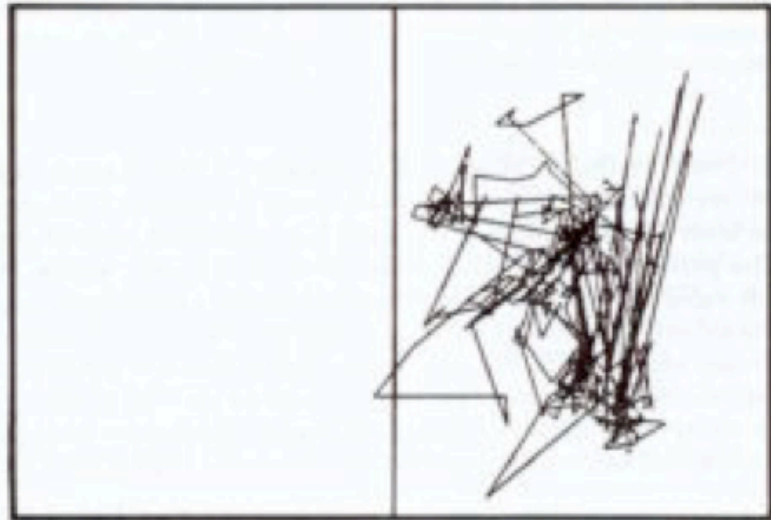# Cognitive Neuroscience of Language:
13: Neglect dyslexia and peripheral dyslexias

Richard Shillcock

Goals

Understand some of the ways in which attention and impairments such as unilateral visual neglect can affect reading. Review some of the other peripheral dyslexias.

Reading

Friedmann, N. & Gvion, A. (2001). Letter Position Dyslexia. *Cognitive Neuropsychology, 18,* 673–696.

Petrich, J.A.F., Greenwald, M.L. & Sloan Berndt, R. (2007). An investigation of attentional contributions to visual errors in right "neglect dyslexia". *Cortex,* online.

Beschin, N., Basso, A. & Della Sala, S. (2000). Perceiving left and imagining right: Dissociation in neglect. *Cortex, 36,* 401-414.

Attention

"Attention" is used very elastically:

focal	divided
overt	covert
goal-oriented	stimulus-oriented
region-based	object-based
serial	parallel
automatic	controlled
constrained	unlimited

What might "attention" look like in the brain?
The augmentation of "normal/default" processing, in spatial, temporal, intensity terms?

Attention and vision

Attention is not just about eye-movements; attention can be directed covertly, to objects and regions, using cueing tasks

Attention may be better seen as task and modality specific

The simpler and more peripheral the task, the more parallel the processing seems to be; the more conscious

