



BME NEUROSCIENCE

PRINCIPLES OF NEURAL SCIENCE

1ST SEMESTER
GRADUATE COURSE
HYOUNG F. KIM

WHO AM I?

Cognitive Circuitry Lab (CoCiLa) 뇌인지회로연구실



Systems neuroscience

Finding functional circuits in the brain

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WHAT I WANT TO SAY IN INTRODUCTION

1. What is the Neuroscience?
2. Why do you want to learn?
3. What's difference for Ph.D. course students?
4. Why is it so difficult to study the Neuroscience?
5. How do we learn?

INTRODUCTION

Why do we learn the neuroscience?



INTRODUCTION

Why do we learn the neuroscience?

Why difficult?



INTRODUCTION

Why do we learn the neuroscience?

Why difficult?



INTRODUCTION

Why do we learn the neuroscience?

Why difficult?

What's different for PhD course students?



PURPOSE OF LEARNING



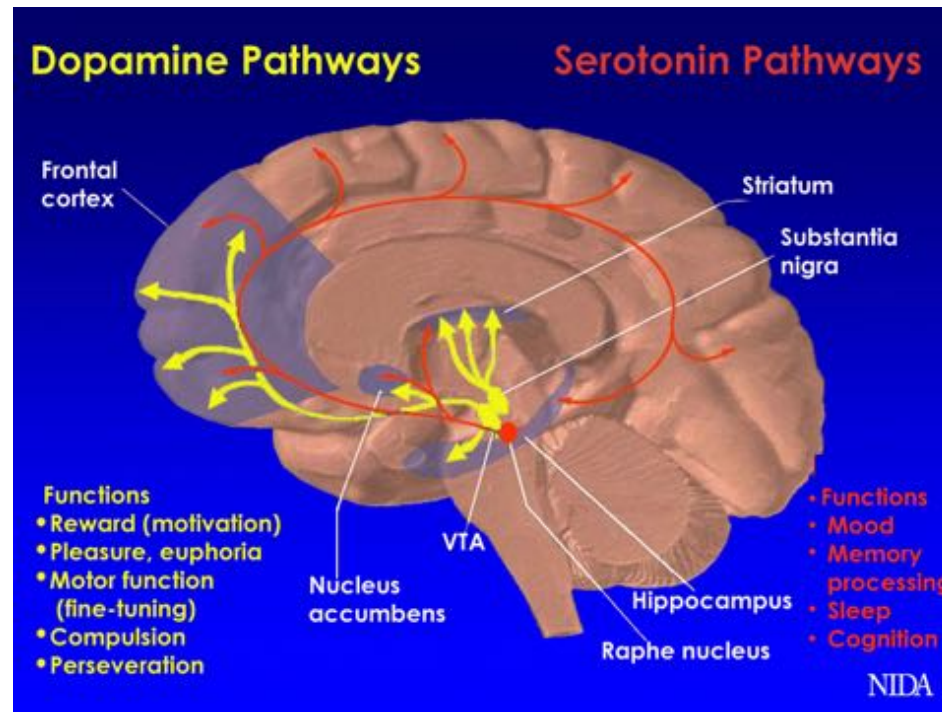
Make your basic knowledge
to find **a good question or technology** in your own field!

BASIC SCIENCE TO APPLICATION!

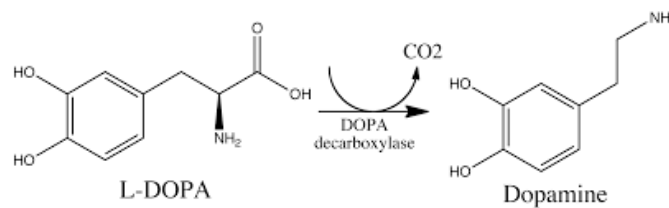
- L-DOPA
- Deep Brain Stimulation (DBS)
- Prosthetic arm

