The quest for consciousness

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http://ramonycajal.mit.edu/kreiman/academia/classes/ncc/quest.htm

Fridays 11-12 am (Jan. 06, 13, 20, 27)

46-5165

Bibliography

http://ramonycajal.mit.edu/kreiman/academia/classes/ncc/quest.htm

The Quest for Consciousness
Christof Koch
Roberts & Company Publishers
Colorado, 2004
www.questforconsciousness.com
See also www.klab.caltech.edu/cns120

The astonishing hypothesis
Francis Crick
Simon & Schuster
New York, 1994

Outline of the class

01/06: What needs to be explained about consciousness?
How can consciousness be studied scientifically?

Brief introduction to Neuroscience

01/13: A framework for the scientific study of consciousness

01/20: Causality. The road ahead

01/27: Experimental approaches. Psychophysics, electrophysiology, functional imaging. Bistable percepts. Given by Dr. Leila Reddy.

02/03: No classes on February 3rd

How can a physical system give rise to consciousness?

How can consciousness be explained in terms neurons and their interactions?

How can a physical system have *qualia*?

Why are humans conscious and not just a bunch of zombies?

Do other animals also have consciousness? How did consciousness evolve?

A list of possible answers

Religious answers. E.g. "… consciousness requires a non-physical soul…"

Science cannot understand consciousness

There is no such thing as consciousness. It's just an illusion.

We need new (as yet undiscovered) laws to explain consciousness

Consciousness requires behavior (and language)

Consciousness is an emergent property

A list of answers

1. Religious answers that require immaterial elements (the "ghost in the machine")

Plato

The bible

Descartes[1] (modern form of dualism: *res extensa* and *res* cogitans)

Aristotle, Thomas Aquinas, Karl Popper, Sigmund Freud, John Eccles

These explanations do not quite satisfy our scientific curiosity

Being non-scientific, these ideas do not have any explanatory or predictive value

Where is this immaterial soul? What are its properties? How does it work?

[1] Descartes, R. *[1649] Les passions de l'ame*

A list of answers

2. Science will never be able to explain consciousness (the mysterian approach)

A system cannot understand itself

Consciousness is just too complex to be understood by humans (e.g. what are the odds that a dog can understand string theory?)

It is not clear how a physical system can generate *qualia*. Therefore, it is pointless to study consciousness scientifically.

Most of this "never" claims in science are dangerous (and usually wrong, e.g. the rain, alchemy, life)

The fact that we don't understand it now does not necessarily imply that we will *never* understand it

It seems better to try than to be pessimistic from the very beginning

A list of answers

3. Consciousness is just an illusion

There is no problem at all (following the behaviorist tradition)

Our common sense ideas about consciousness are just an artifact of illusions, language, social constructions and learing

See Daniel Dennett[1], *Consciousness Explained*

Francis Crick used to say that one should pay attention to philosophers' questions and ignore their answers

It seems quite counter-intuitive (which does not imply that it is wrong)

[1] Dennett, D. *Consciousness explained*, (Little and Brown, Boston, 1991)

A list of answers

4. We need new laws

See Roger Penrose, *The Emperor's New Mind*

Panpsychism (everything is conscious). See David Chalmers[1]

Consciousness depends on the complexity of the neural structures (Tononi and Edelman)

We should try to see how far we can go with the current laws. Then, if new laws are needed, that's fine. But first, let's see if they are really needed.

Panpsychism seems strange. Is this table conscious?

[1] Chalmers, D. *The conscious mind: in search of a fundamental theory*, (Oxford University Press, New York, 1996).

A list of answers

5. Consciousness requires output

We are not just brains. Behavioral output is part of consciousness

Language is required for consciousness

Dreams occur in the absence of output

Locked-in patients can be conscious

Narcolepsy

Cotterill, R. (1998) Enchanted looms. Conscious networks in brains and computers. New York, Cambridge University Press

Some basic working assumptions

We are conscious (it is not an illusion or an epiphenomenon)

Some other animals are also conscious

We start with simple questions that we can try to study rigorously

We start with vision. Hopefully, we will be able to extrapolate some of what we learn from vision to other sensations (e.g. pain, smell, self-awareness)

We need an explicit representation

Only parts of the brain will correlate with the contents of consciousness. We search the *neuronal correlates of consciousness* (NCC)