Location- *vs.* object-based attention
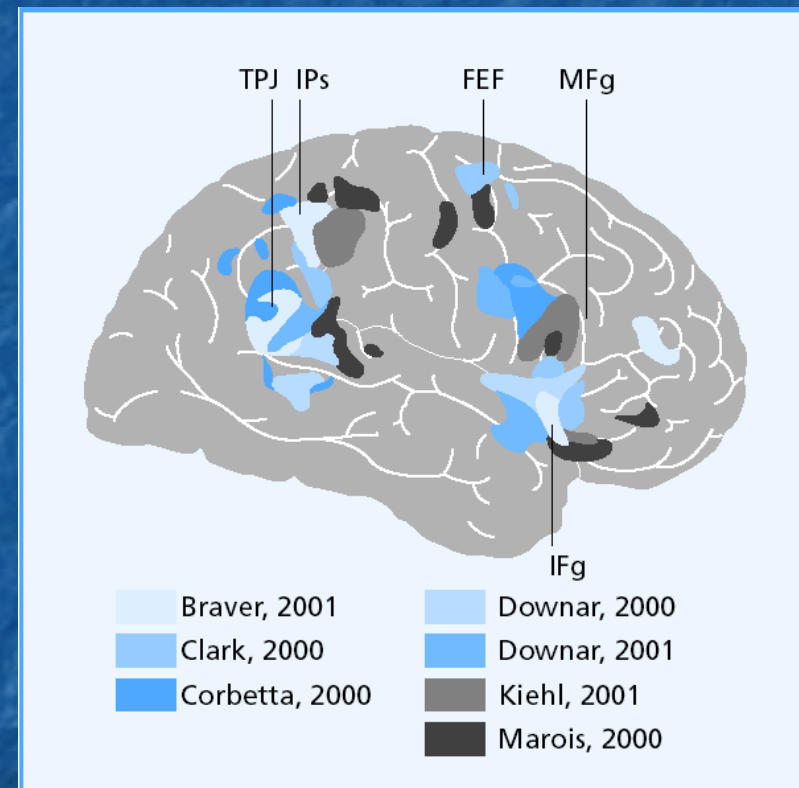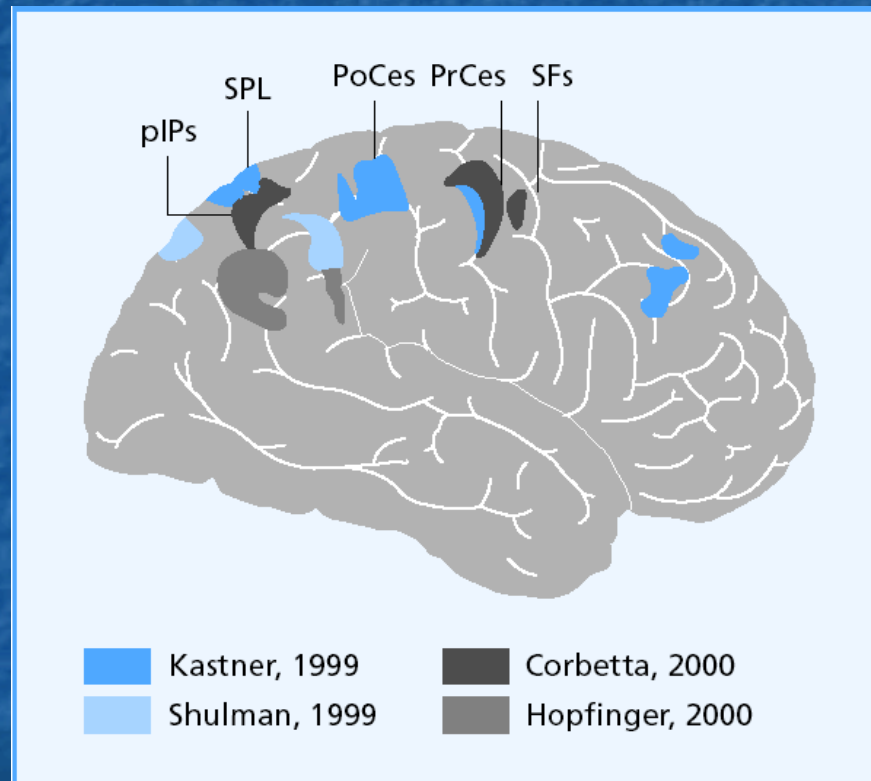
Egly, Driver & Rafal (1994)
