IN SEARCH OF AMBIENT VISION

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Litton/TASC

Recent Trends in SD Research
San Antonio TX
15 Nov 00

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AMBIENT VISION: Background

- Term first coined in 1968
- " … Subserves spatial localization and [spatial] orientation"
- Known as "where" system
- Contrasted with "focal" vision

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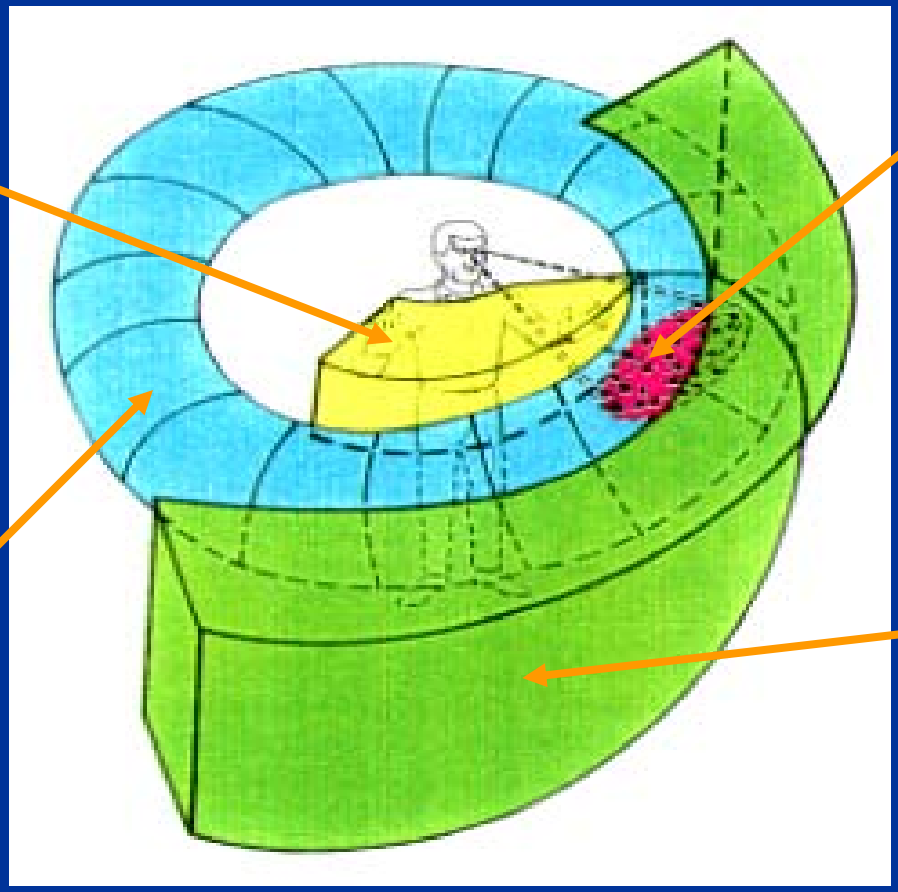
AMBIENT VISION: Location

Peripersonal
(reaching)

Focal
Extrapersonal
(saccadic)



Action
Extrapersonal
(topographical)

Ambient
Extrapersonal
(earth-fixed)

Previc (1998)

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AMBIENT VISION: General Features

- Area-dependent (biased toward peripheral eccentricities)

