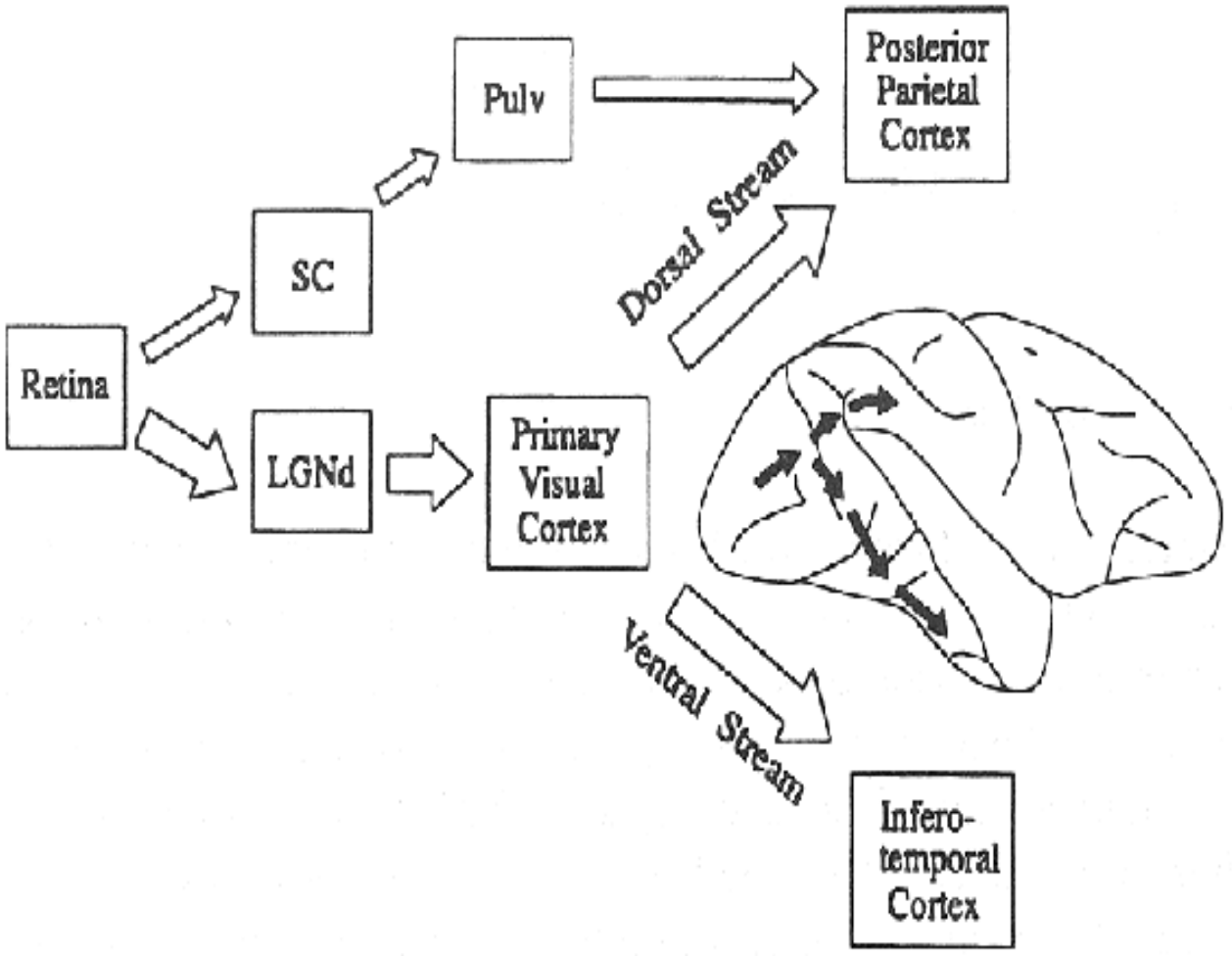
# Vision

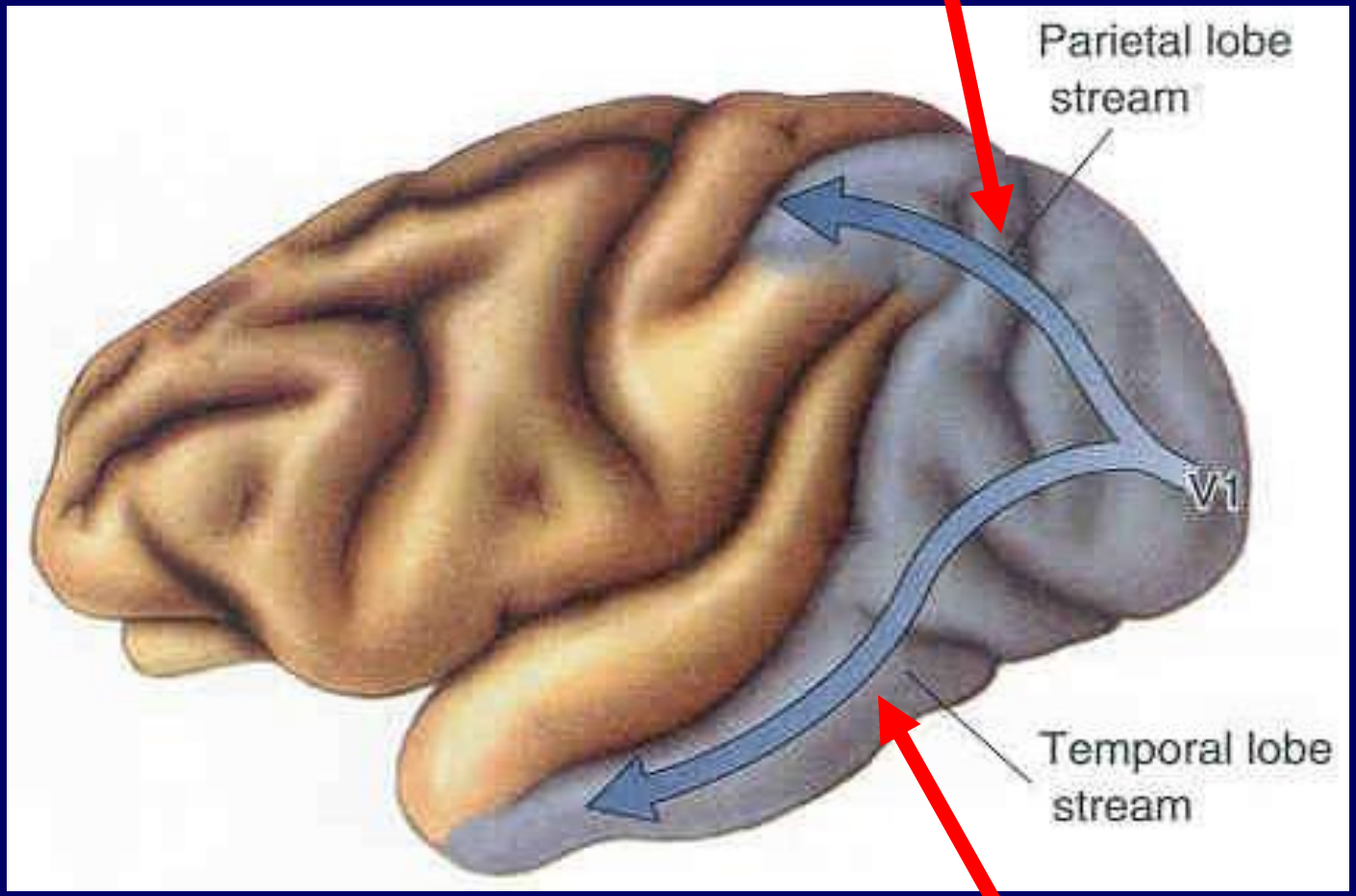
Delivers our experience of the world

Guides our movements throughout the world

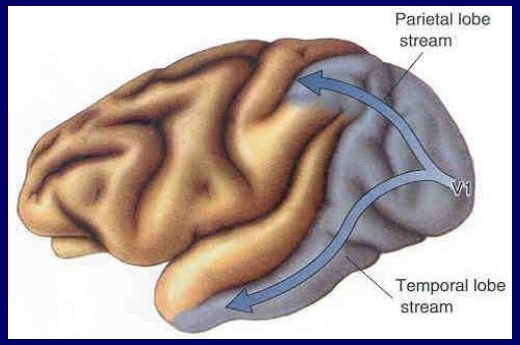
Even though we may perceive visual features such as color, form, etc, in the end we perceive a **unified representation** of the external world