HOW TO FIND YOUR QUESTION AND APPLY? EXAMPLE: L-DOPA

Biology



Biochemistry



HOW TO FIND YOUR QUESTION AND APPLY? EXAMPLE: L-DOPA

Disease



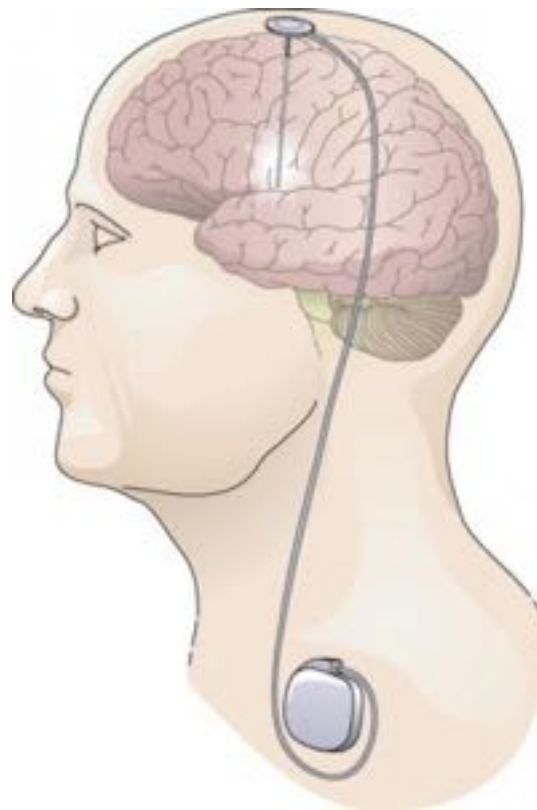
HOW TO FIND YOUR QUESTION AND APPLY? EXAMPLE: L-DOPA



<https://www.youtube.com/watch?v=sfIN0Zf5IqA>

MEDICAL APPLICATION TO PARKINSON'S PATIENTS

Deep brain stimulation (DBS)



MEDICAL APPLICATION TO PARKINSON'S PATIENTS

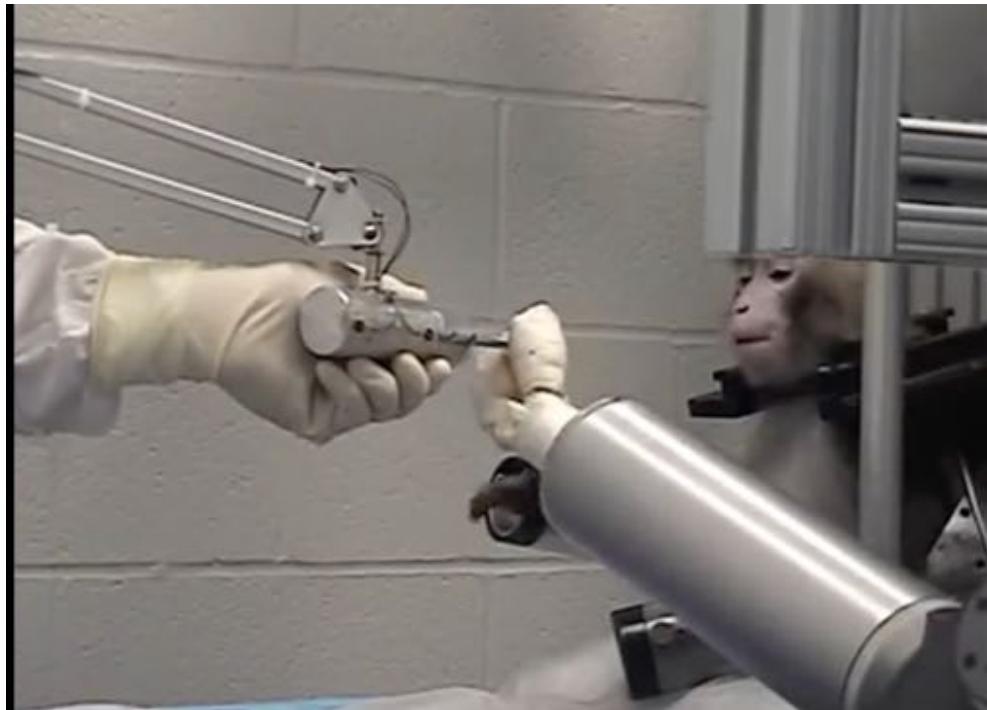
Deep brain stimulation (DBS)



Deep Brain Stimulation - Awake Surgery - Mayo Clinic

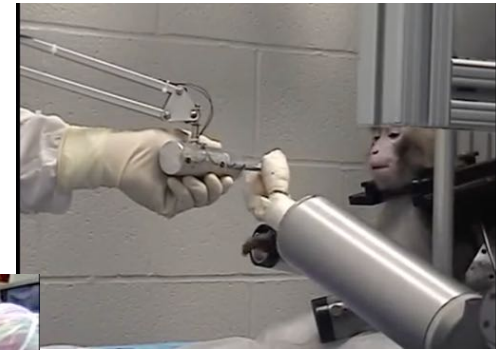
https://www.youtube.com/watch?v=M_fjiEOb40M