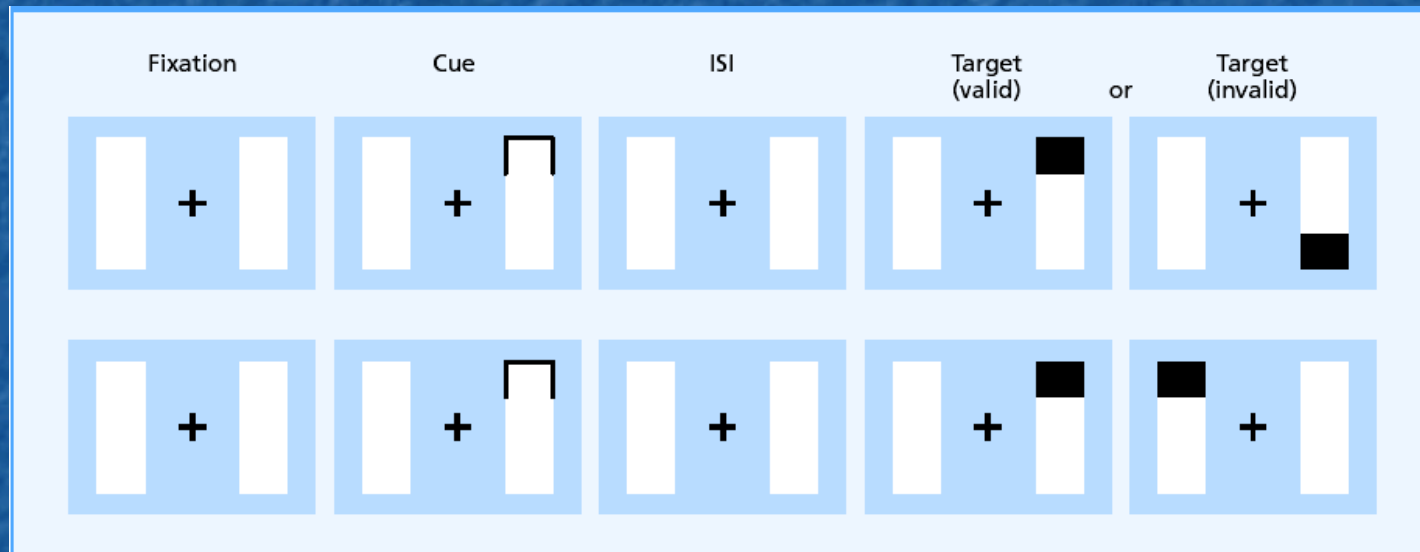
Cueing is more effective when the target is in the same object, compared with a different object