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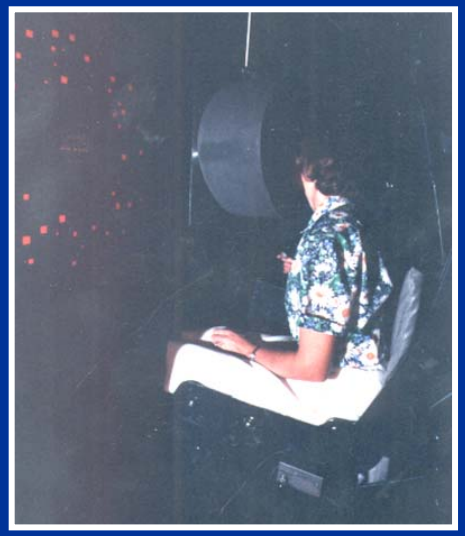
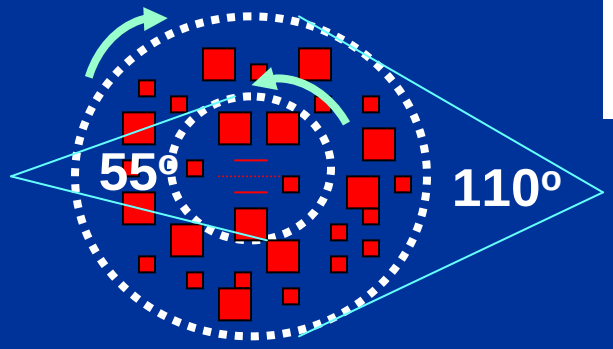
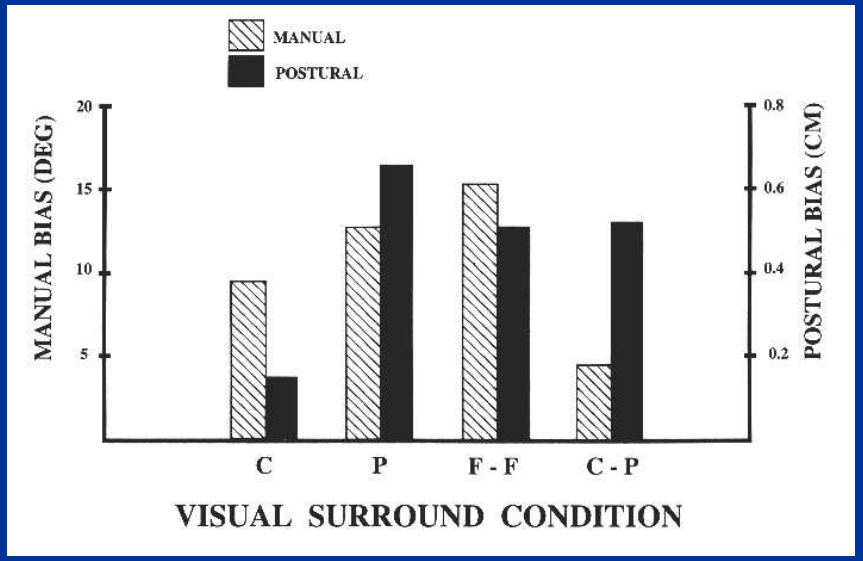
AMBIENT VISION: Peripheral Dependence





Previc & Neel (1995)



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AMBIENT VISION: General Features

- Area-dependent (biased toward peripheral eccentricities)
- Dominated by visual background
- Prefers relatively sluggish inputs (<0.2 Hz)
- Contributes to self-motion, sense of upright, slant perception

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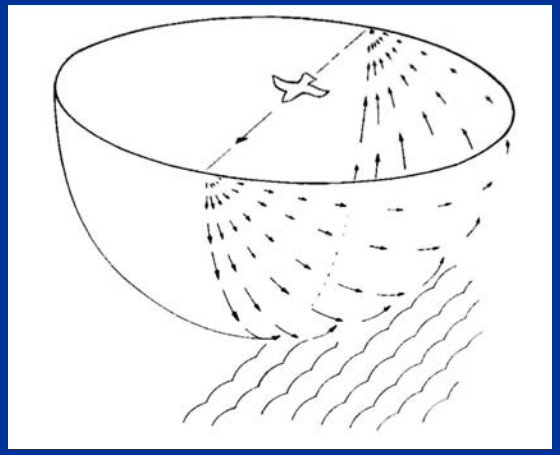
AMBIENT VISION: Functions



Self-motion perception

Sense of upright

Slant perception

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AMBIENT VISION: General Features

- Area-dependent (biased toward peripheral eccentricities)
- Most dependent on background
- Prefers relatively sluggish inputs (<0.2 Hz)
- Contributes to self-motion, sense of upright, slant perception
- Mainly preconscious system

