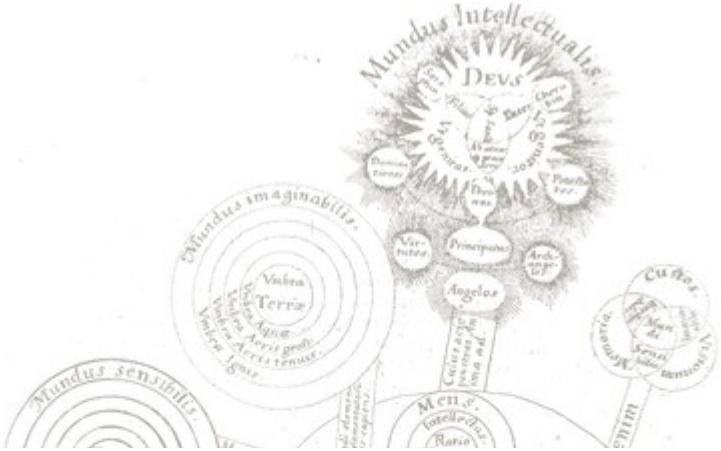
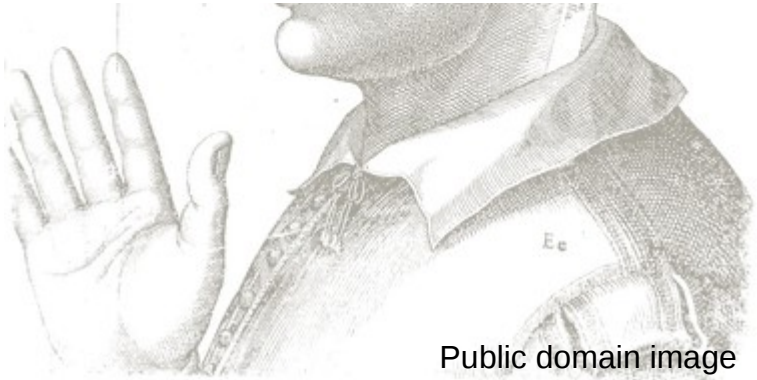


Aspects of consciousness

1. Conceptions of consciousness



Public domain image

Aspects of consciousness

Religious experience

Pride and Prejudice

Medical

Sleep, dreams

Language use

Access consciousness

Evolutionary fitness

Phenomenal consciousness

Zombies

Soul

Free will

Non-human animals

Computers

Episodic / autobiographical memory

Hypnosis

Meditation

Mindfulness

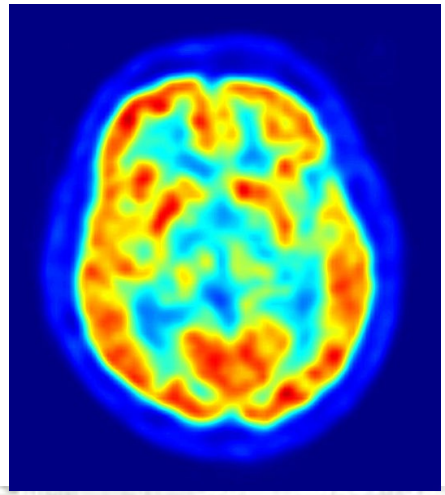
Philosophy

- Block, N. (1995). On a confusion about a function of consciousness. *Behavioral and Brain Sciences*, *18* , 227-287 (prioritise Target Article).
- *Free will*. (2012). Retrieved from http://en.wikipedia.org/wiki/Free will (Online)

The “explanatory gap”

"How it is that anything so remarkable as a state of consciousness comes about as a result of irritating nervous tissue, is just as unaccountable as the appearance of Djin when Aladdin rubbed his lamp.”

- T.H. Huxley (1866)



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Two types of consciousness

- Phenomenal Consciousness
  - *P-consciousness is experience*. We have P-conscious states when we see, smell, hear, taste and have pains.
- Access consciousness
  - *A-consciousness is control*. A state is A-conscious if it is *available for rational control of action*.