TO APPLICATION : ROBOT ARM (PROSTHETIC)



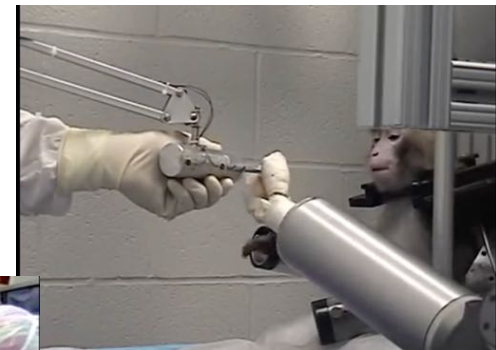
<https://www.youtube.com/watch?v=wxlgdOIT2cY>

TO APPLICATION : ROBOT ARM (PROTHETIC)



We do not know the exact mechanism.

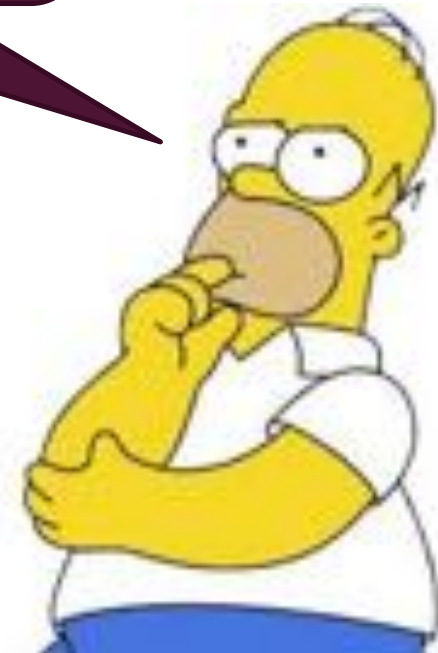
TO APPLICATION : ROBOT ARM (PROTHETIC)



We do not know the exact mechanism.
In other words lots of unsolved questions remain!

DO YOU WANT TO GET SOME NICE QUESTIONS
AND START SOME FANCY THINGS?

What should I do?



DO YOU WANT TO GET SOME NICE QUESTIONS
AND START SOME FANCY THINGS?

Get basic knowledge
&
Practice to make your own questions



IN THIS CLASS



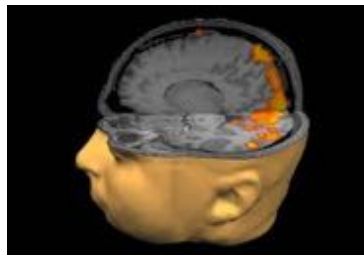
Neuroscience based on Biology & Behavior...

CATCHPHRASE IN THIS CLASS

“Learn from olds”

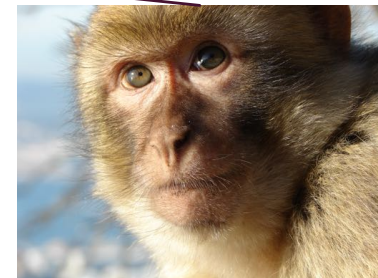
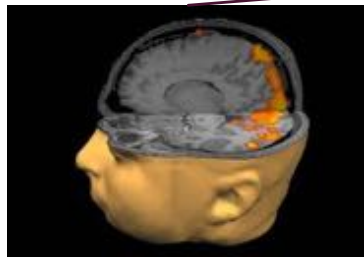


WHO'S THE WISE MAN? JUST EXAMPLE...