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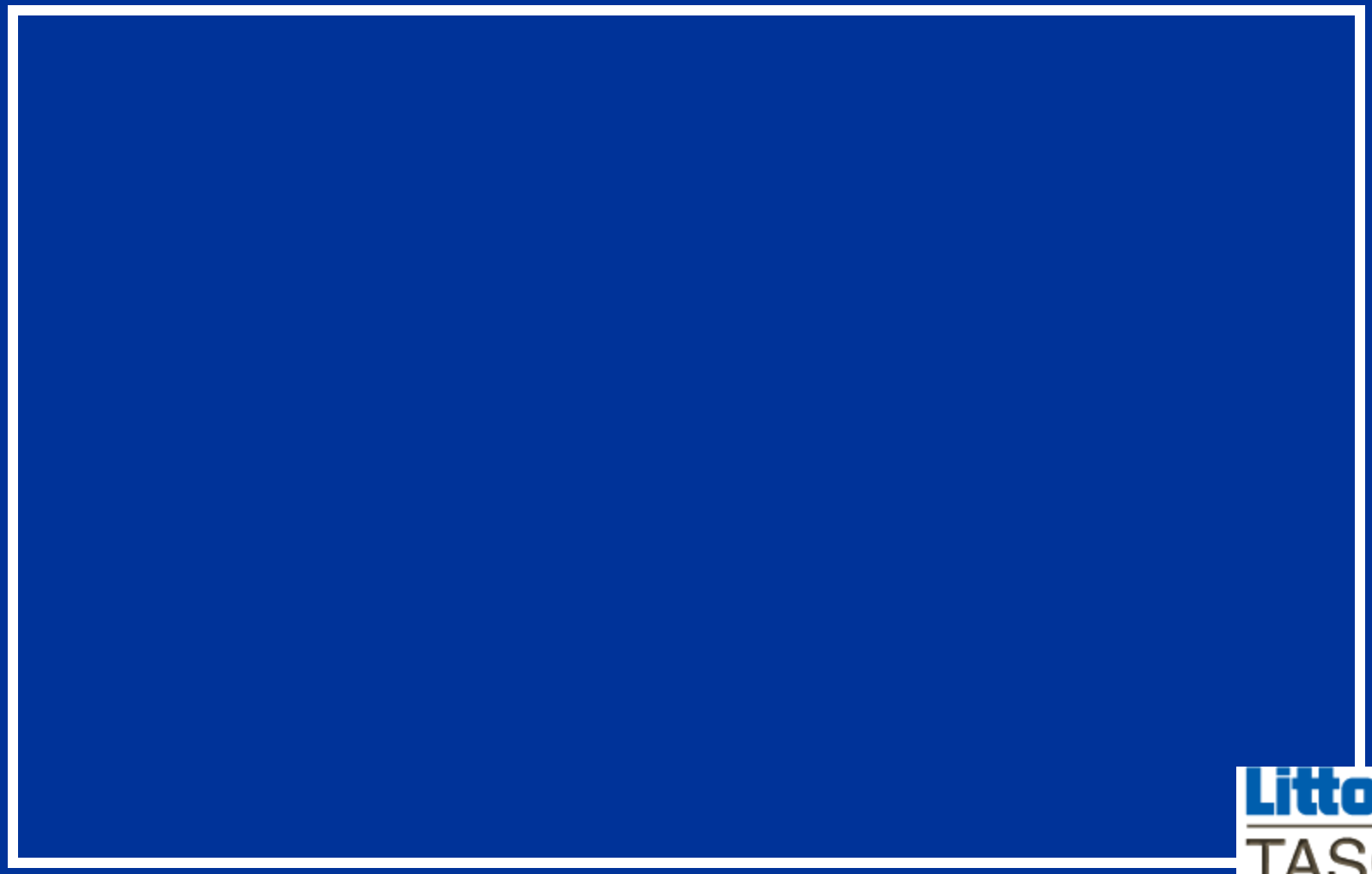
AMBIENT VISION: Problems in its Recreation



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AMBIENT VISION: Problems in its Recreation

ASDD visual system
(114º, nearly collimated)

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AMBIENT VISION: Problems in its Recreation

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Failure to achieve
“visual dominance”