Several aspects of consciousness that we leave out for now

Dreams

Lucid dreaming

Out of body experiences

Hallucinations

Meditation

Sleep walking

Hypnosis

Self awareness

Qualia

Feelings

In search of the Neuronal Correlates of Consciousness

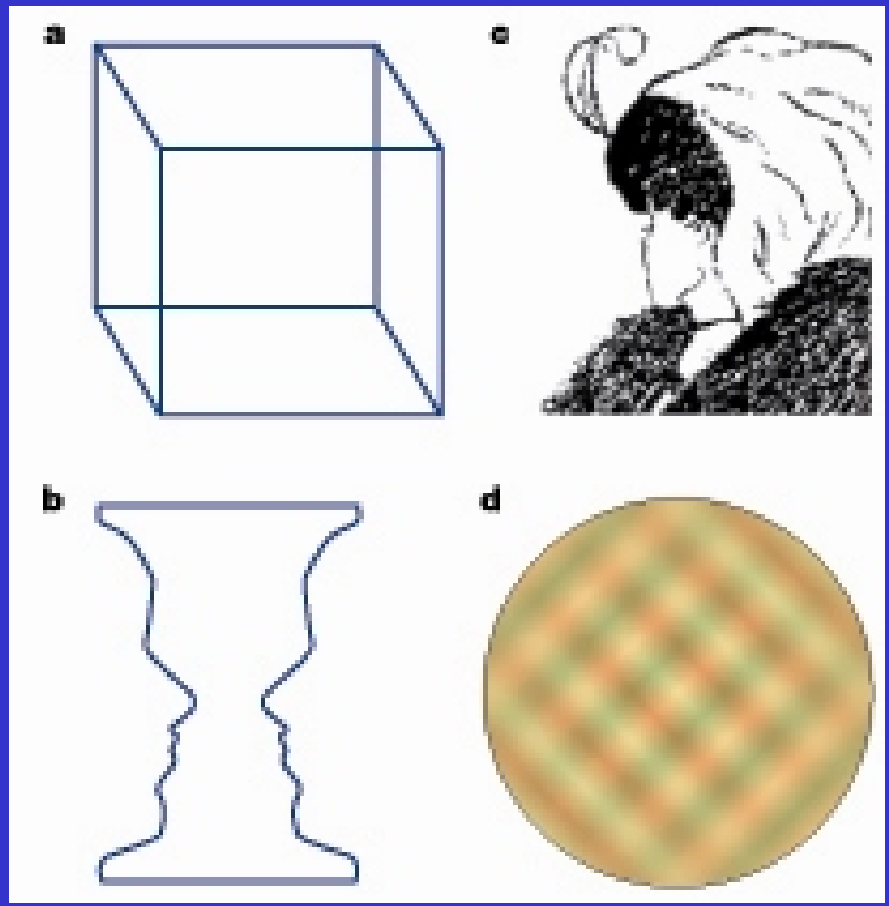
A minimal set of neuronal events and mechanisms jointly sufficient for a specific conscious percept

In search of the Neuronal Correlates of Consciousness

Bonneh effect
(movie)

Bonneh *et al* (2001) Motion-induced blindness in normal observers *Nature* **411**:798-801

In search of the Neuronal Correlates of Consciousness



Blake and Logothetis (2002) Visual competition *Nature Rev. Neurosci.* **3**:13-21.