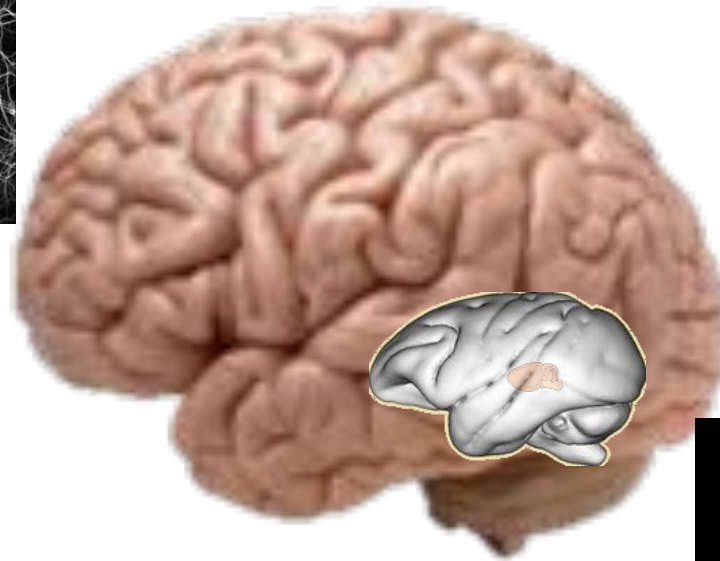
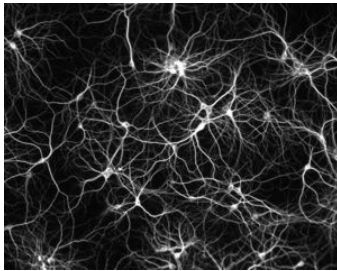
Learn from wise scientists...

WHO'S THE WISE MAN? JUST EXAMPLE...



Learn from wise scientists...

OVERALL DIRECTION



OVERALL DIRECTION

Molecular & Cellular level

Brain circuits & Movement

Conscious & Unconscious processing

Learning & Memory

Brain disorders

STUDY PLAN

	Date	Session I (1:15h)	Session II (1:15)	Point
1		Introduction		
2		Cell and molecular biology of neurons/Synaptic transmission	Presentation 1	Cell level understanding
3		Synaptic transmission	Presentation 2	Cell level understanding
4		Movement	Presentation 3	Basic movement-plan, reflex
5		Movement	Presentation 4	Gaze control
6		Movement	Presentation 5	Gaze control & Cognitive neuroscience
7	4	Midterm report		
8		Movement	Presentation 6	Basal ganglia & Disease
9		The unconscious and conscious processing of neural information	Presentation 7	Reflex & Awareness – brain stem
10		The unconscious and conscious processing of neural information	Presentation 8	Hypothalamus & Motivation
11		The unconscious and conscious processing of neural information	Presentation 9	Emotion & Addiction
12		The unconscious and conscious processing of neural information	Presentation 10	Seizure and Sleep
13		Language, thought, affect, and learning	Presentation 11	Learning & Memory, Hippocampus
14		Language, thought, affect, and learning	Presentation 12	Conscious & Unconscious disorders
15		Language, thought, affect, and learning	Presentation 13	Brain disorders
16	6	Finalterm report		

CLASS PLAN

Lecture	Paper presentation	Paper presentation	Report
50 min	40 min	40 min	Mid&Final
To take basic knowledge about neuroscience	Presentation with a classic paper	Presentation with a classic paper	

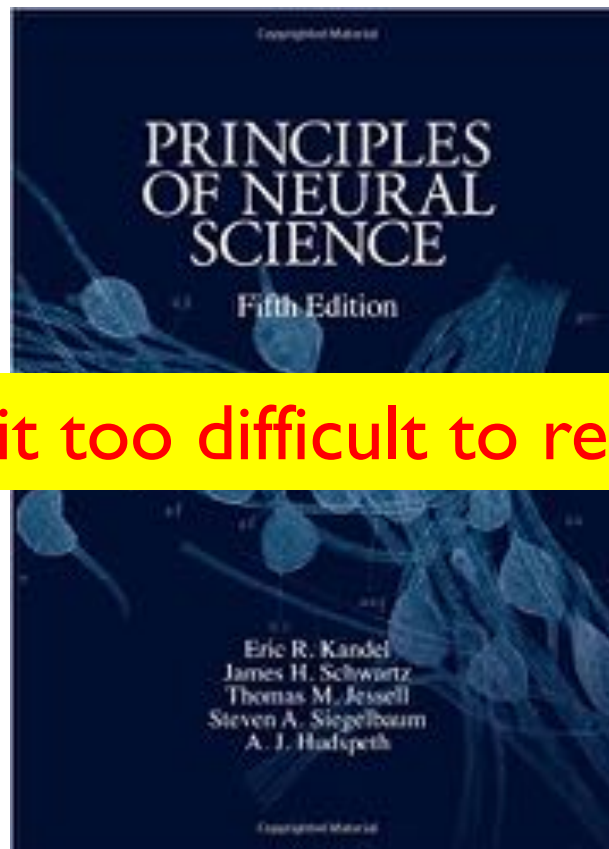
TEXT BOOK

Principles of Neural Science, 5th edition
Kandel et al.