Retina
SC
Pulv
Posterior Parietal Cortex
Dorsal Stream
LGNd
Primary Visual Cortex
Ventral Stream
Infero-temporal Cortex

Where system (dorsal stream)




What system (ventral stream)




**What system – ventral stream**

- **Enduring characteristics of an object**
- **long-term perceptual representations**
- **represents our KNOWLEDGE BASE OF THE WORLD –**
- ***OBJECT-BASED – constancies of size, shape, color etc***

**Where system – dorsal stream**

- **moment to moment information about location and disposition of an object with respect to the effector**
- **mediates visual control of skilled actions**
- ***VIEWER-CENTERED – both location of object and motion must be encoded relative to the observer***

# Cortical lesions show same dissociation

Trained monkeys to perform 2 tasks

1. Object discrimination (food under new object)

2. Location task (food hidden in tray near landmark)

Ungerleider and Mishkin(1982)

**Object discrimination**
(food under new object)

**Location task**
(food hidden in tray near landmark)

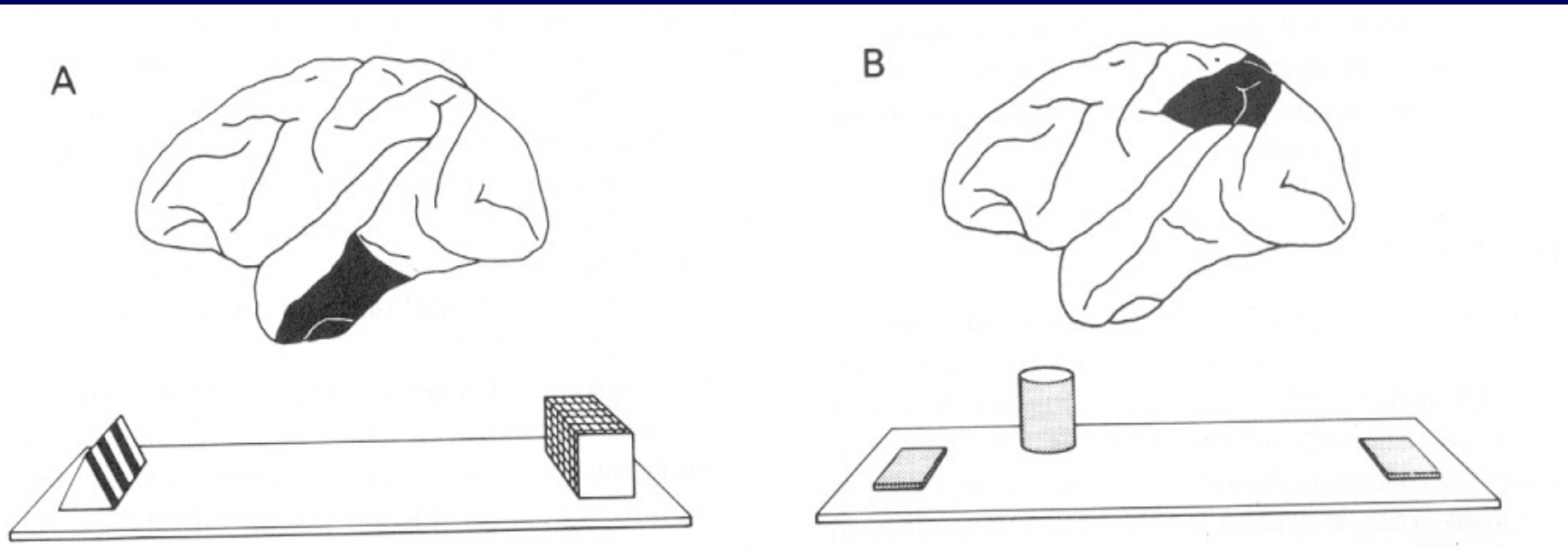
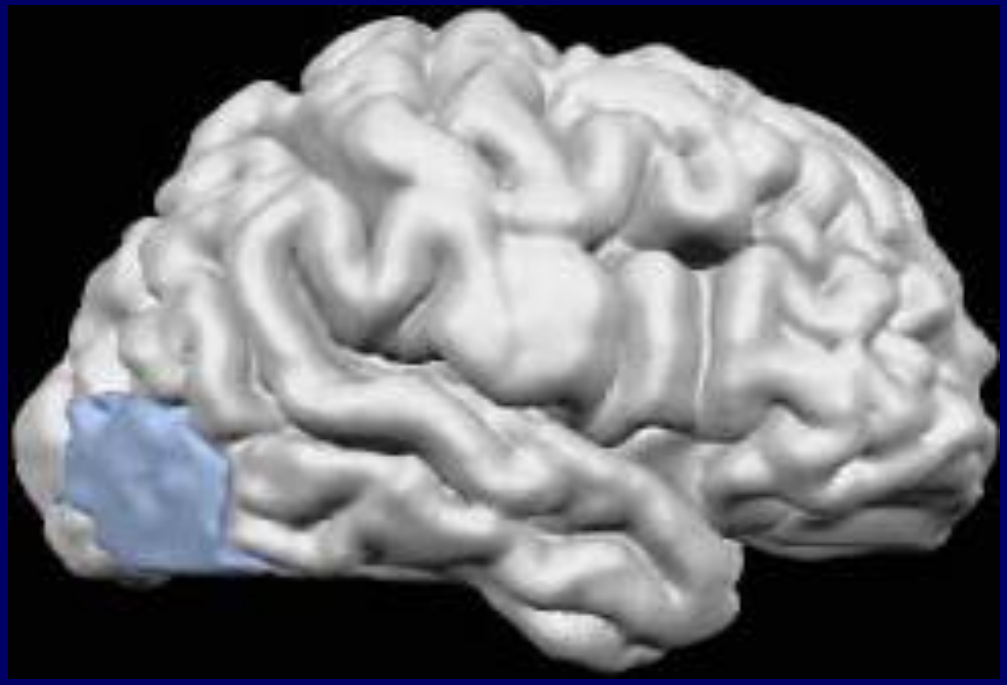



**Figure 2.** Behavioral tasks sensitive to cortical visual lesions in monkeys. (**A**) Object discrimination. Bilateral removal of area TE in inferior temporal cortex produces severe impairment on object discrimination. A simple version of such a discrimination is a one-trial object-recognition task based on the principle of non-matching to sample, in which monkeys are first familiarized with one object of a pair in a central location (familiarization trial not shown) and are then rewarded in the choice test for selecting the unfamiliar object. (**B**) Landmark discrimination. Bilateral removal of posterior parietal cortex produces severe impairment on landmark discrimination. On this task, monkeys are rewarded for choosing the covered foodwell closer to a tall cylinder, the 'landmark', which is positioned randomly from trial to trial closer to the left cover or closer to the right cover, the two covers being otherwise identical.