- The *explanatory gap* refers principally to P consciousness.

The problem of free will

- **Laplace's demon** – Imagine an entity who knows the entire history of the universe, and knows all physical laws. This entity could predict the future, including what you will do next. Therefore, you do not have free will.
- In other words, if *determinism* is true, *free will* is false.
- The problem is that most people believe they have free will.
- How do we resolve this?

Mikhail Vrubel (1856-1910) - "Demon and angel with Tamara's soul"
Public domain image.

Answer 1: Theological libertarianism

- Determinism is an attribute of the physical world.
- The soul is non-physical and hence non -deterministic.
- The soul controls our actions.
- Hence we have free will
- **Mind-body problem**
  - How does the non-physical control the physical? What possible mechanism could there be?
  - Is the soul amenable to scientific study?
  - If theological libertarianism is true, is this whole course (and psychology in general) rather misguided?

Answer 2: Physical libertarianism

- Determinism, plus random chance
  - Quantum mechanics.
  - Neural noise.
  - Issue: Is that really free will? *The Dice Man* (Luke Rhinehart) as a model of a free agent?

Public domain image

Answer 3: Determinism is correct

- Objections to determinism:
  1. How can something as dry, simplistic, and reductionist, as deterministic physical laws give rise to something as complex, multifaceted, asethetic, and beautiful, as the behaviour of biological systems?
  2. Are you serious? We could never predict human behaviour in the way we predict, for example, planetary motion.

Answer 3: Determinism is correct

- Answers to these objections:

  1. Emergence: Perhaps, free will is an illusion brought on by a lack of understanding of emergent properties

Image: Benjamin Ebel

http://www.willslab.org.uk/vid/flockofbirds.mp4

http://www.willslab.org.uk/vid/boids.mp4

http://www.vergenet.net/~conrad/boids/

In order to get that last link to work, you may have to change your Java security settings.

Answer 3: Determinism is correct

- Answers to these objections:

  2. Chaos - We can't predict the weather that well either. Complex systems, like the weather – or even two magnets and a pendulum – are chaotic. This means they are incredibly sensitive to starting conditions. It's unlikely that we could ever measure starting conditions accurately enough to make deterministic predictions about individual behaviour.