TEXT BOOK

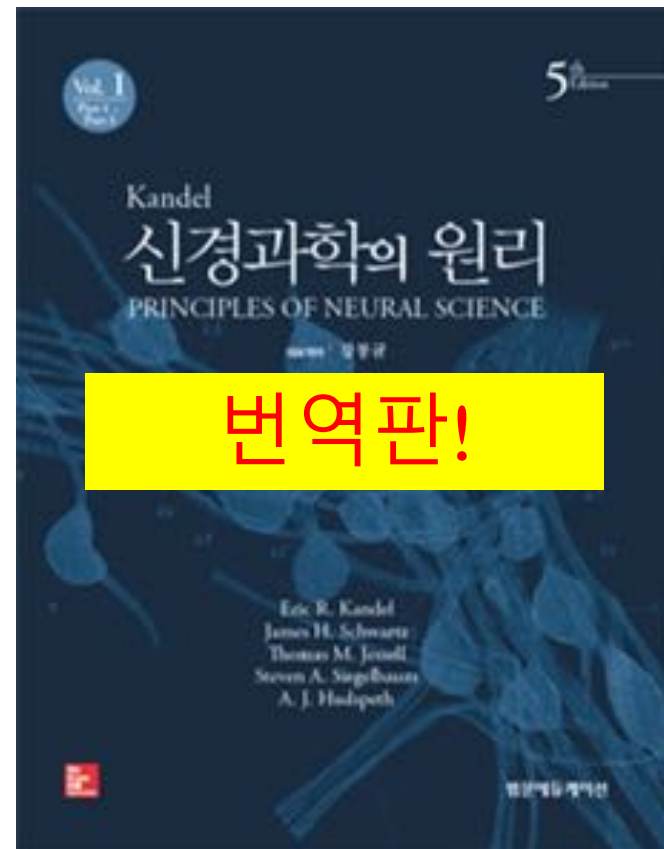
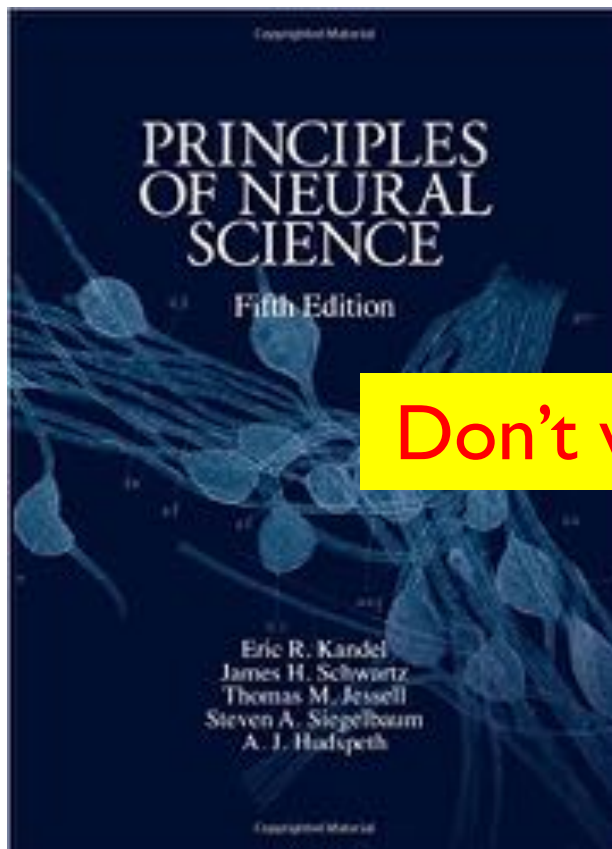
Principles of Neural Science, 5th edition
Kandel et al.



Is it too difficult to read?

TEXT BOOK

Principles of Neural Science, 5th edition
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HOW TO PRESENT

Focus on the story of paper

What's the main question?

Why is the question important?

What is the background information? (History)

Logic



Experimental procedure

Logic



Results

Logic



Conclusion

Logic



Discussion

VIRTUE OF SCIENTISTS



Knowledge, idea
& skill

VIRTUE OF SCIENTISTS



Knowledge, idea
& skill

Communication



For people



GROUP DISCUSSION!



INTRODUCE YOURSELF

Please write down your story in 10 min.

SEE YOU NEXT WEEK!