In search of the Neuronal Correlates of Consciousness

1. Inattentional blindness (movie)
2. Attention and consciousness (movie)

Introduction to Neuroscience

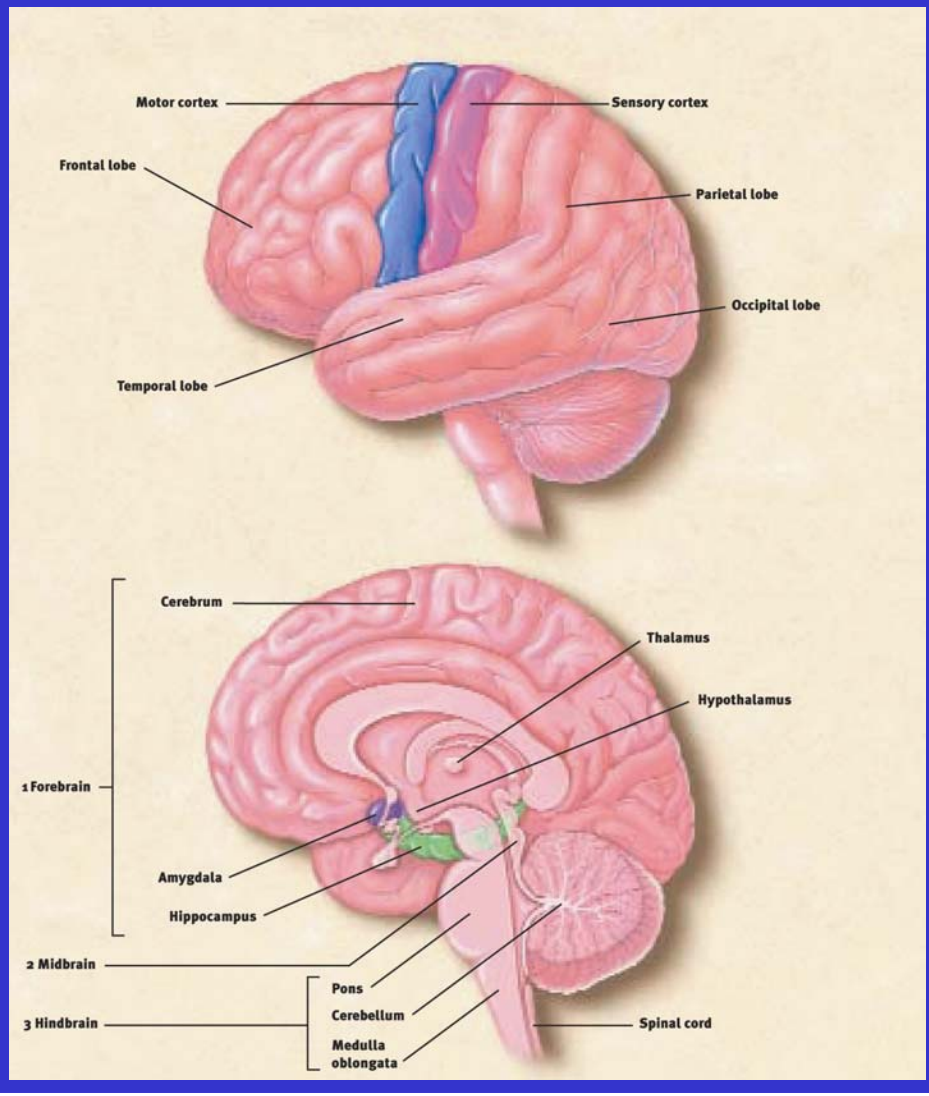
Basic anatomy of the human brain

Neurons, action potentials and neural networks

Techniques used in *Neuroscience*

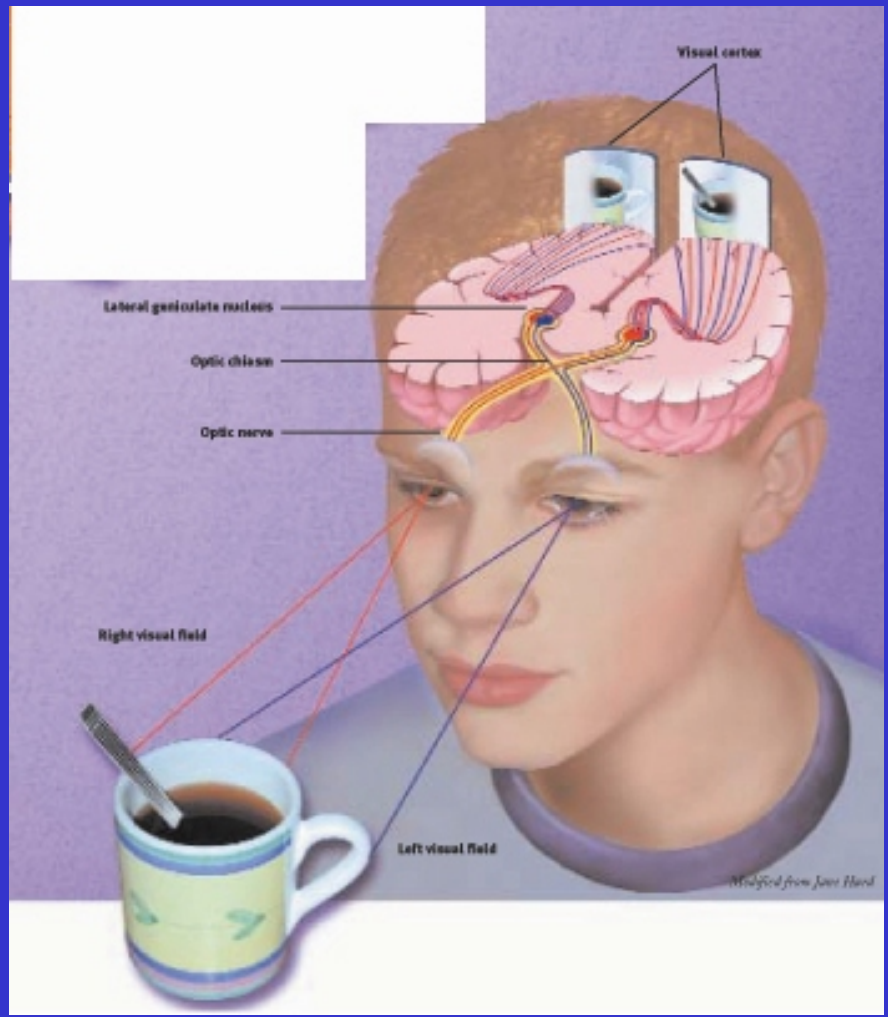
Neural coding

Basic anatomy of the human brain



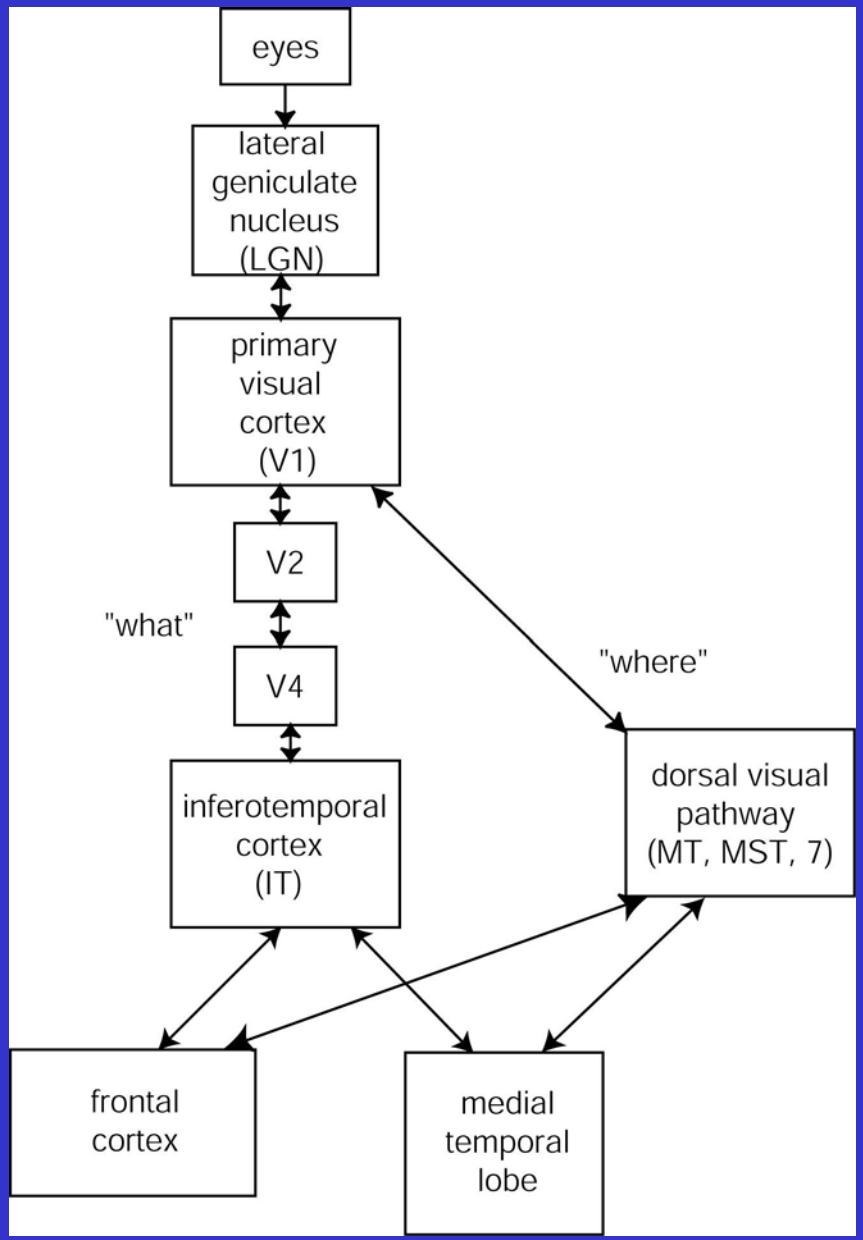
From SFN Brain facts (http://www.sfn.org)