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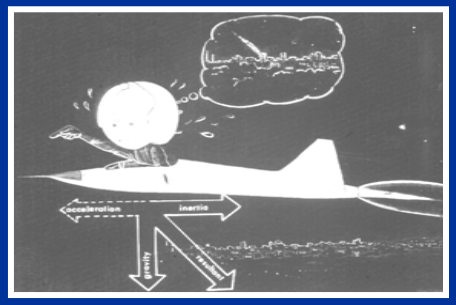
AMBIENT VISION: Problems in its Recreation

Previc et al. (1992)



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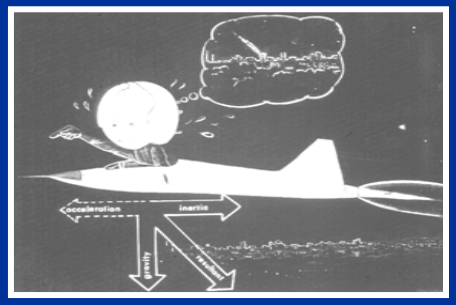

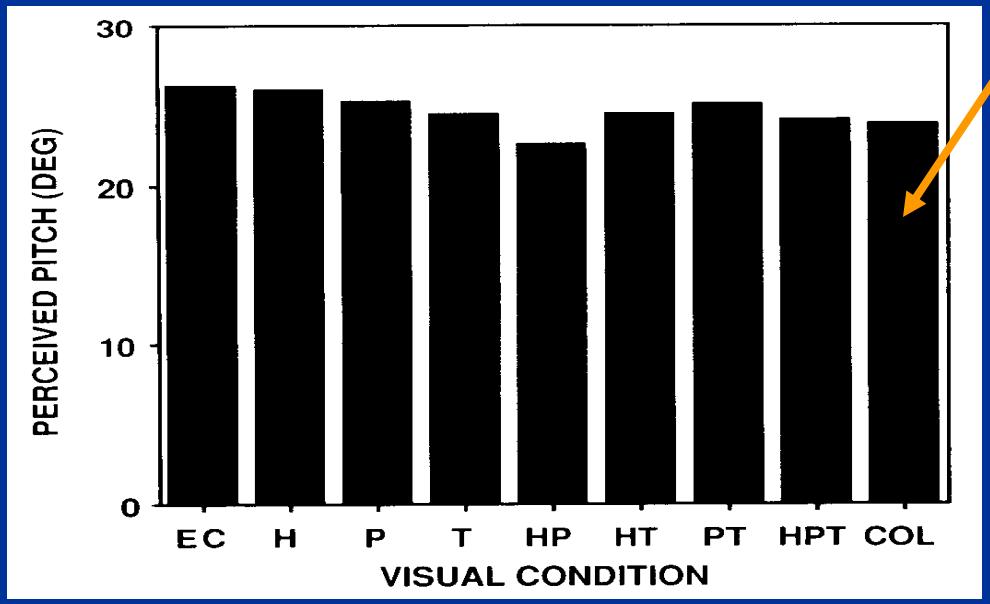

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AMBIENT VISION: Problems in its Recreation

Otakeno et al. (in preparation)

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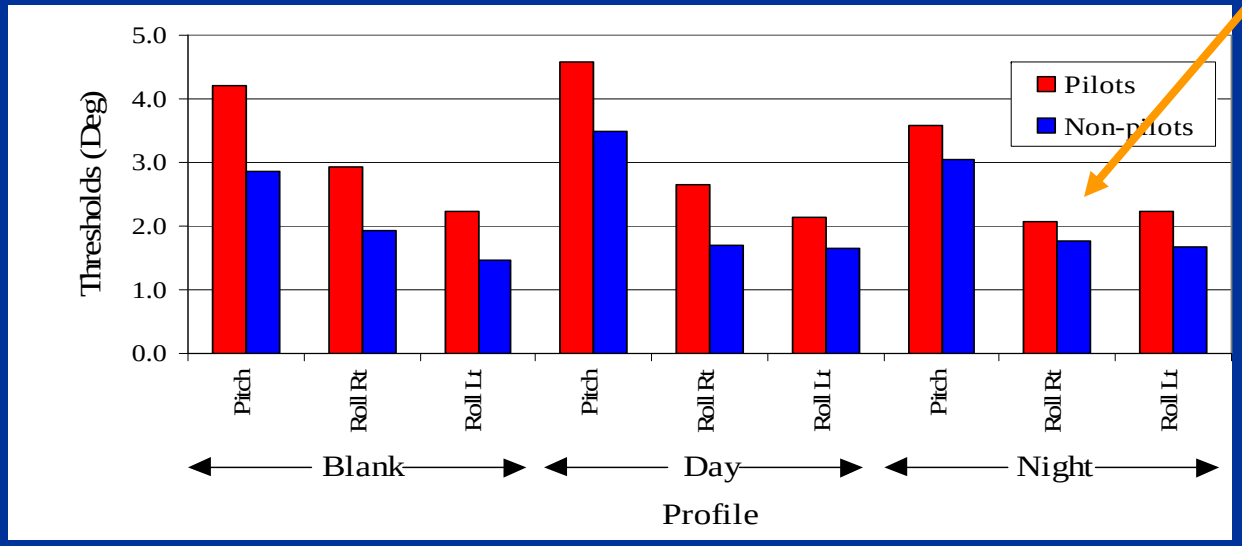