**Ungerleider and Mishkin, 1982**

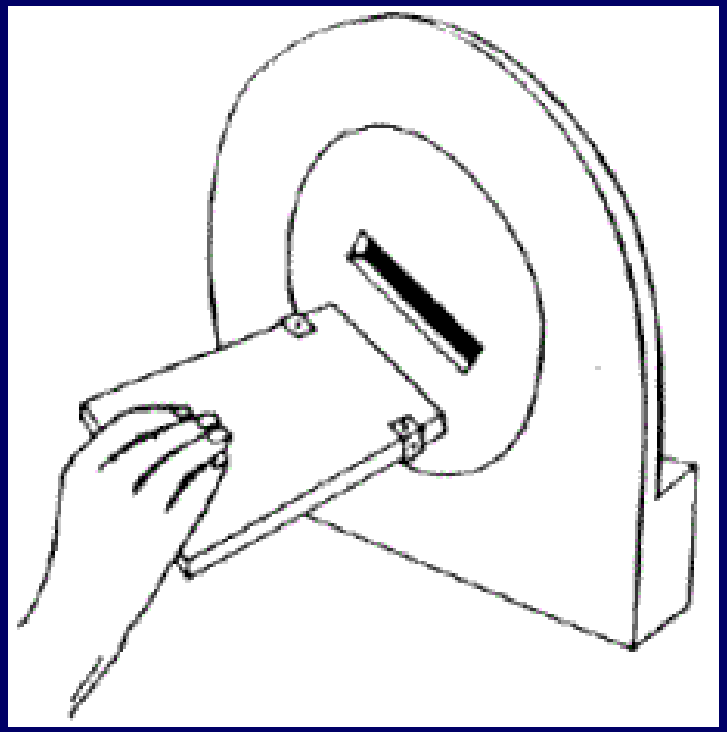
# Patient DF

damage to occipital-temporal projections from carbon monoxide poisoning



# DF

- impaired in recognizing faces
- could not tell difference between geometric figures, e.g. square vs. triangle
- can’t recognize or name objects by shape or form
- impaired ability to name or match orientation of slot



# BUT

**DF**

- can recognize people by voice
- recognize and name objects placed in her hand

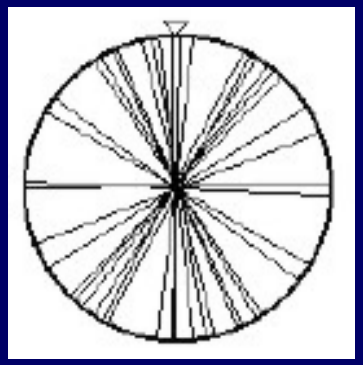
–*Un*impaired at placing card in slot

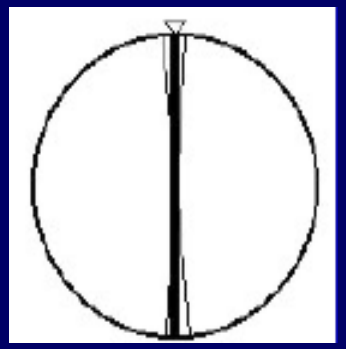
Suggests that parietal lobe is involved in visually-guided actions (i.e., “how” to perform actions in space)

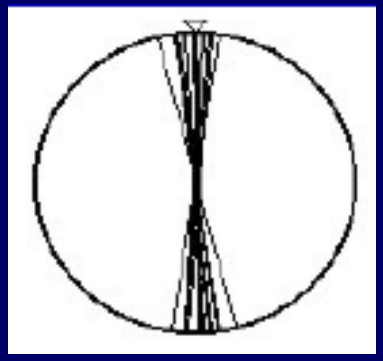
# Orientation Estimation vs. Posting

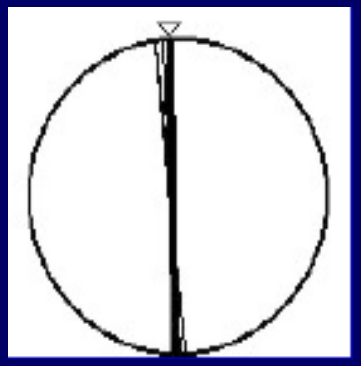
DF

Controls









# “What” vs. “How”

Functional Processing “Streams”

**Ventral: projections to temporal lobe:**

- “perception”: visual awareness of objects and events
- supports long-term representations

**Dorsal: projections to parietal lobe:**

- “action”: visual guidance (or direction) of actions to objects
- online and temporary representations

# Predictions

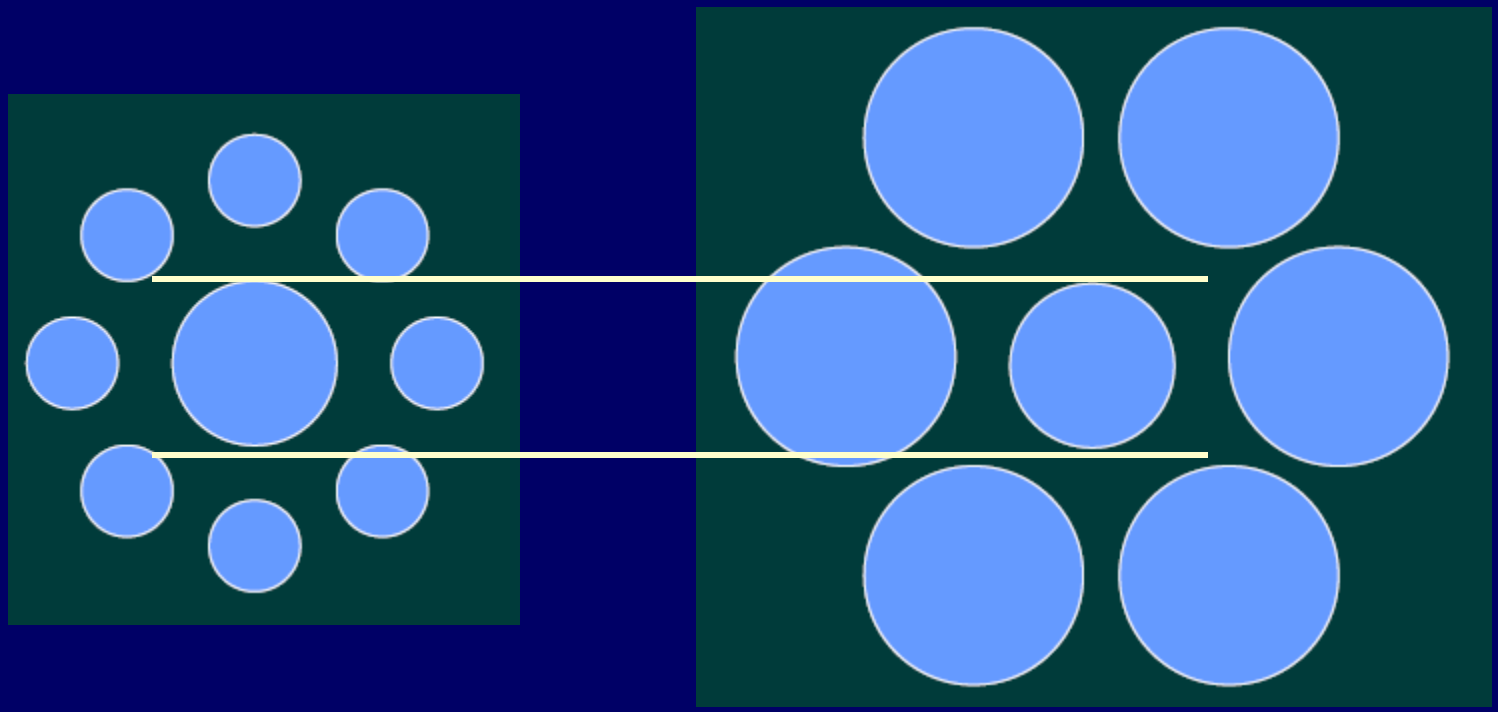
Double Dissociation?