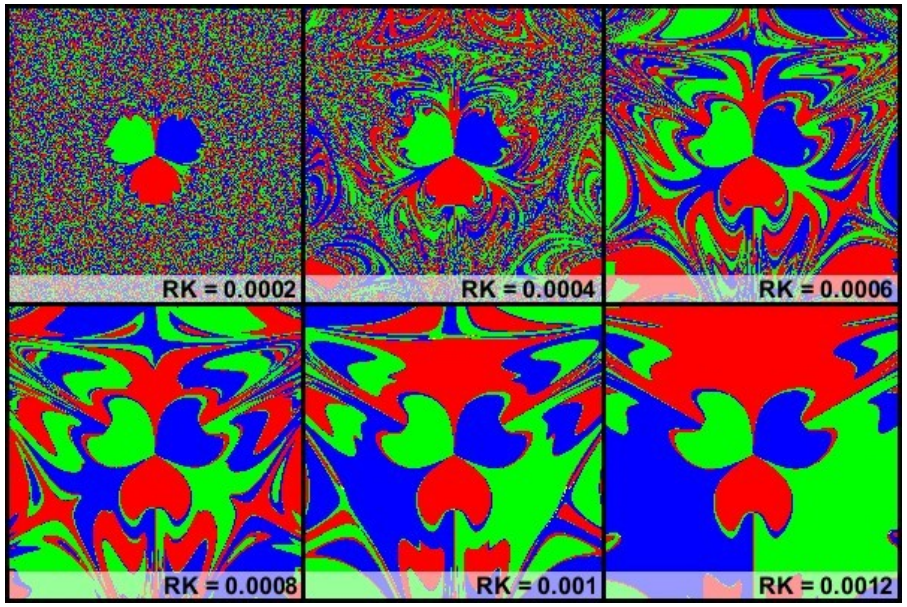
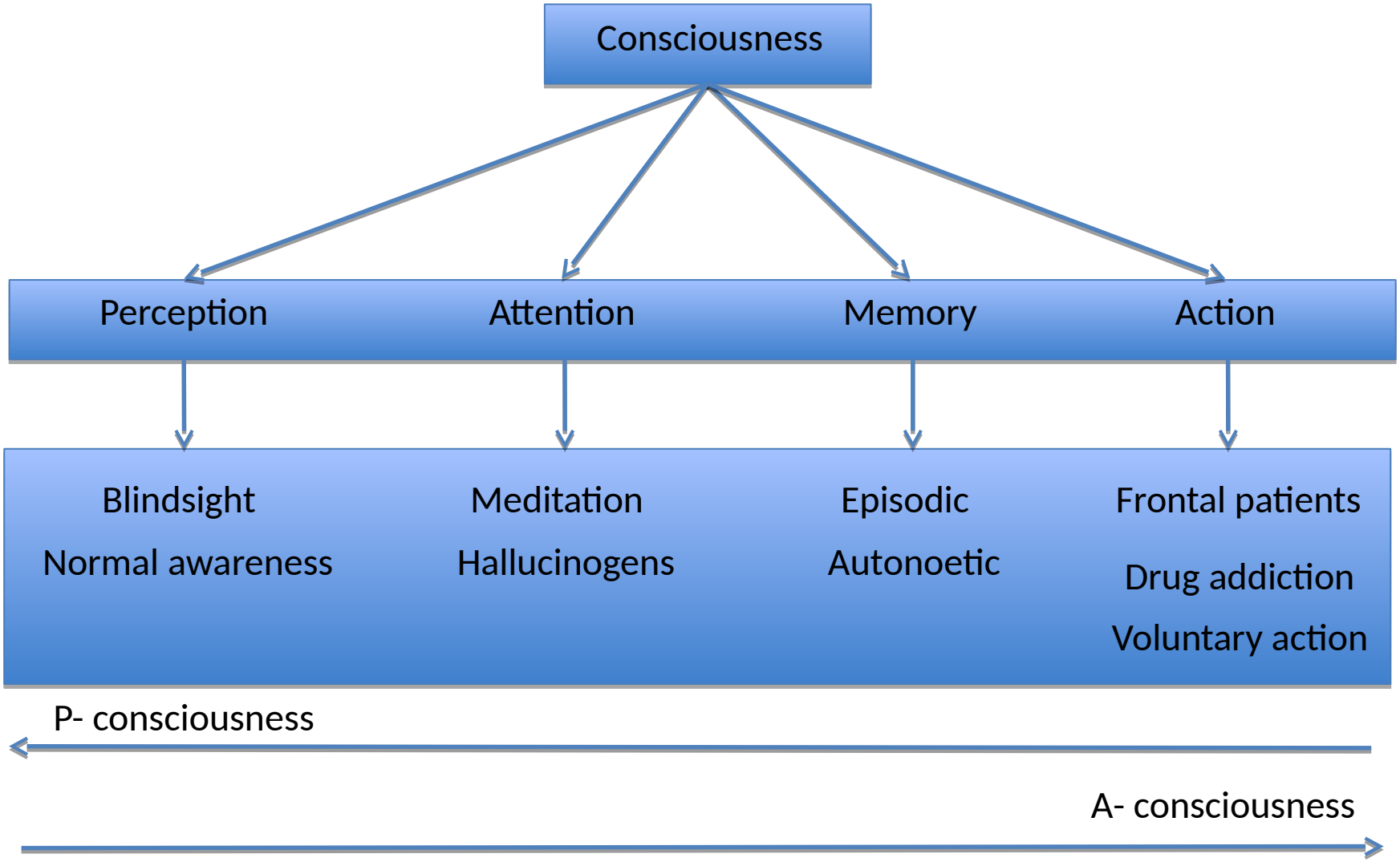