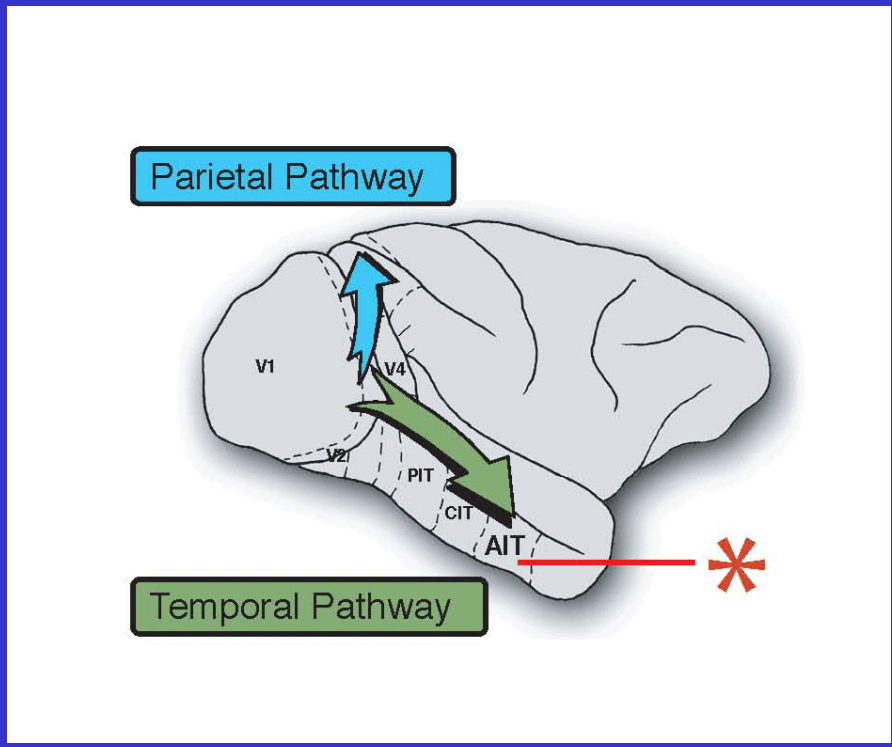
Basic anatomy of the human brain
Visual information



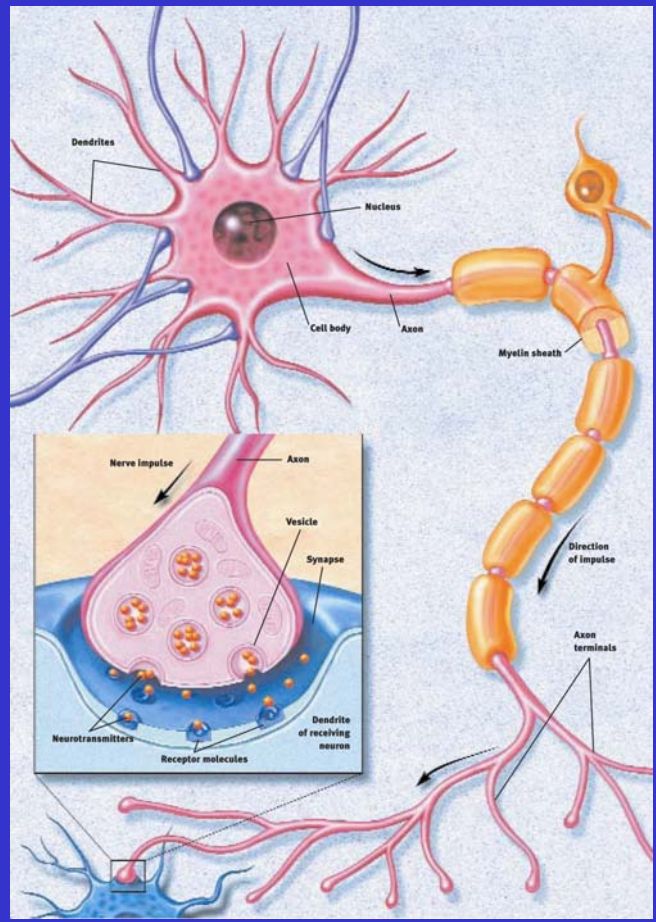
From SFN Brain facts (http://www.sfn.org)