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AMBIENT VISION: Problems in its Recreation

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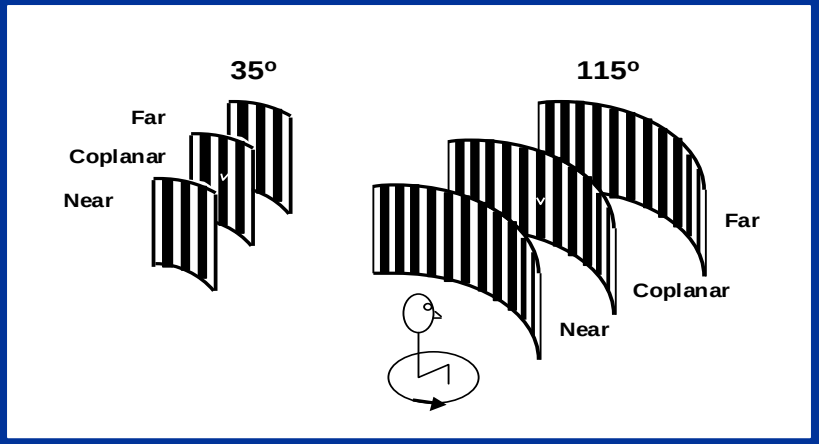

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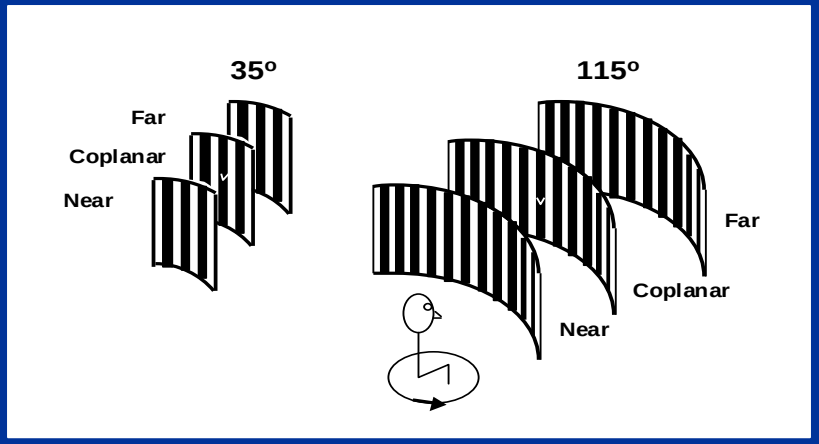