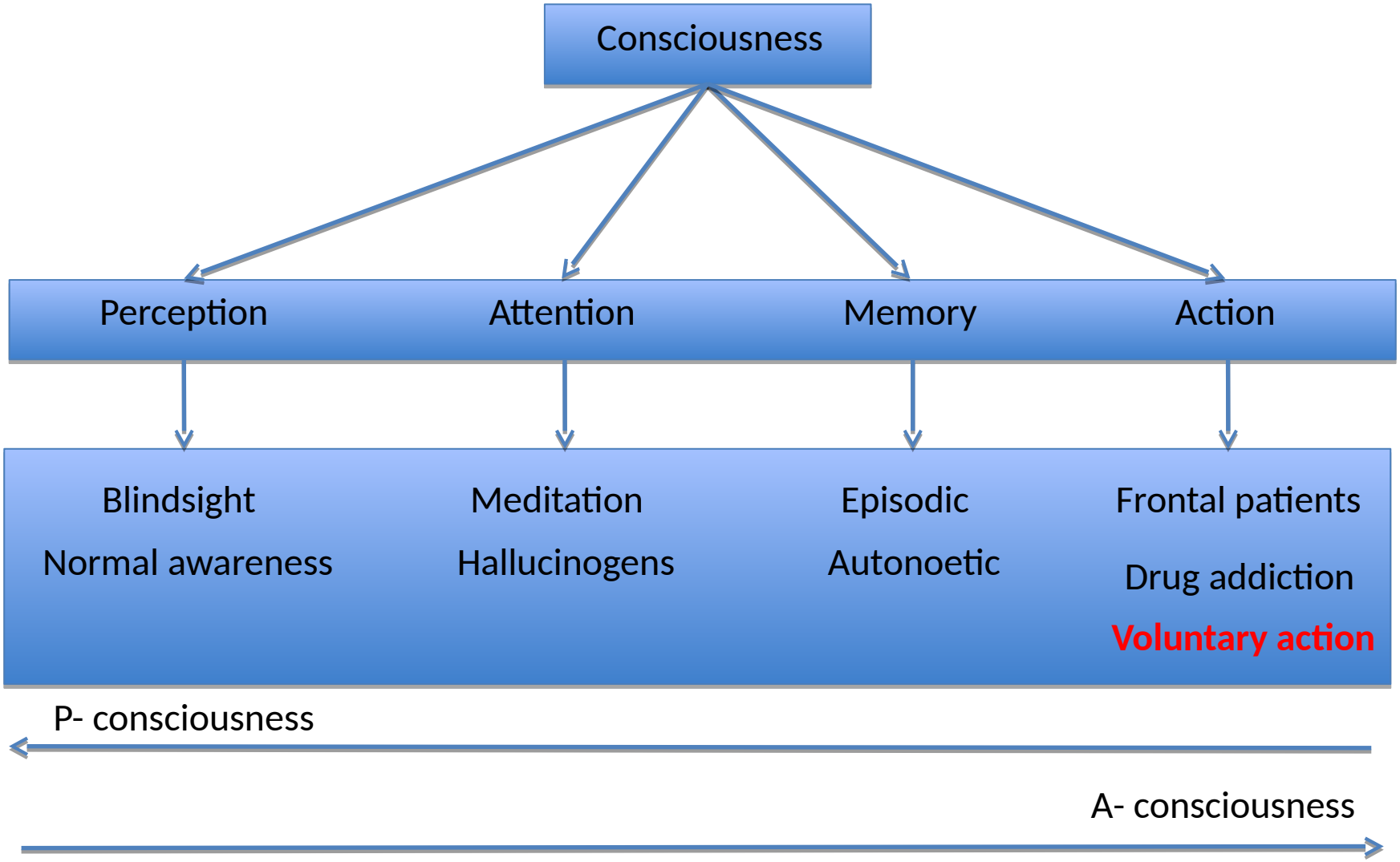
Image and video believed to be in the public domain.