Basic anatomy of the human brain



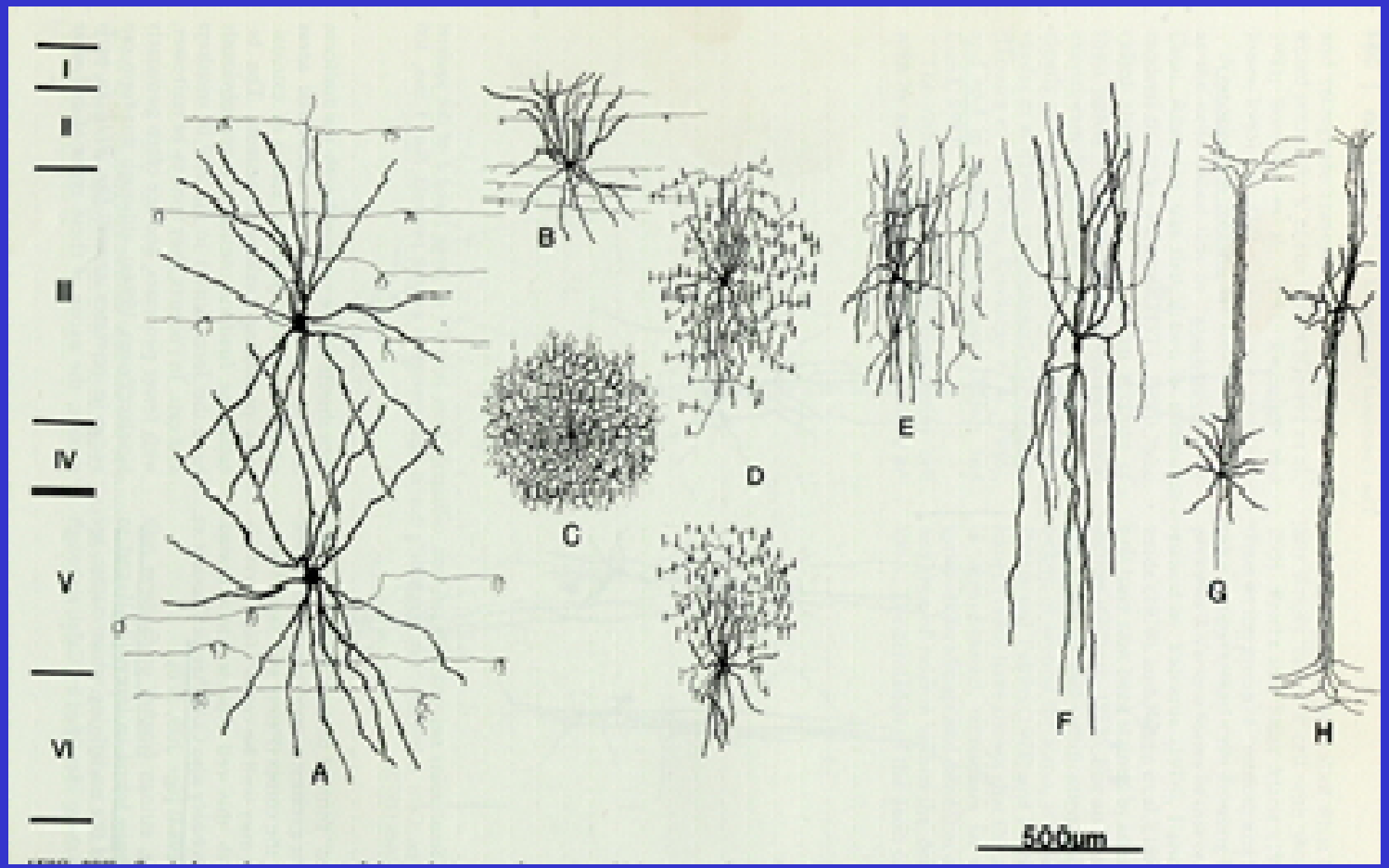


Neurons, action potentials and neural networks



From SFN Brain facts (http://www.sfn.org)