LH damage impairs switching between objects, RH damage impairs switching between locations

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Different attentional systems
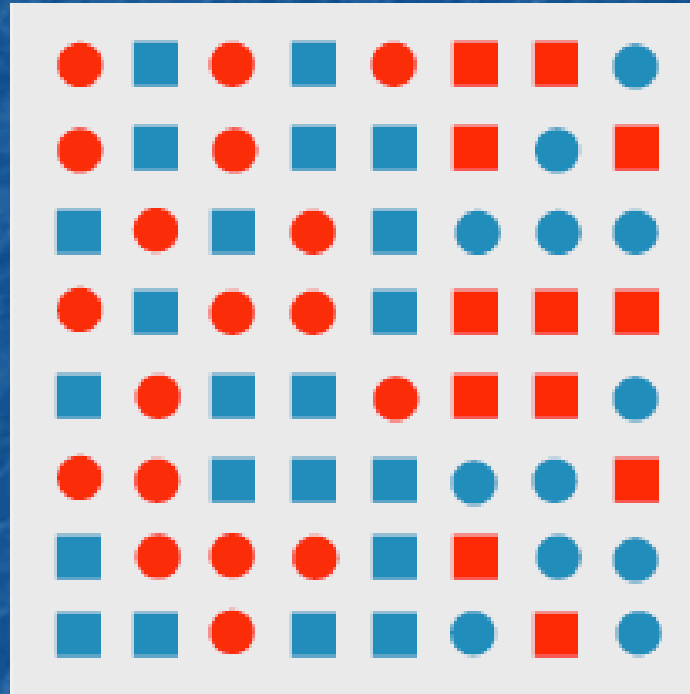
Corbetta & Shulman (2002)

Goal directed – dorsal fronto-parietal

Stimulus driven – RH ventral fronto-parietal

Visual attention

Treisman (1988, 1992)

