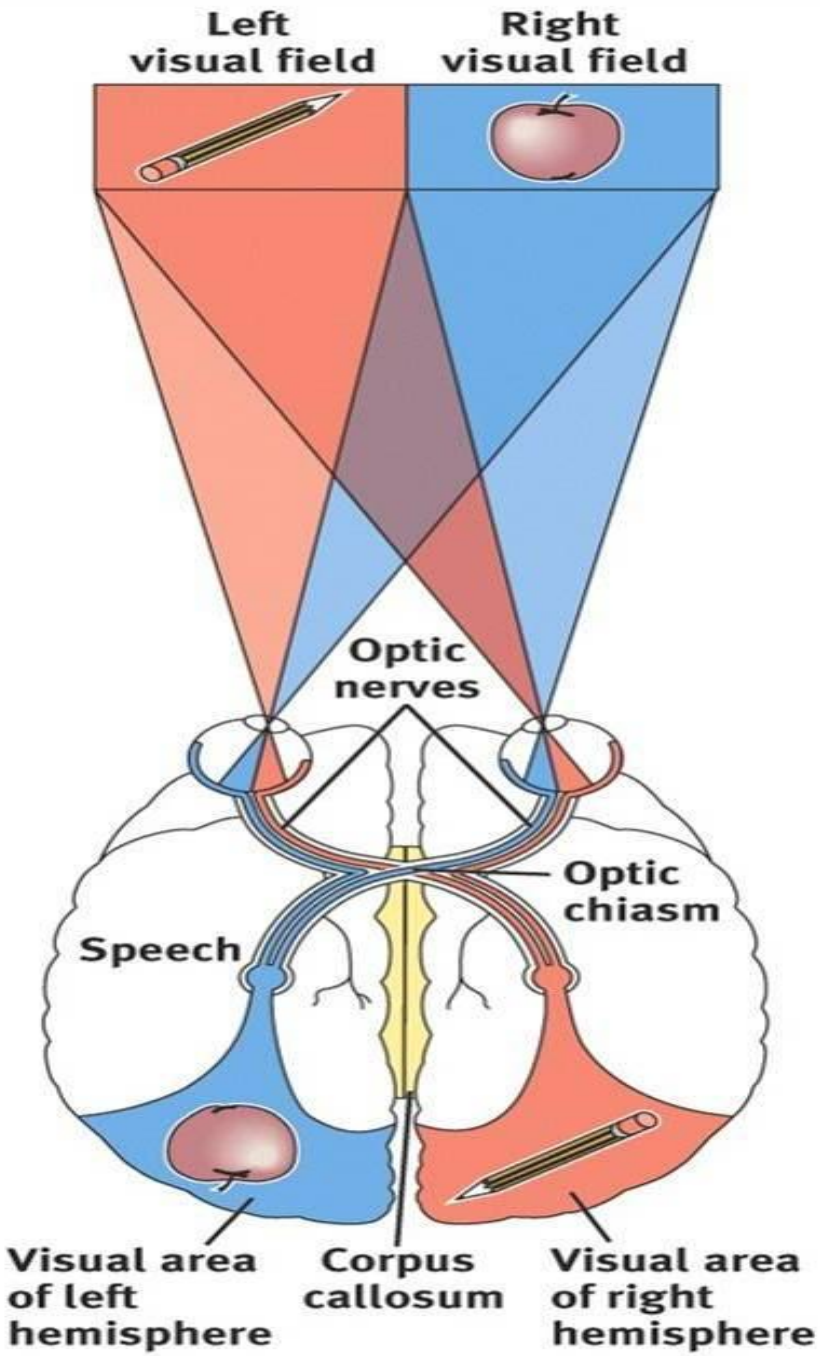
분할된 뇌
좌뇌와 우뇌가 별개로 기능하는가



Courtesy of Terence Williams, University of Iowa

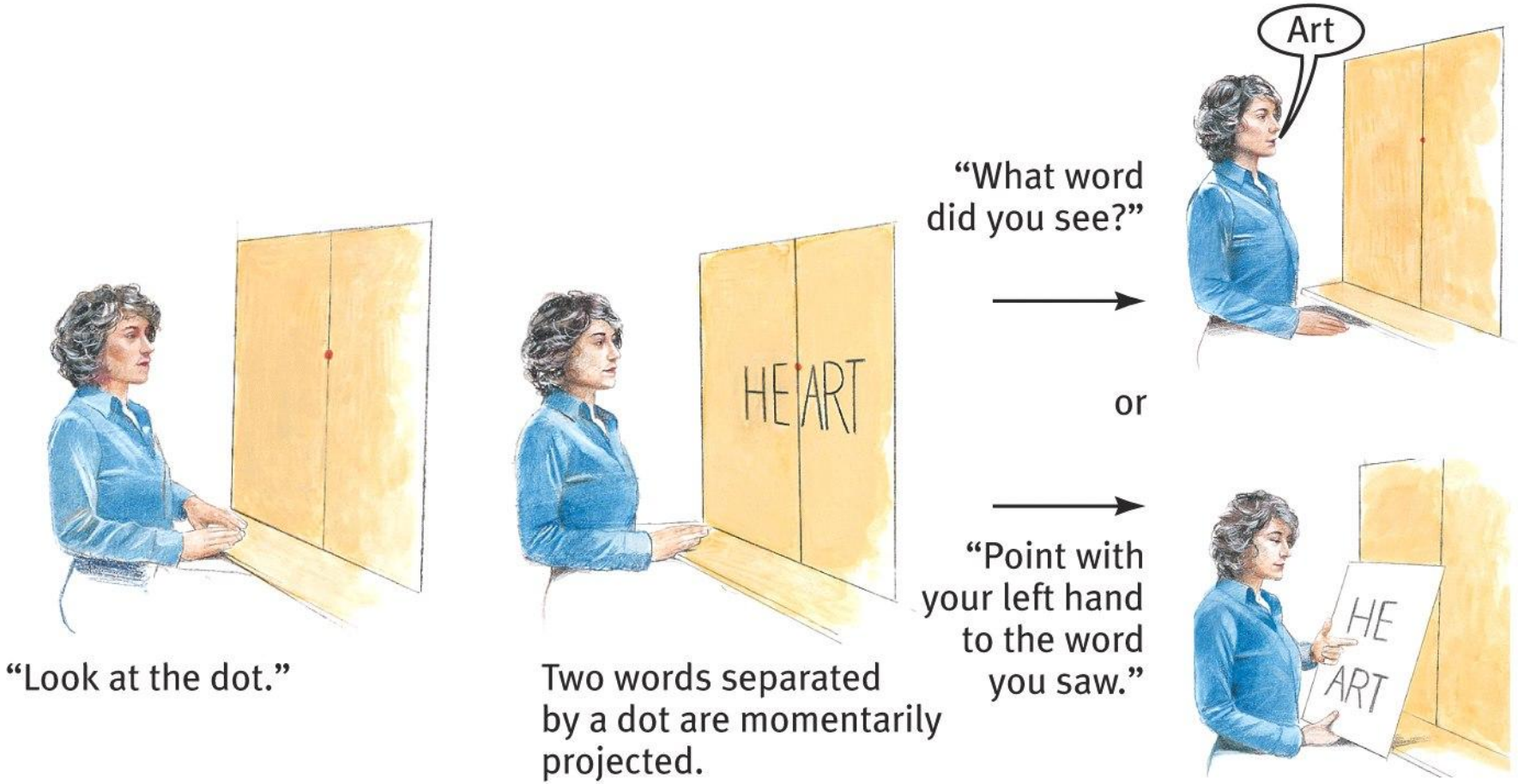


Martin M. Rother


Left visual field
Right visual field
Optic nerves
Optic chiasm
Speech
Visual area of left hemisphere
Corpus callosum
Visual area of right hemisphere

분할된 뇌의 실험 결과

Divided Consciousness



Non-Split Brains(정상뇌)

정상적인 뇌에서도 좌뇌-우뇌 차이 있음

right brain ➔ 지각 공간과제 담당

left brain ➔ 언어과제 담당.