Neurons come in different shapes



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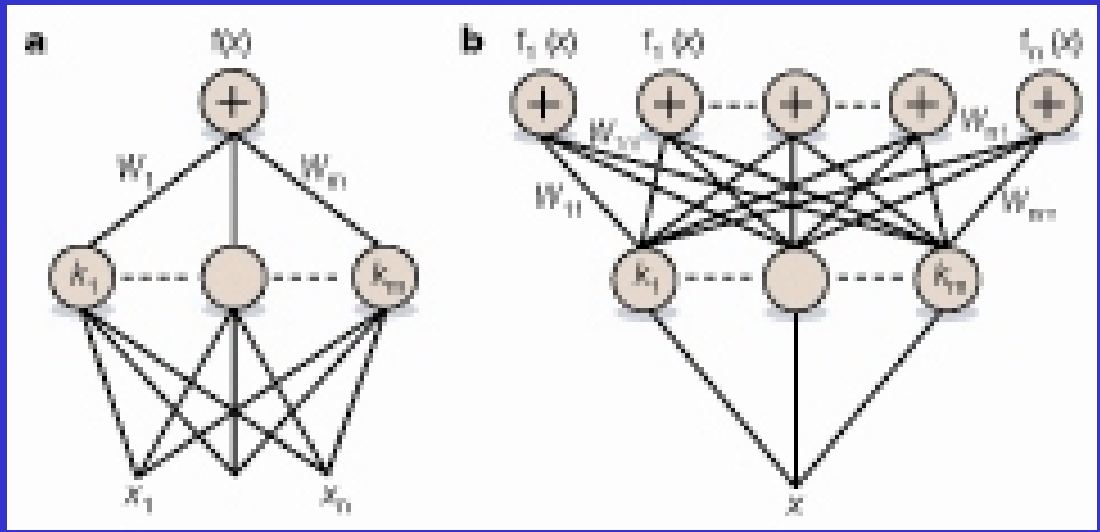
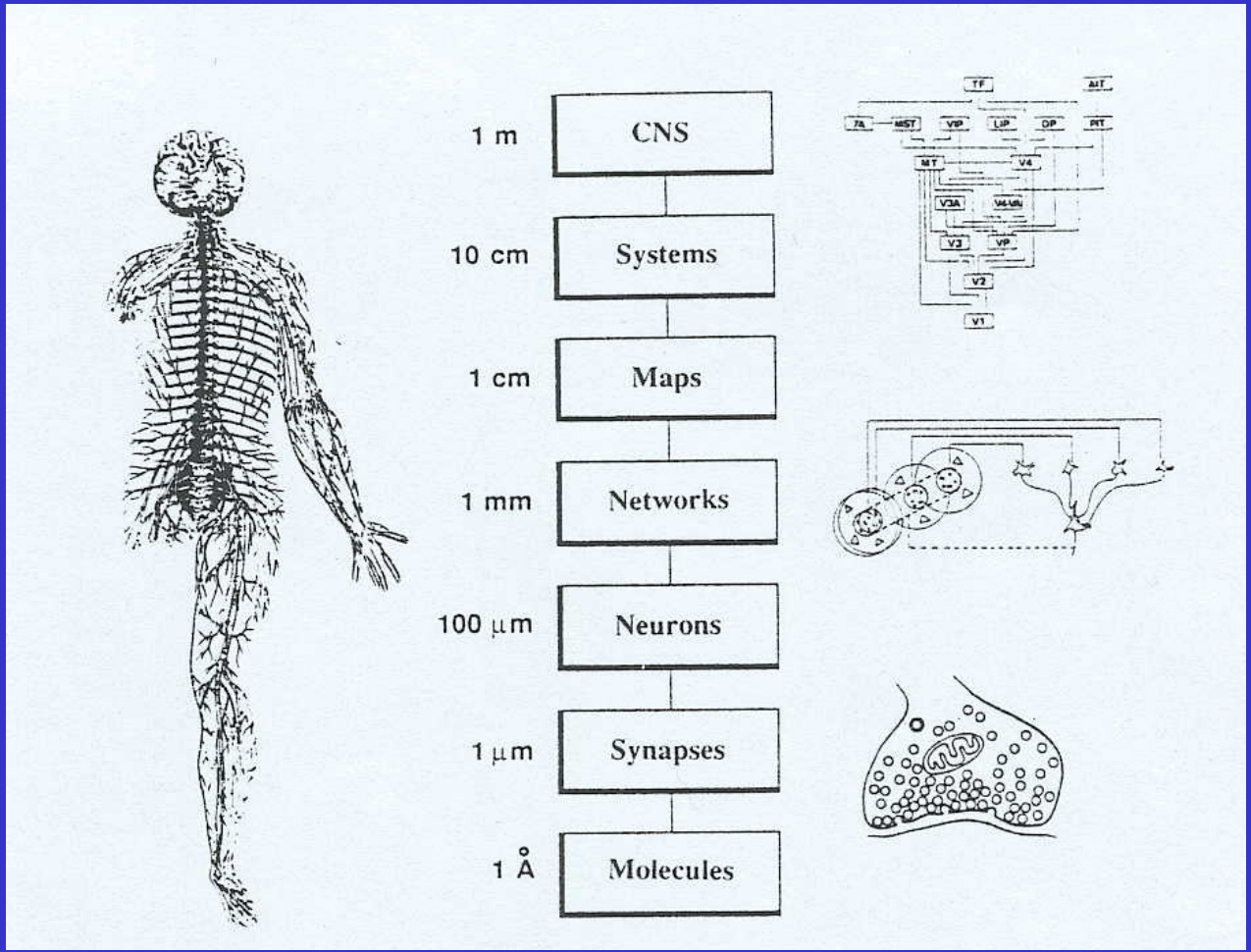


Techniques used in *Neuroscience*



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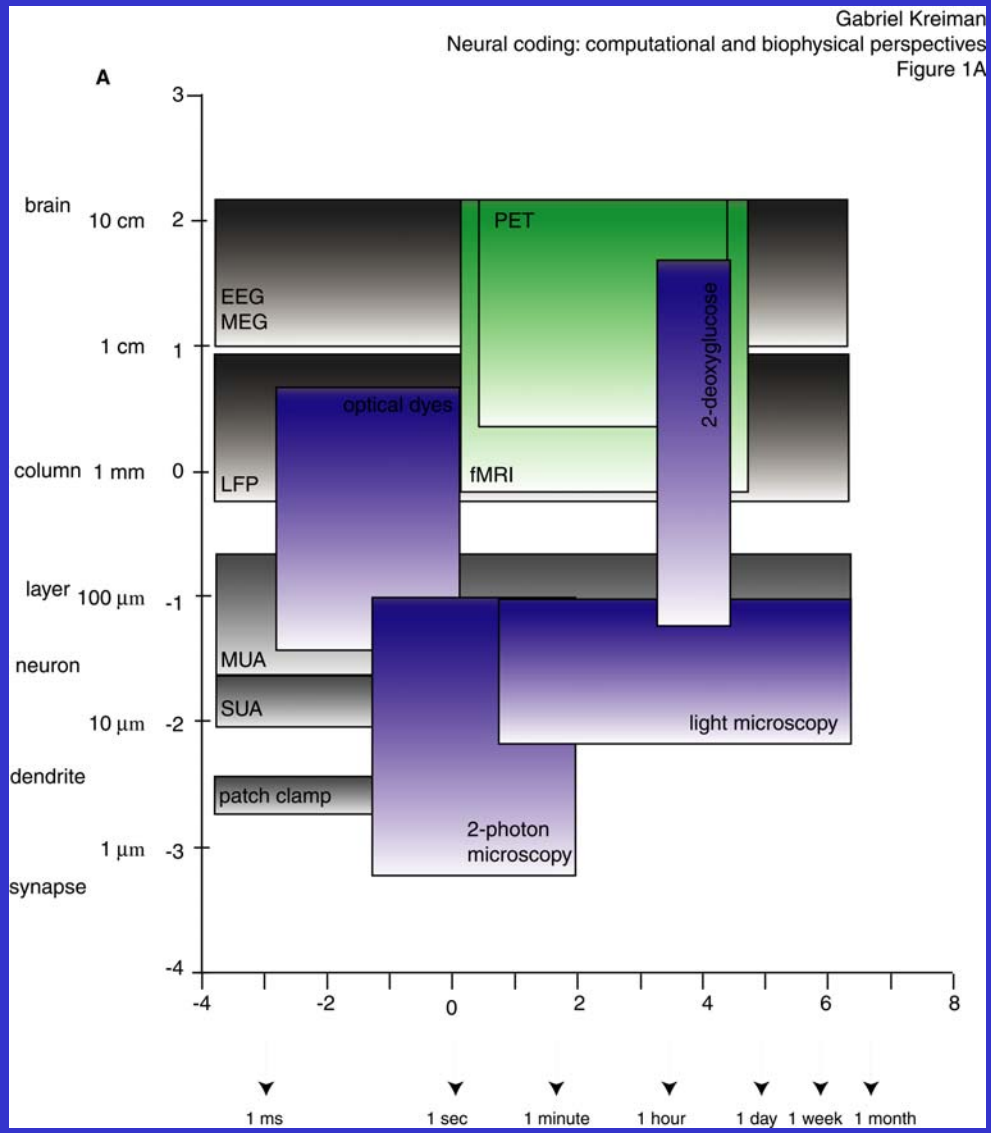