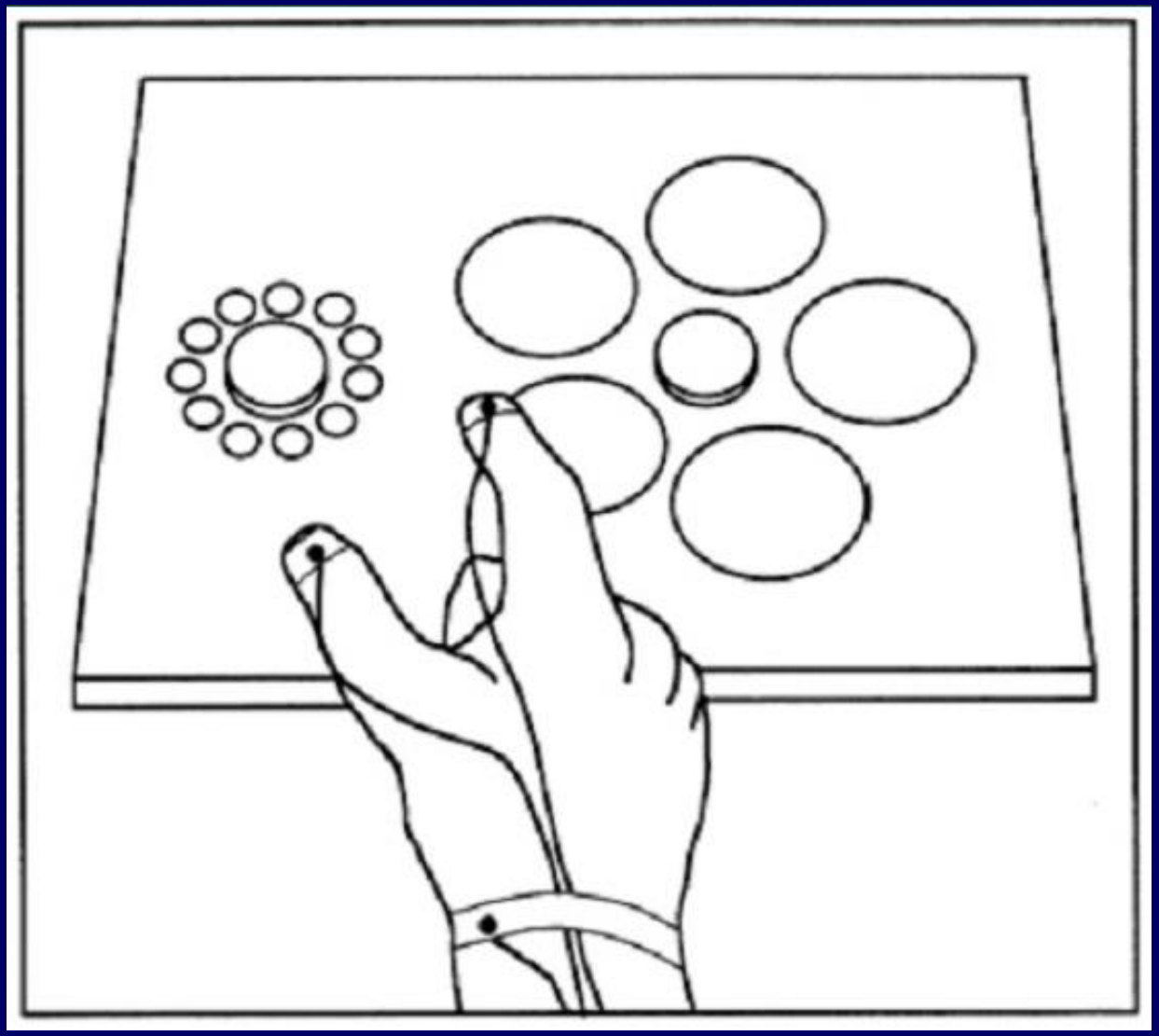
# Optic Ataxics

damage to occipital-parietal projections

Impaired ability to making reaching movements directed at objects (location and grip aperture)

