

# Some Thought on Consciousness and Neuroscience

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From “Cognitive Neuroscience”  
(Gazzaniga Editor)

# Outline

- Why are we conscious
- The nature of the visual representation
- What is essential for visual consciousness
- Recent experimental results
  - Action without seeing: classical blindsight
  - Action without seeing: the on-line system
  - Bistable percepts
- Evicting the NCC from V1
- The frontal lobe hypothesis
- Future experiments

# Why Are We Conscious?

- Biological usefulness
- Zombie and frog
  - Unconscious
  - Separate systems for snapping at and jumping away
- Human has separate unconscious systems
- Why not just many of those?
  - “Such an arrangement is inefficient”!
  - Better to produce a single but complex representation
  - Make it available to the parts that make a choice of action

# The Natural of the Visual Representation

- NCC - neural correlate of consciousness
- Multilevel
  - Lines, eyes, faces
- Explicit
  - Face cells
- Symbolic interpretation
  - Results of unconscious computation
- A working hypothesis:
  - Only some neurons express NCC
    - More than one area but not in V1!

# What Is Essential for Visual Consciousness

- Normal vivid experiences
  - When actually looking at visual scene
- Short-term memory essential for consciousness
  - Iconic memory
  - Outside memory
  - Working memory
- Visual attention enriches consciousness
  - May not be essential
  - Bottom-up/top-down
  - Competing interpretation biased by attention.

# Recent Experimental Results

- Action without seeing: classical blindsight
  - Existence of true blindsight: residual visual abilities in the absence of any acknowledged awareness
  - Uncertain neuronal substrate: e.g. SC

# Recent Experimental Results

- Action without seeing: the on-line system
  - Multiple systems: e.g. eye-movement
  - In parallel with the seeing system, even interfered by

TABLE 89.1

*Comparison of the hypothetical on-line system and the seeing system\**

	On-Line System	Seeing System
Visual inputs handled	Must be simple	Can be complex
Motor outputs produced	Stereotyped responses	Many possible responses
Minimum time needed for response	Short	Longer
Effect of a few seconds' delay	May not work	Can still work
Coordinates used	Egocentric	Object-centered
Certain perceptual illusions	Not effective	Seen
Conscious	No	Yes

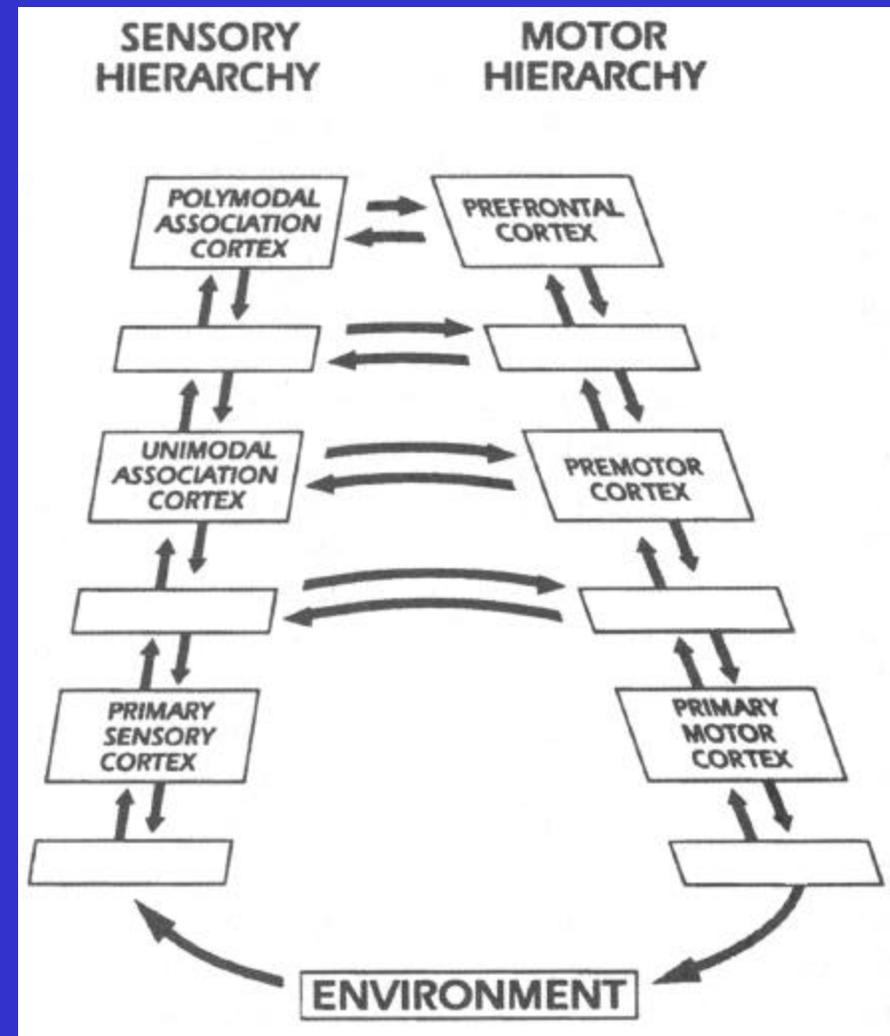
\*Based on Milner and Goodale, 1995.