A parallel and a serial process

Effects – or not – of set size

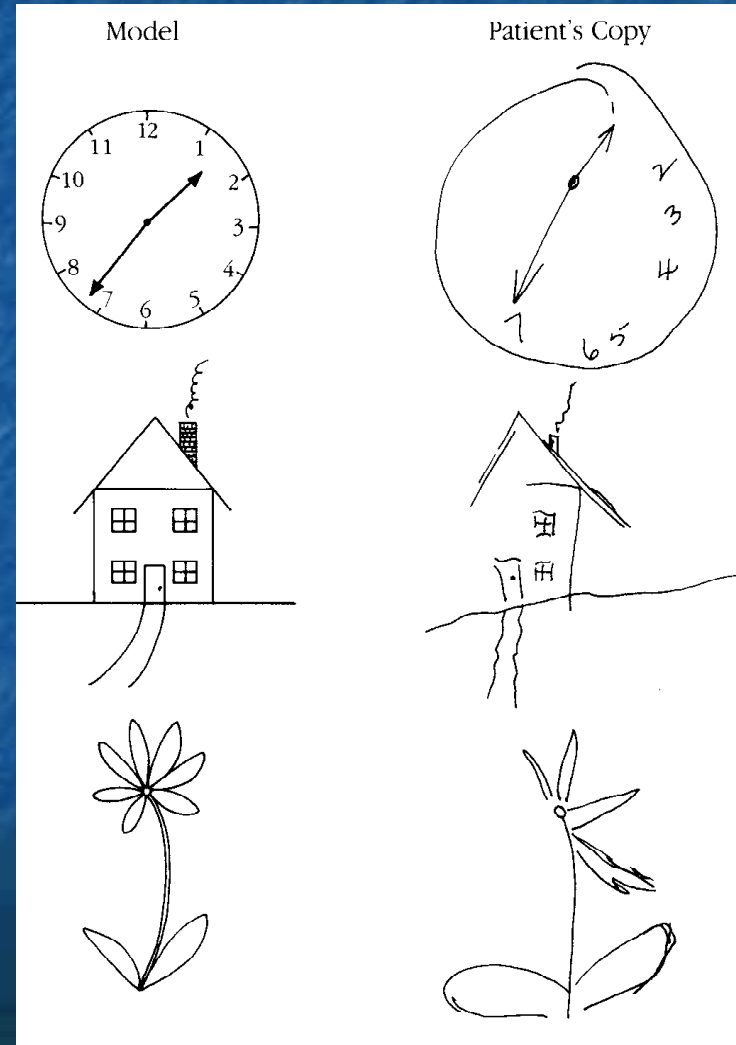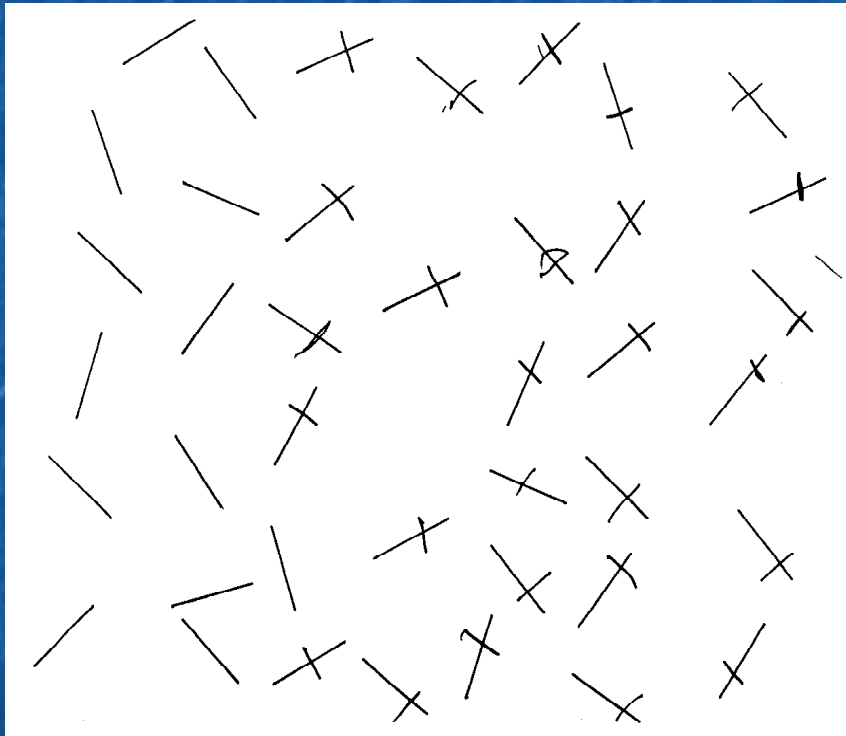Effects of the nature of the distractors