# Ebbinghaus Illusion

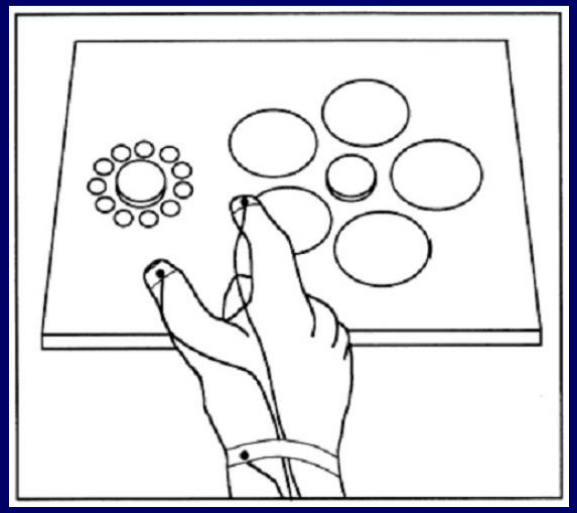


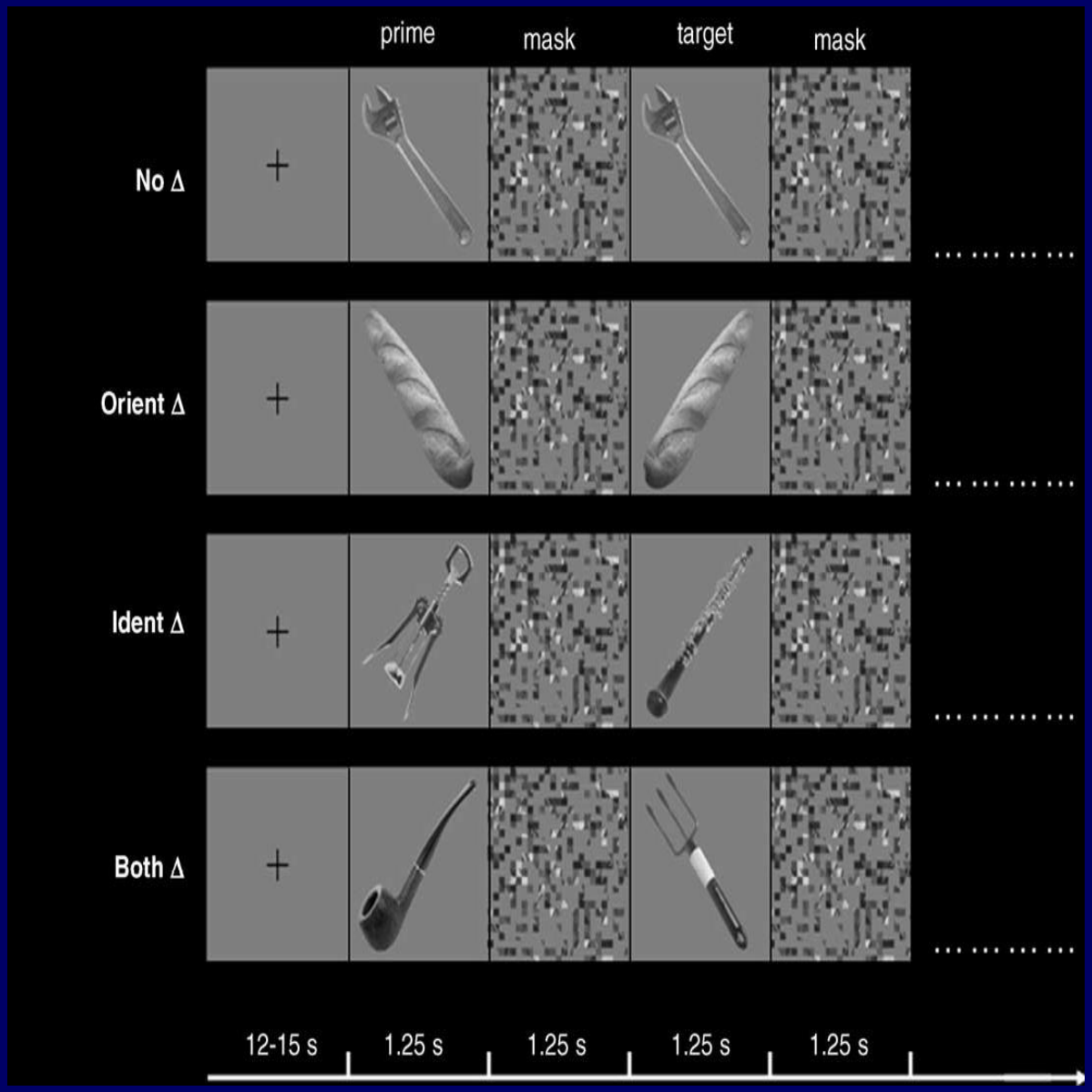


**we grip accurately when directing action at the disk**

**however,**

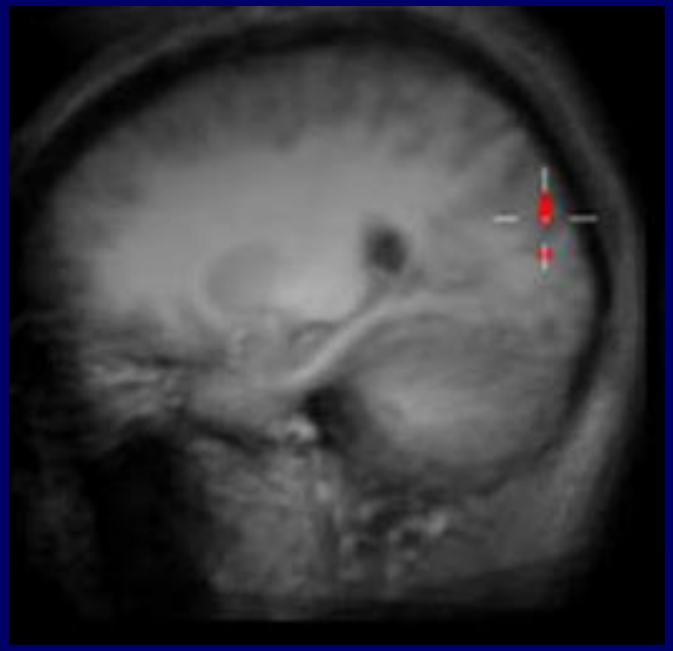
**when mimicking the action we show the effect of the illusion (our percept gets in the way)**