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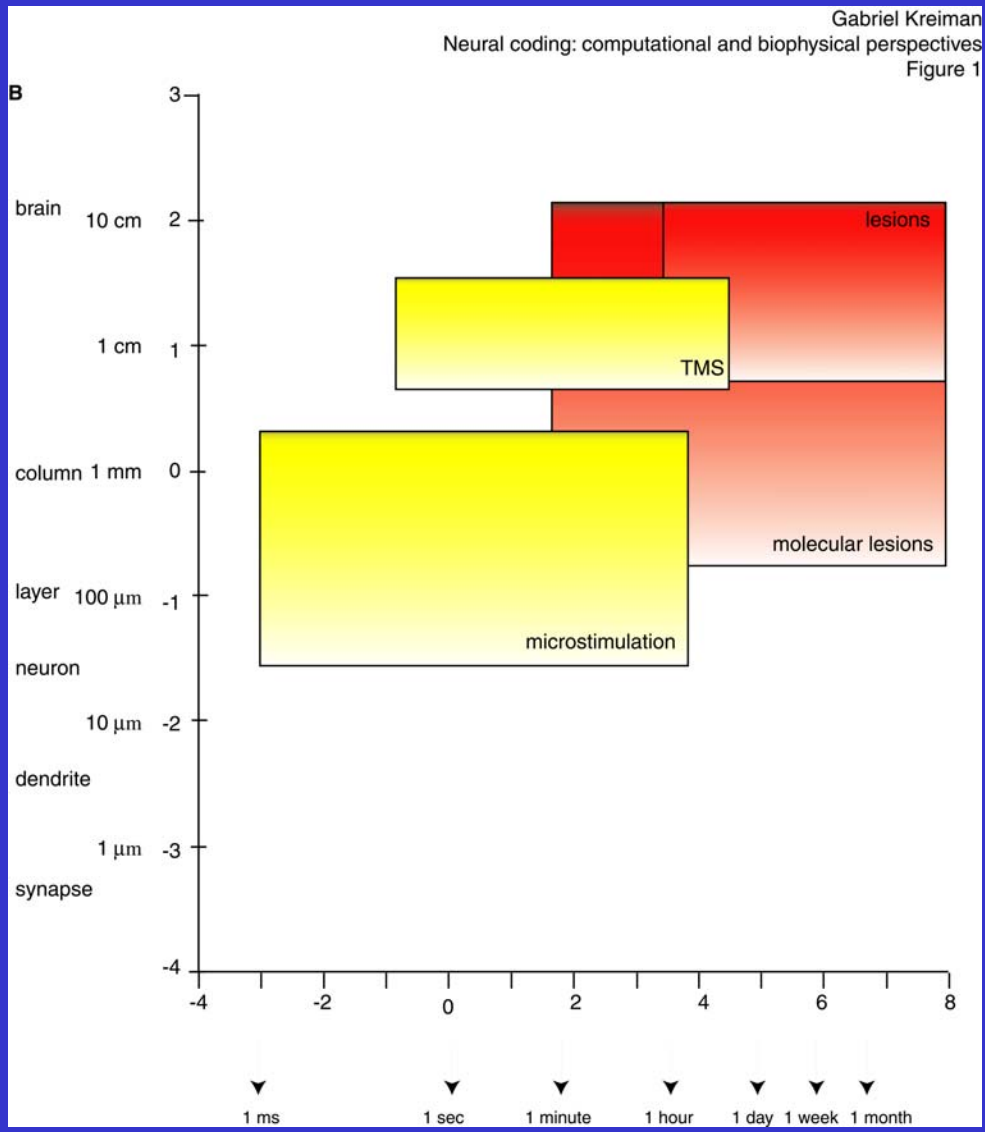