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Attention and hearing

Psychologists have used the dichotic listening task to study "filtering" and the role of "higher-level processing"

A particular spoken discourse is spontaneously followed when it switches ears in a dichotic listening task

Unilateral visual neglect
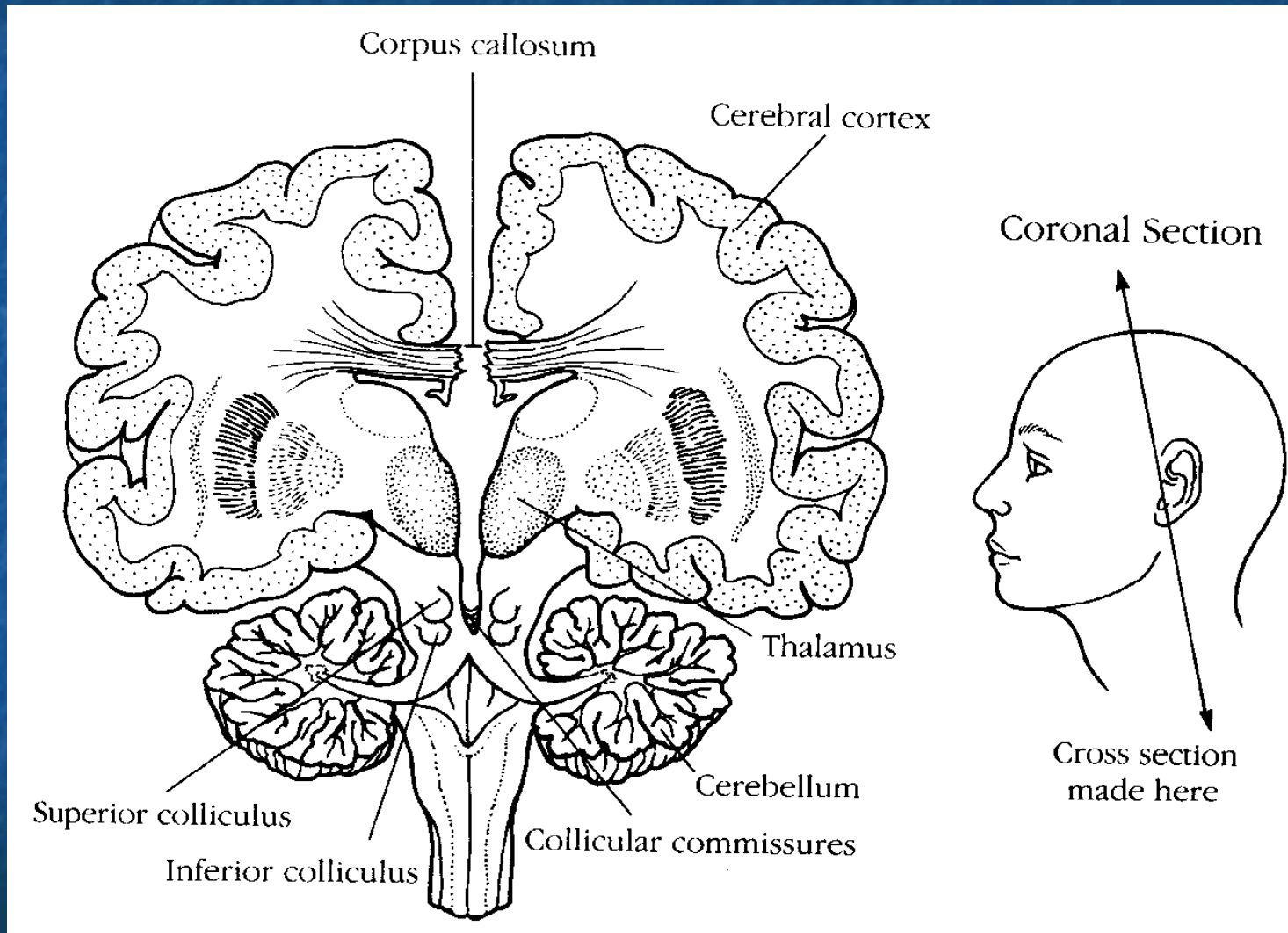## Halligan & Marshall (1994); Kolb & Whishaw (1990)
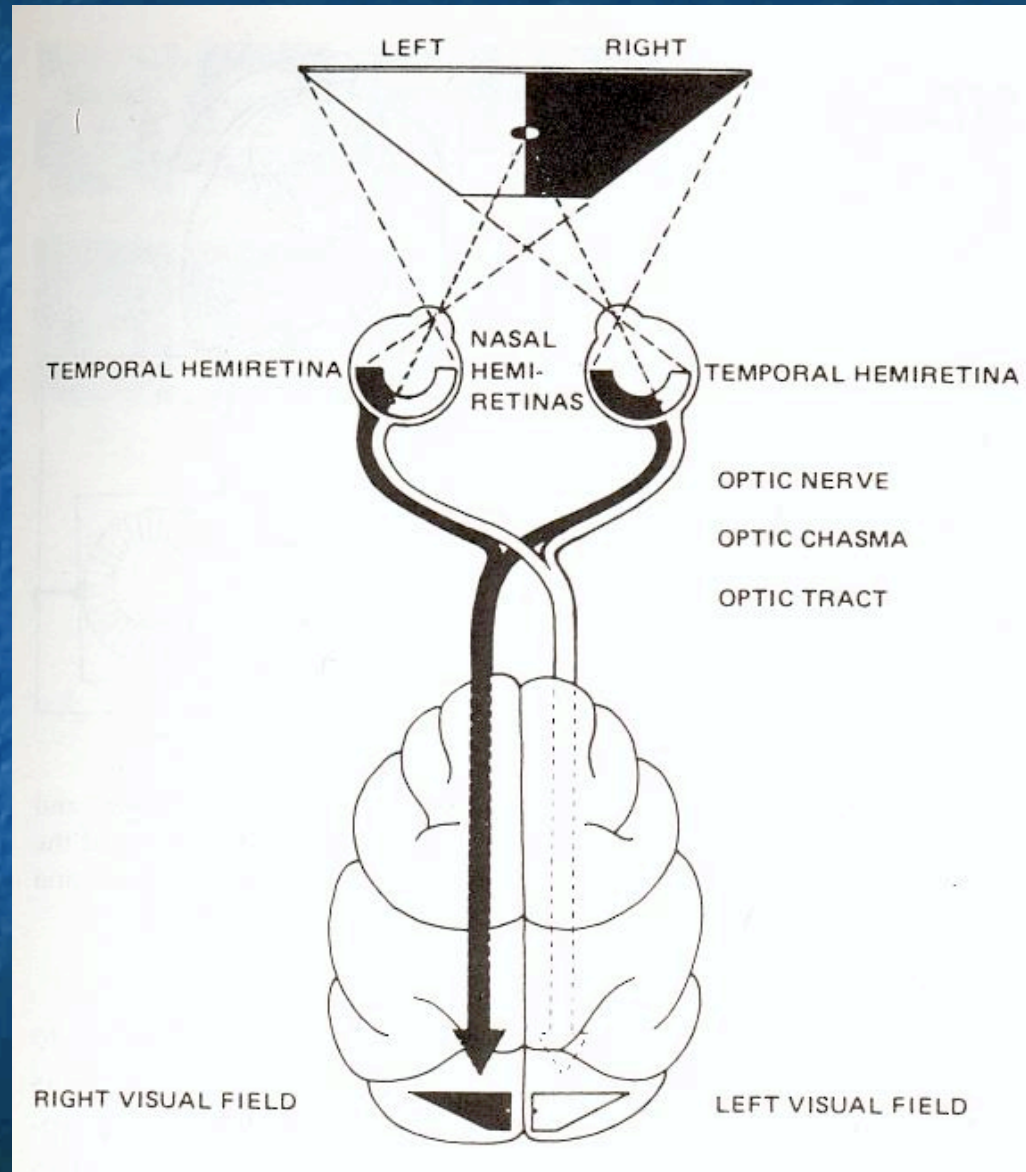
Neglecting internal representations