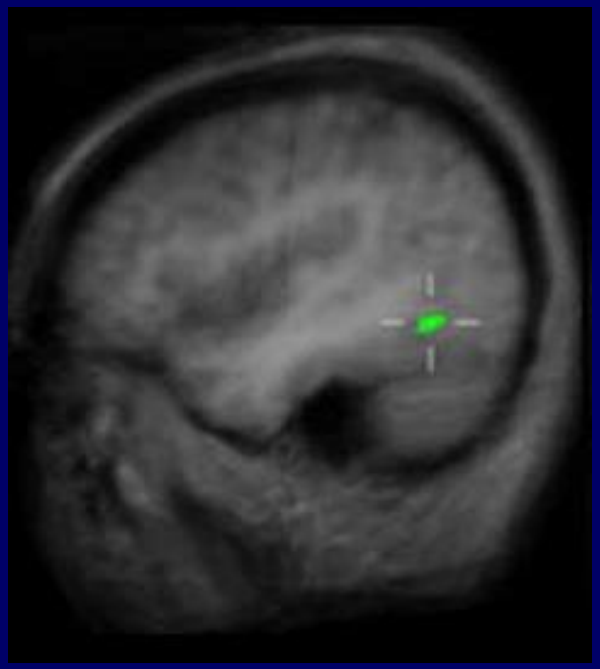



**Valyear et al., 2005**

Orientation change vs. no change



Identity change vs. no change

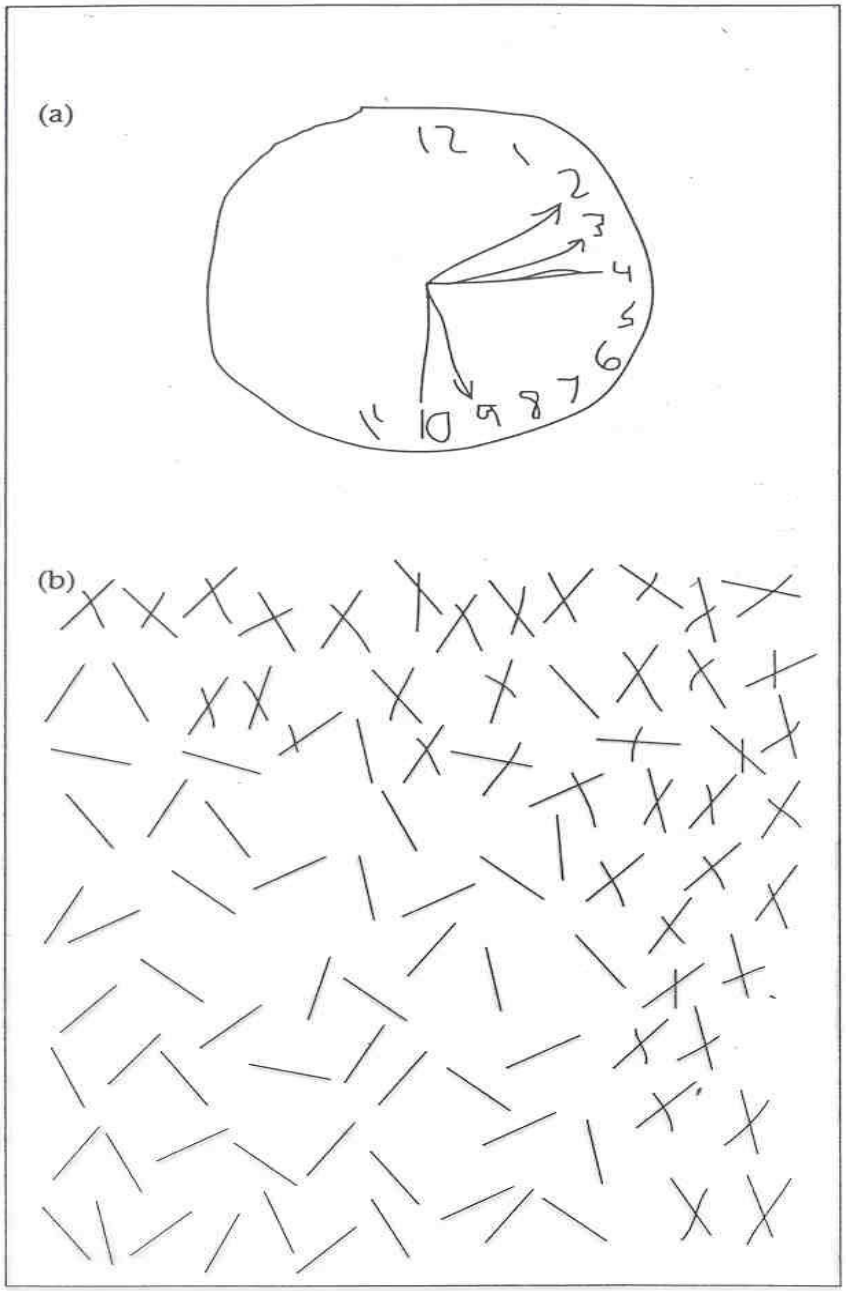


**Valyear et al., 2005**

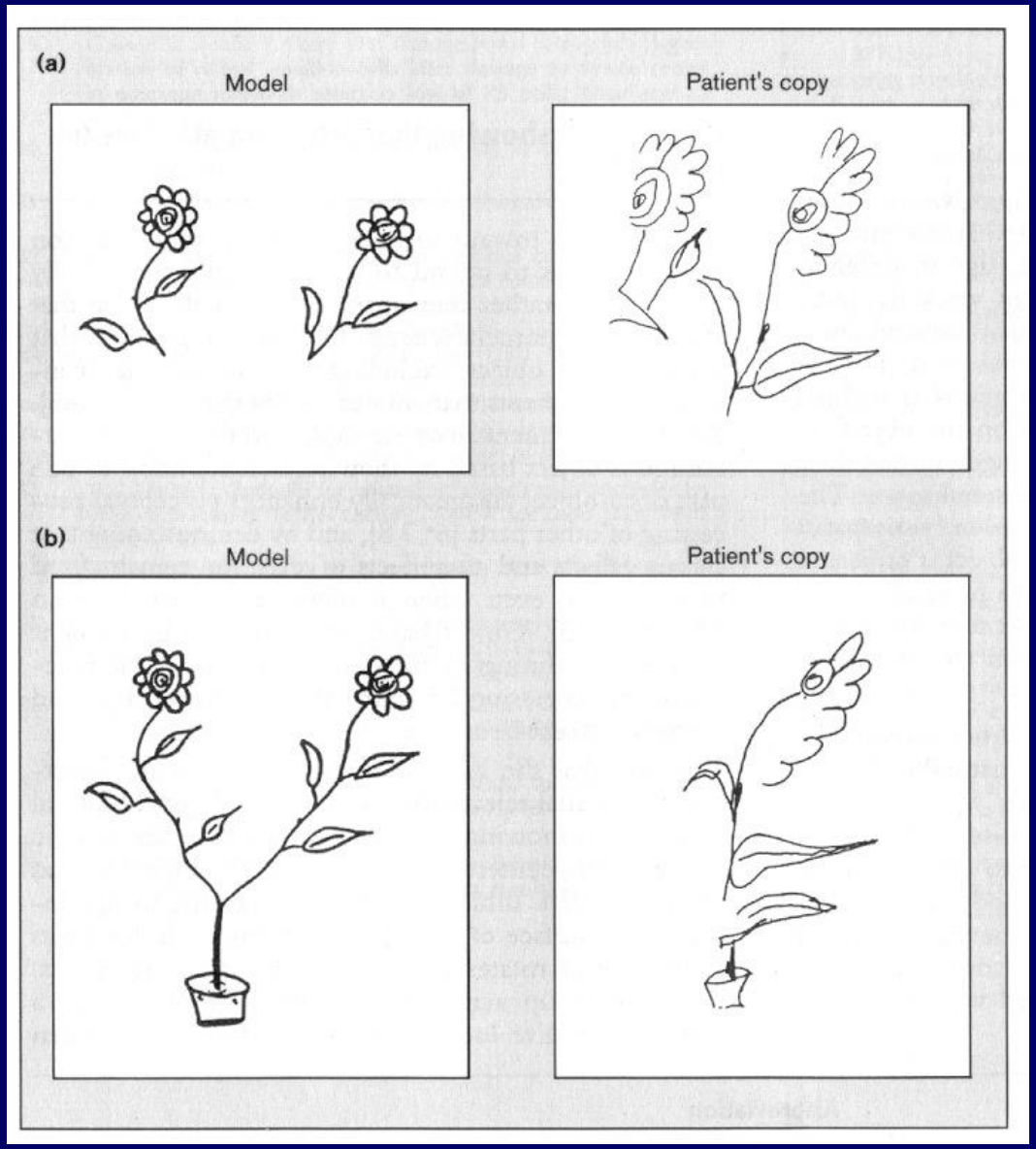
Damage to right parietal lobe produces
**Neglect Syndrome**

ignores input from left side of space

- eats food from one side of plate
- washes only half of face
- fails to locate objects if on neglected side
- reading words like pigpen or parties reads pen or ties




Examples of performance of a patient with unilateral neglect on *(a)* the clock drawing task and *(b)* Albert's Line Cancellation test (Albert, 1973).


(a)
Model
Patient's copy
(b)
Model
Patient's copy

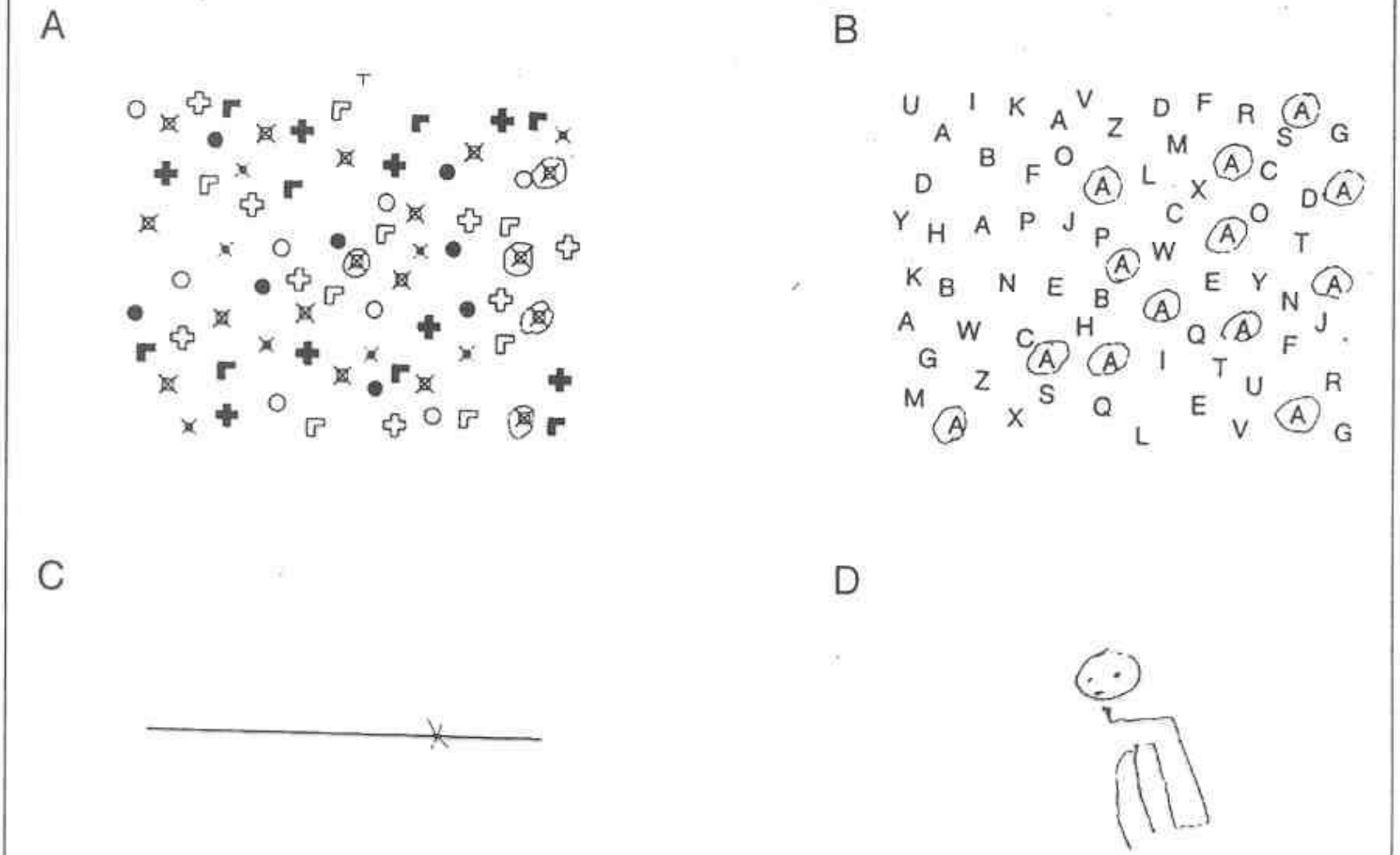



**Fig. 1 Examples of the performance of patients on clinical tests of hemispatial neglect. (A)** Symbol search and **(B)** letter search performance reflects the inability to respond to targets to the left of midline. **(C)** Line bisection shows the typical rightward bias of patients' transections, suggesting that they perceive the left end of the line as being shifted rightward. **(D)** A patient's copy of a person showing the lack of detail for features to the left of the patient's midline.