www.willslab.org.uk/vid/magpend1.mp4

Scientific study of consciousness



Scientific study of consciousness



Voluntary action

- Haggard, P. (2005). Conscious intention and motor cognition. *Trends in Cognitive Sciences*, *9* , 290-295. [start with this one].
- Libet, B., Gleason, C., Wright, E. W., & Pearl, D. K. (1983). Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential). the unconscious initiation of a freely voluntary act. *Brain*, *106* , 623-642. [classic EEG study].
- Lau, H. C., Rogers, R. D., Haggard, P., & Passingham, R. E. (2004). Attention to intention. *Science*, *303* , 1208-10. [classic fMRI study].

Voluntary action

Q: “What is left over if I subtract the fact that my arm goes up from the fact that I raise my arm?” – Wittgenstein

A: Intention.

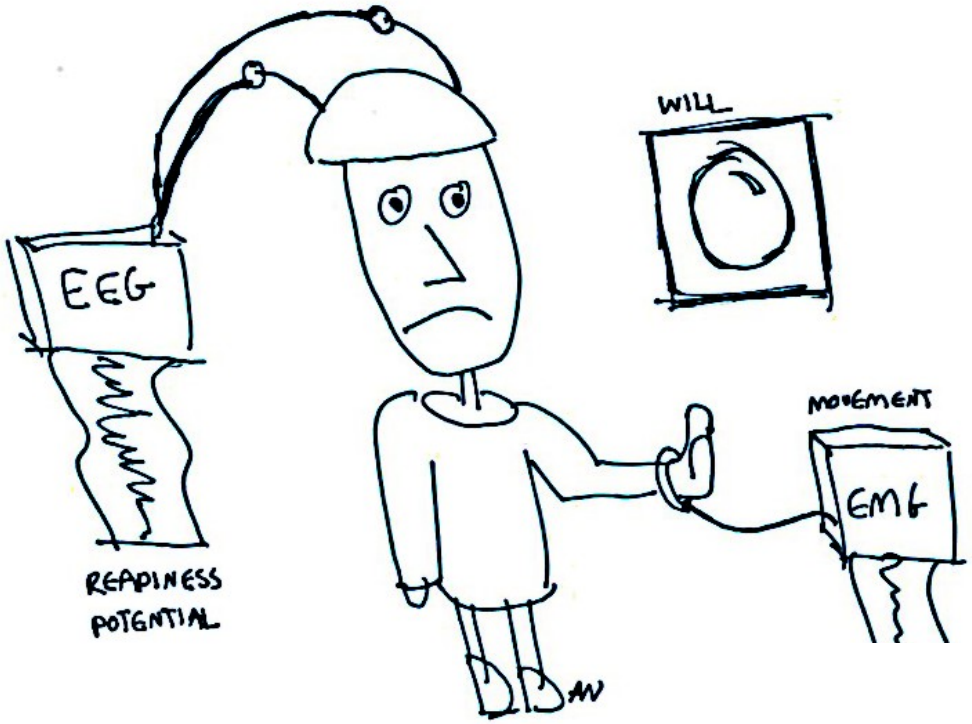
- Philosophy, and folk psychology, often assume:

  Conscious intentions -cause-> actions

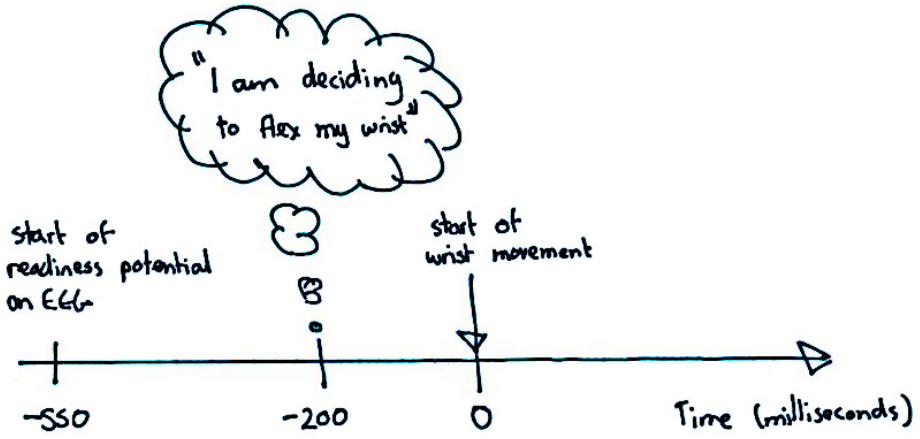
- Neuroscience rejects this *mind-body causation* and argues:

  Action preparation in frontal and parietal lobes
  -causes->
  Conscious experience of intending to act

Libet et al. (1983)



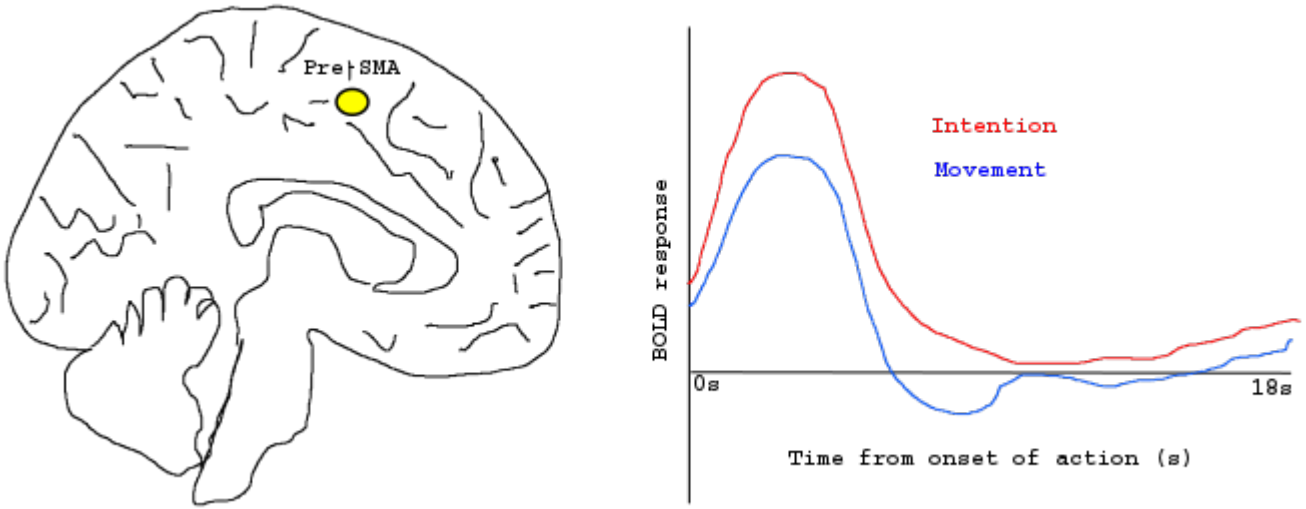
• The brain starts preparing for the movement about 350ms before the conscious awareness of the intention to move.



Lau et al. (2004)

1. Libet's task in the scanner.
2. Control condition where participants judge time of motor movement rather than time of intention.

(1) is presumed to enhance the intentional aspects of the task, relative to (2). Subtracting brain activation in the two conditions (1-2; Wittgenstein's question) should highlight the brain region(s) responsible for the experience of conscious intention.



Correlation does not imply causation

- Pre-SMA activity correlates with conscious intention.
- The decline in piracy on the high seas correlates with global warming.
- Neither relationship is necessarily causal.

Producing intention and action

- Fried et al. (1991)
  - Implanted electrodes
  - Stimulation leads to reported intention to act.
  - Stronger stimulation leads to performance of that action.

Influencing intention unconsciously

- Ammon & Gandevia (1990)
  - Participants voluntarily choose to make a left or right response.
  - Stimulating with left pre-SMA with TMS increases likelihood of a right response, and vice versa.
  - Participants reported no awareness that their actions had been influenced.