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Neglect and the hemispheres

Contralateral projection

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Neglect dyslexia

Patients tend to ignore the left hand side of words (Ellis *et al.*, 1987)

cage ➔ "age"; river ➔ "liver"; yellow ➔ "pillow"

Ellis *et al.* claim patients tend to preserve the length of the target word and preserve the letter positions

Dissociates from spatial neglect: Costello and Warrington (1987) reported a patient who neglected the left of words but the right of objects

Neglect dyslexia

Lexical processing resembles performance in the line bisection task: very short words may be extended (Chatterjee, 1995)

Connectionist modelling
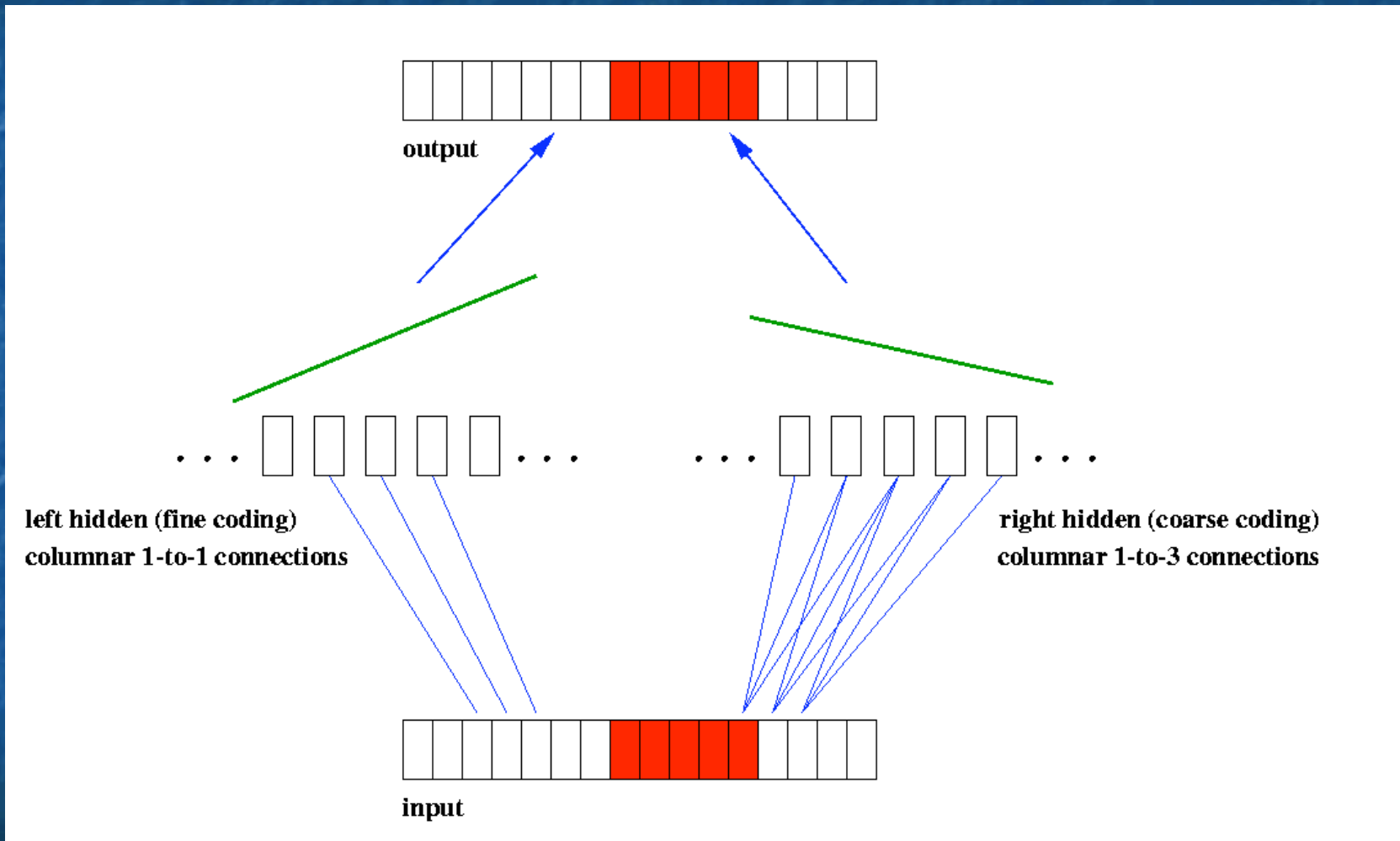
Visual dyslexia

Reading errors throughout the word (not necessarily biased as in neglect dyslexia) (Lambon-Ralph & Ellis, 1997)

lend ➔ "land"   easel ➔ "aerial"

arrangement ➔ "argument", calm ➔ "claim"

Like neglect dyslexics (?), visual dyslexics preserve the length of the target word

Impaired letter encoding ➔ letter deletions, substitutions, etc.:

Attentional dyslexia

Patients who can read single words but have problems identifying embedded words and letters (Shallice & Warrington, 1977):

BFXQL ➜ "F" or "Q"

Letters tend to "migrate" between words

WIN FED   ➜   "fin" and "fed"

POT BIG HUT ➜   "but, big, hut"

Disruption in "perceptual grouping"?

Reflects impaired encoding of letter positions

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Letter-by-letter reading (pure alexia)

'Pure' alexia without agraphia (Dejerine, 1890)

Patients who cannot read words but show slow sequential identification of letters in words (Patterson & Kay, 1982):

CASTLE -> "C, A, S, T, L, E ... castle"

After a word is read aloud letter by letter the patient recognizes the meaning of the word from their own spoken output

Reflects an inability to get from visual analysis to the orthographic input lexicon (word forms)

Letter Position Dyslexia

(Friedmann & Gvion, 2001)

Migratable word pair, middle migration:

הפסיק-הספיק

HSPIK-HPSIK (/hispik/ = managed –
/hifsik/ = stopped)

The problem occurs in getting from visual analysis to the orthographic input lexicon (word forms)

Analogous behaviour can be induced in normals (Davis & Bowers, 2004)

Conclusions

A variety of reading impairments exist as a result of attentional problems

The most fully investigated – neglect dyslexia – can be characterized in terms of problems with contralaterally projected opponent processors, possibly with coarse coding in the RH

Conclusions

Connectionist models provide scope for varied patterns of impairment, but may need further (possibly anatomical) constraints

Even then, deficits are not robustly "pure"

Interaction with semantics may afford more scope for connectionist modelling

Causal argumentation needs to be subtle