# Visual System

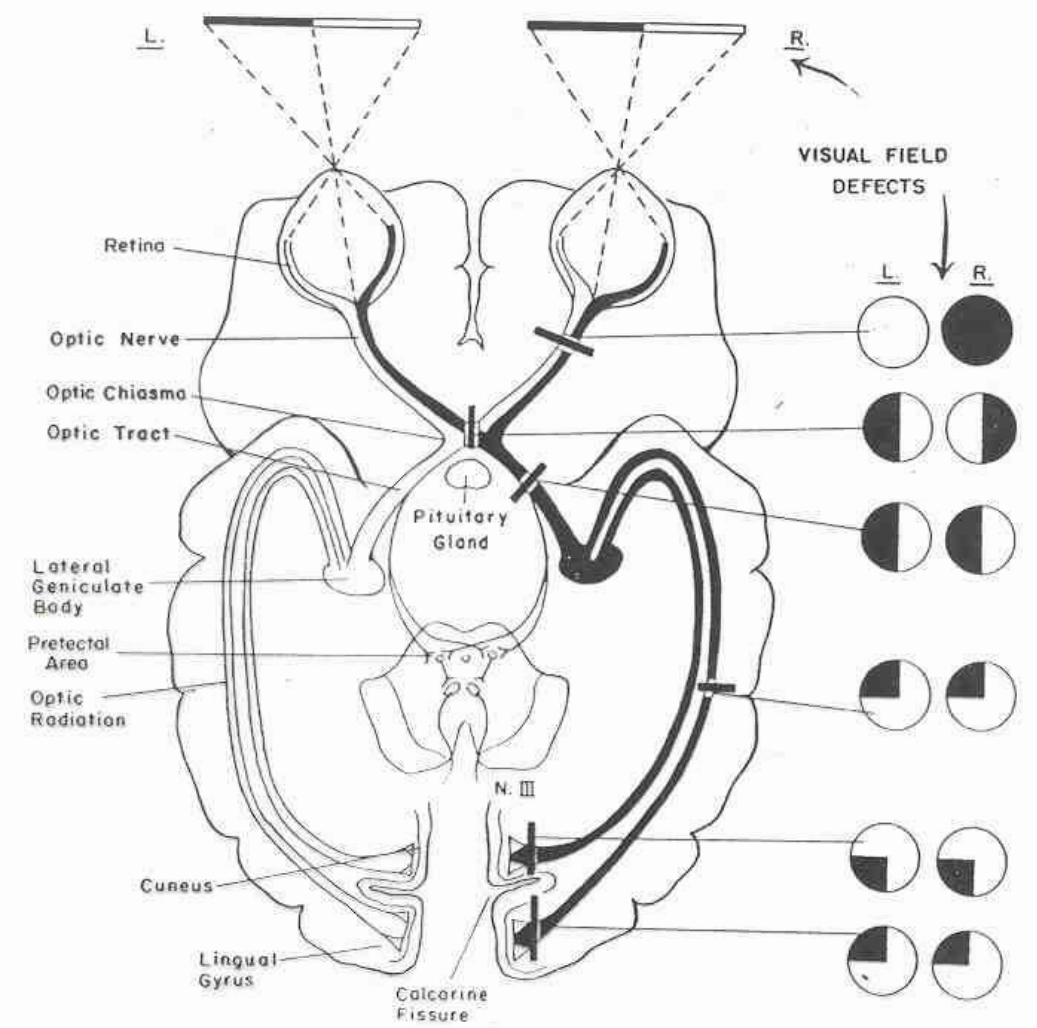



Fig. 34. The visual pathway. On the right are maps of the visual fields with areas of blindness darkened to show the effects of injuries in various locations.

# Picture priming and discrimination methodology

The semantic priming, lexical decision task used lateralized picture primes and centrally located target letter strings. The prime displays were composed of one line drawing of an object and one nonsense figure presented simultaneously for 200 ms to opposing visual fields. We felt that the double simultaneous displays, together with the short display duration, maximized the probability that the prime picture would be neglected and that compensatory eye movements would not occur. The target letter strings followed the offset of the prime displays by 200 ms and remained visible until a word/nonword judgment was made. The discrimination task was virtually identical to the priming task, except that the target letter strings were replaced by the forced-choice alternatives that were aligned vertically.