# Recent Experimental Results

- Action without seeing: the on-line system
  - Patient D.F: deficient in seeing orientation and form
  - But good at catching a ball
  - No problem playing hand/card into slot
- Suggestions:
  - 1. Milner & Goodale: dorsal visual stream, “how” unconscious
  - 2. Wise et al: direct projections from parietal into premotor unconscious
- Alternative view:

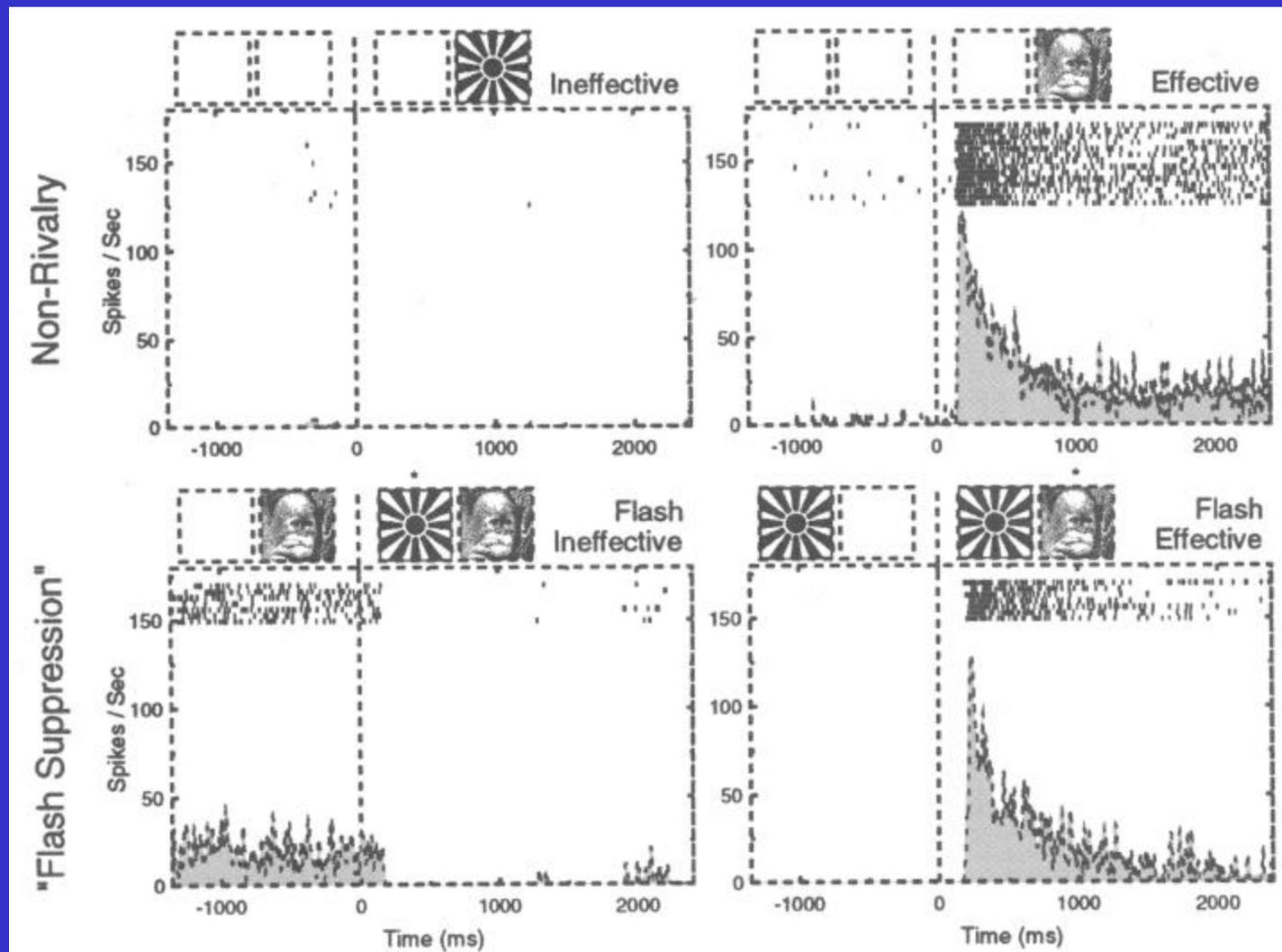
# Recent Experimental Results

- Alternative view:
  - Intermediate levels
  - Tries to use quickest
  - The zombie part



# Recent Experimental Results

- **Bistable percepts:** Binocular rivalry: 40% followed, half anticorrelated to the percept, Logothetis et al.



# Evicting the NCC From V1

- No projection to frontal cortex
- No correlate with color perception

# The Frontal Lobe Hypothesis