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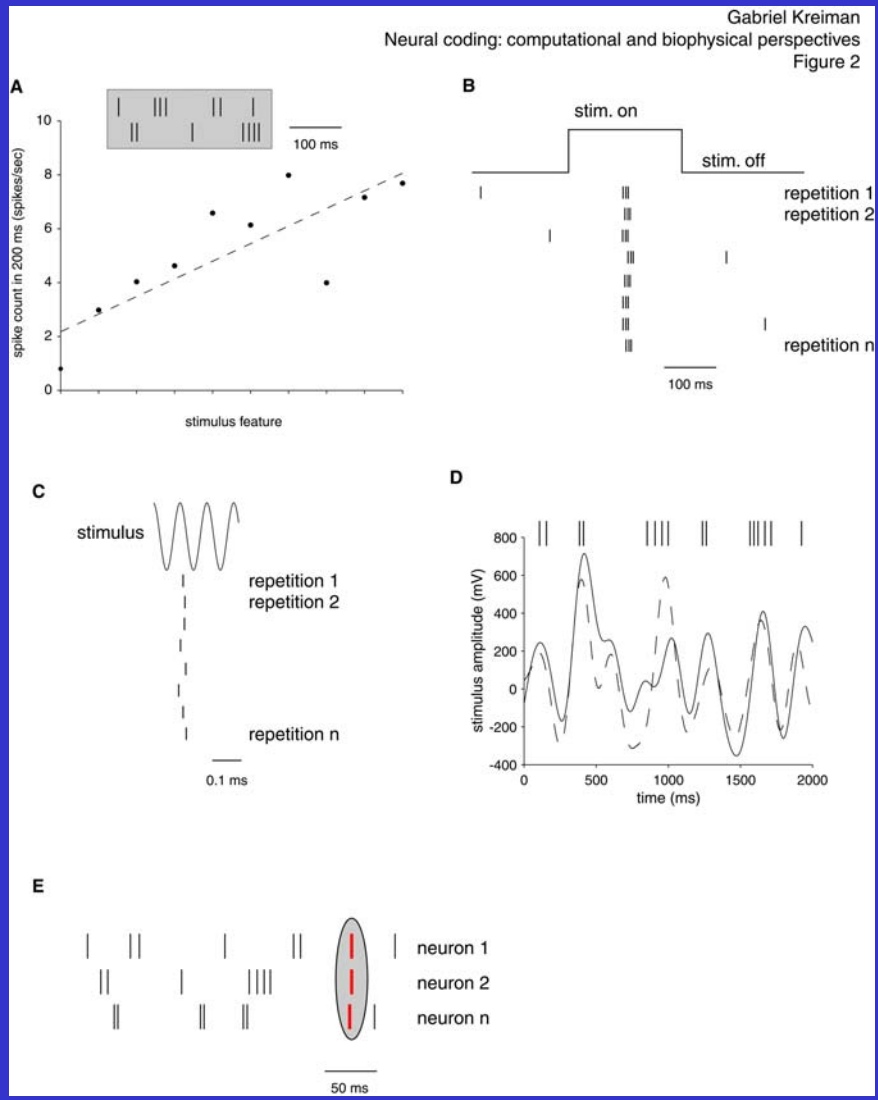
Neural coding



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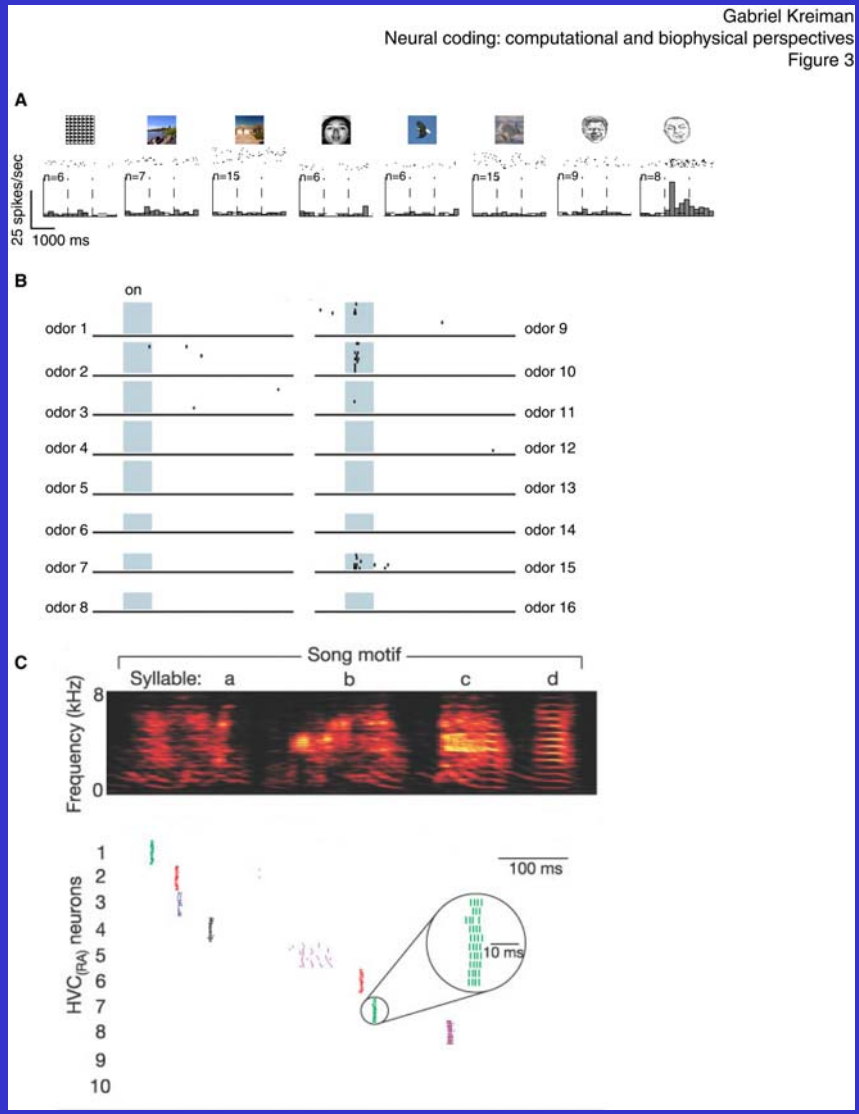

Summary

There are multiple (non-scientific) approaches to understanding consciousness
(dualism, science will not understand it, deny the problem)

Two alternative scientific approaches suggest (i) we need new laws and principles, (ii) behavioral output (and language) are required for consciousness

We try to search the neuronal correlates of visual consciousness

- Some other animals are also conscious
- We start with simple questions
- Hopefully, we will be able to extrapolate
- We need an explicit representation
- Only parts of the brain will correlate with the contents of consciousness

References

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