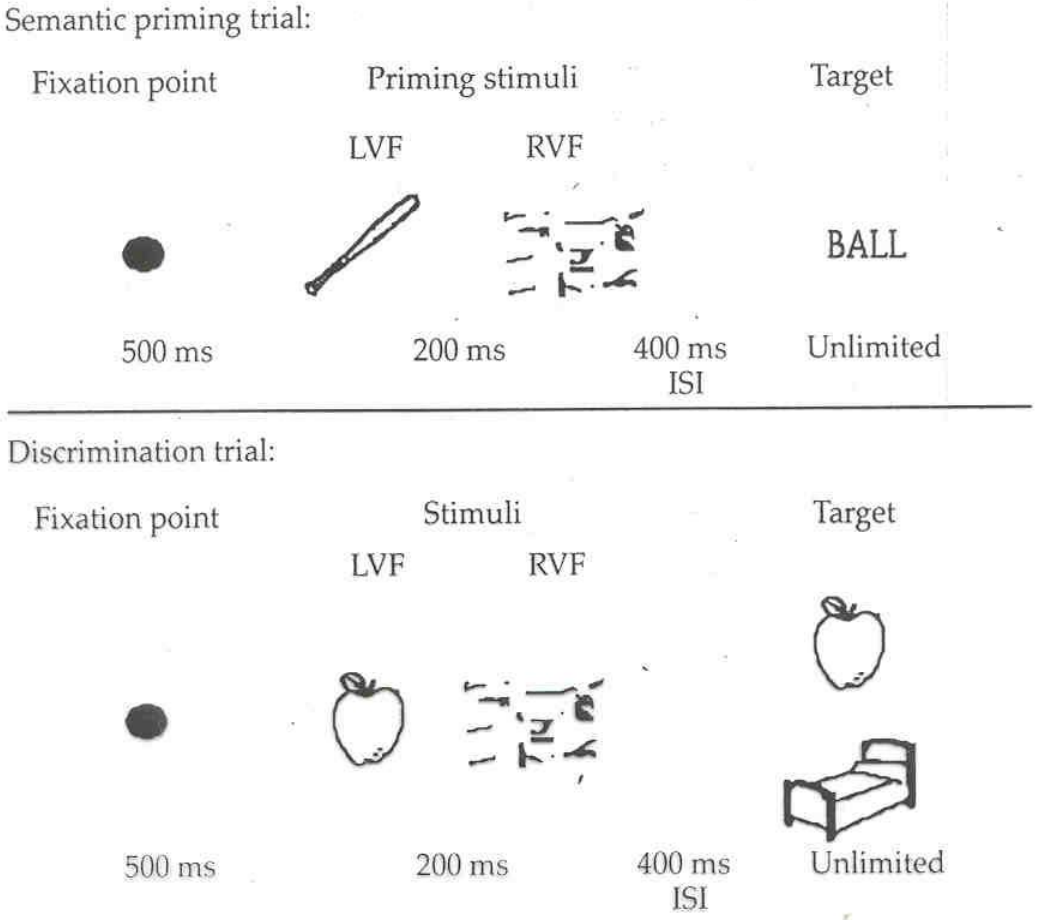
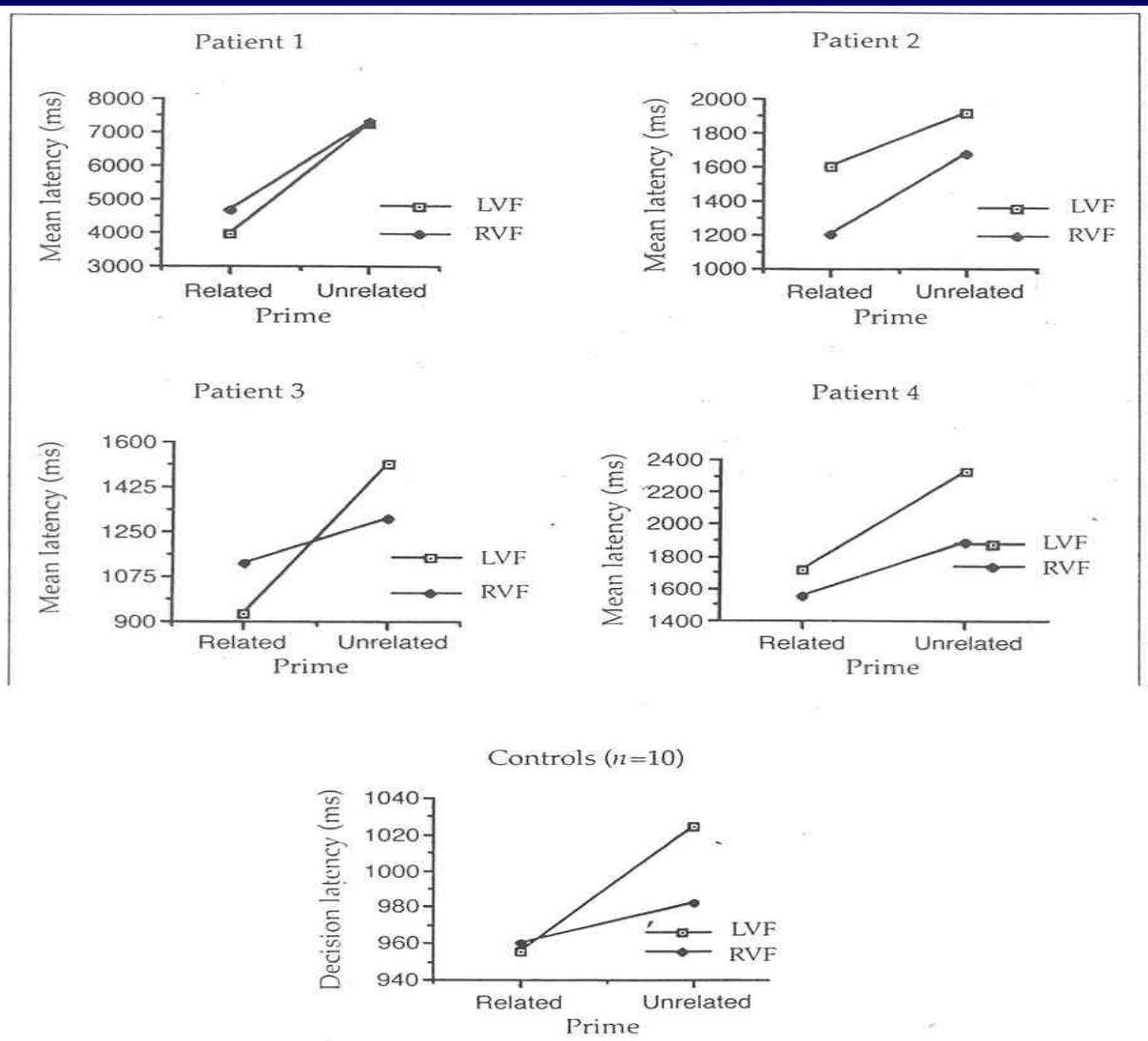
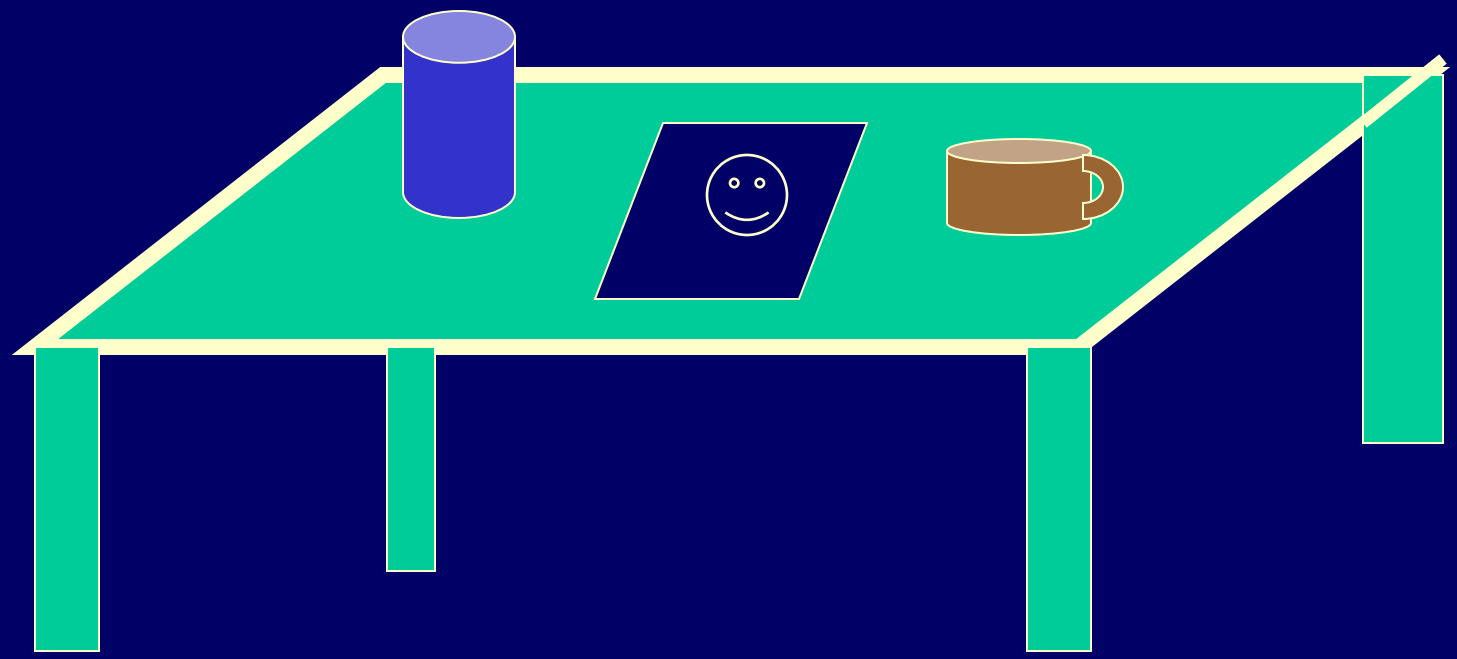



**Fig. Picture priming and discrimination trial and time course.** (From Ref. 34.) LVF, left visual field; RVF, right visual field.




. **Mean decision latency for the picture priming task for individual neglect patients, a hemianopic patient and the control group.** This figure displays the effect of the related compared with unrelated prime word on lexical decisions. In all cases of neglect (and in the control data) there is an effect of prime that is equivalent in the two visual fields. The hemianopic patient showed significant priming only from right visual field primes. Note: the scales are different in order to represent the individual data better. Statistical significance was assessed on an individual basis. (From Ref. 34.) LVF, left visual field; RVF, right visual field.

# DEMO - THE BINDING PROBLEM



# Binding Problem

Class of problems

- auditory – localization in space – where did the sound come from?
- voice of individual with identification of speaker
- cross-modality – seeing a bat and ball and hearing a ball hit it