Ch. 23

What are the neuronal correlates of consciousness?

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Questions

Q1. What properties do the NCC have?

Q2. What is the important point to uncover the NCC?
Easy & Hard Problem of Consciousness

Distinction proposed by David Chalmers

- The easy problems:
  - Fining the neuronal correlate of consciousness
  - Explaining the ability of a system to access its own internal states
  - Explaining the ability to discriminate, categorize, and react to environmental stimuli

- The hard problems:
  - Why does consciousness feel the way it does? Why does it feel like anything?
Easy & Hard Problem of Consciousness

What a Surprise!!

What are the neuronal correlates of consciousness?
Easy & Hard Problem of Consciousness

What are the neuronal correlates of consciousness?
Easy & Hard Problem of Consciousness

Francis Crick & Christof Koch:

- Concentrate on the Easy Problem and believe that the answers to the hard problem will be solved

Neuroscience approach to Consciousness

What particular neural activation leads to a particular conscience experience?

Why are some aspects of subjective experience impossible to convey to other people?
Terms

Consciousness:

(1) Wakefulness – the level of consciousness (e.g. confused, somnolent)
(2) Awareness – the contents of consciousness (e.g. hearing, feeling)

Qualia:

The subjective aspect of color, feeling, …
(e.g. the redness of red, the painfulness of pain)

NCC (Neuronal Correlates of Consciousness):

The minimal set of neuronal mechanisms
Searching for the NCC

Where are the NCC?
Are the NCC Local?
Evidence 1: Achromatopsia (Zeki 1993)

- Inability to perceive color—color knowledge and color naming can be intact.
- Acquired after cortical brain damage
- Distinct from congenital color blindness (photoreceptor abnormality)
- Involuntary eye movements
Are the NCC Local?
Evidence 1: Achromatopsia (Zeki 1993)

Normal view VS Achromatopsia view

What are the neuronal correlates of consciousness?
Are the NCC Local?
Evidence2: Akineptosia (Zihl, 1983)

- Knows as motion blindness
- Brain damage resulting in the inability to perceive moving objects, despite stationary objects remaining more or less visible.
- Loss of motion is permanent.
Are the NCC Global?
Evidence: FMRI, PET

What are the neuronal correlates of consciousness?
What is that piece of the cortex?
Essential Node

- Piece of the cortex in charge of one aspect (e.g. color, motion)

- No imply that a person who have essential node for color always can perceive color

- But It is necessary to be conscious of one aspect of the percept
Essential Node

- What activity do essential node have to?
  - High threshold, long maintain time
  - Small patch of pyramidal cells
  - Common properties if they are in same column
  - Synchronized firing at certain neurons

What are the neuronal correlates of consciousness?
Questions about Consciousness

1. Do Consciousness Have a Unity?
2. Are All Actions Performed Consciously?
3. What is Conscious for?
4. Is Memory Necessary for Consciousness?
5. Is Attention Necessary for Consciousness?
Do Consciousness Have a Unity?

What are the neuronal correlates of consciousness?
Unity of Consciousness

- Conscious subjects have multiple simultaneous conscious states.
  - Visual experiences
  - Bodily sensations
  - Emotional experiences
  - …

- These states are **unified**: i.e., they are subsumed by a single encompassing conscious state.

- Binding Problem

What are the neuronal correlates of consciousness?
Unity of Consciousness
One Head – Two Consciousness

Sperry and Bogen had been doing animal neuroscience research since 1939

What are the neuronal correlates of consciousness?
Unity of Consciousness
One Head – Two Consciousness

What are the neuronal correlates of consciousness?
Unity of Consciousness
One Head – Two Consciousness

- Blind the cat’s right eye, and train the cat to go through a maze
- Next, blind the cat’s left eye, then the cat doesn’t know where to go
- It seems as if the cat has two distinct consciousness

What are the neuronal correlates of consciousness?
Are All Actions Performed Consciously?
Unconscious Actions

- Resident Evil

What are the neuronal correlates of consciousness?
Unconscious Actions

- Our behavior has zombie-like character
Unconscious Actions

- We do very stereotyped action very rapidly, unconsciously
- This happens occasionally in sports
- Sleepwalker…
- Complex Partial Seizure
What is Consciousness For?
What is Consciousness For?

- Evolutionary perspective:

  Conscious action is slow, can deal with complex situation

  Unconscious action is fast, can deal with stereotyped situation quickly
What is Consciousness For?

- Evolutionary perspective:

  Human need to do flexible, complexible behavior

  To have properties both conscious and unconscious action maybe helpful

What are the neuronal correlates of consciousness?
What is Consciousness For?

What if there is only hardware?

What are the neuronal correlates of consciousness?
Is Memory Necessary for Consciousness?

What are the neuronal correlates of consciousness?
Is Memory Necessary for Consciousness?

- Episodic memory
- Procedural memory
- Working memory

Memory may enrich Consciousness
But, it is not necessary to be conscious
Is Attention Necessary for Consciousness?

- Lack of understanding about Consciousness
- Attention may be used as a variable
- Recent research generally propose that attention is not necessary condition nor sufficient condition
- “molecular biology tool is needed”
  Koch said
Q1. What properties do the NCC have?
- Multilocal
- High threshold, long maintain time
- Small patch of pyramidal cells
- Synchronized firing at certain neurons

Q2. What is the important point to uncover the NCC?
- Different process of conscious activity and unconscious activity
- Inactivating some part of brain
THANK YOU