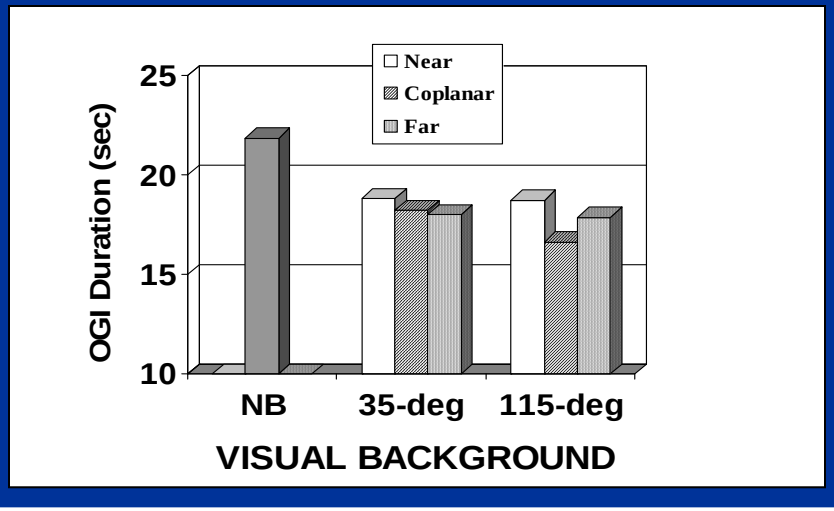

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AMBIENT VISION: What Recreates It?

- Relatively greater distance, FOV ("beyond frame-of-motion")
- "Believability"
  - Sufficient temporal resolution (>100 Hz?),
  - Spatial resolution (1 min of arc resolution?)
  - Realistic scene content
  - No conflicting depth cues or lags

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  - No conflicting depth cues or lags

Painted surrounds (e.g., optokinetic chamber, room, or tilt-translation device) work better than computer displays!

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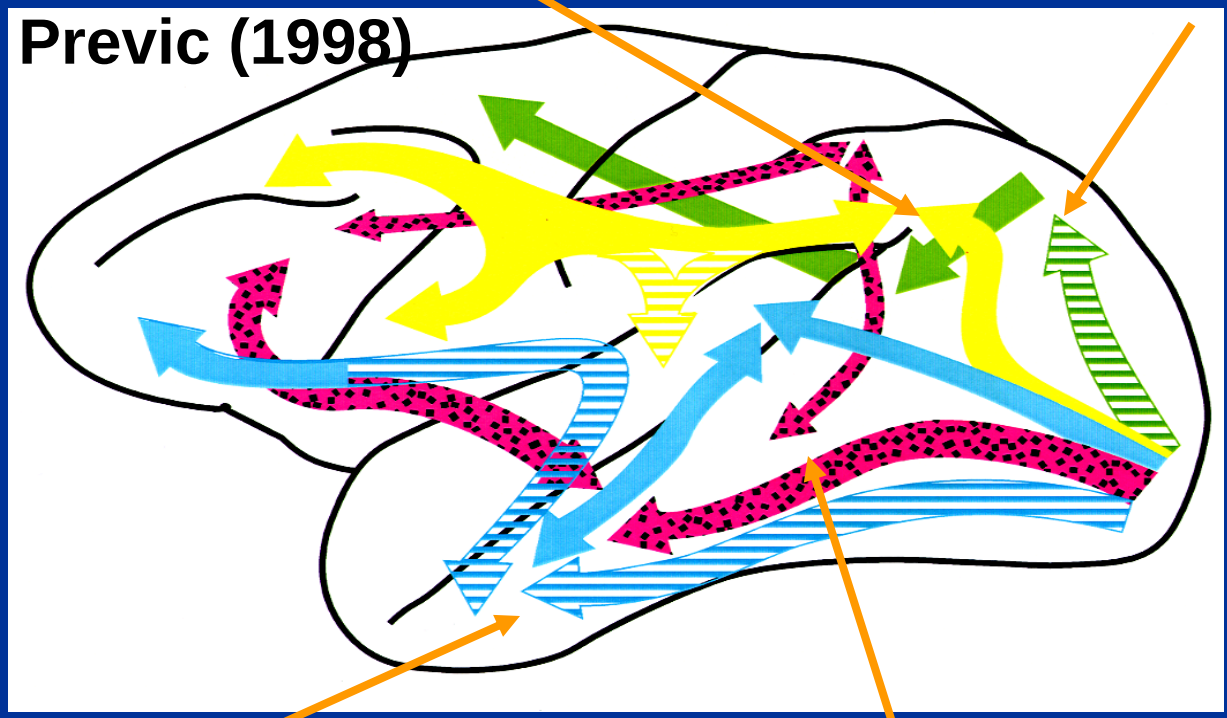
AMBIENT VISION: Brain Mechanisms



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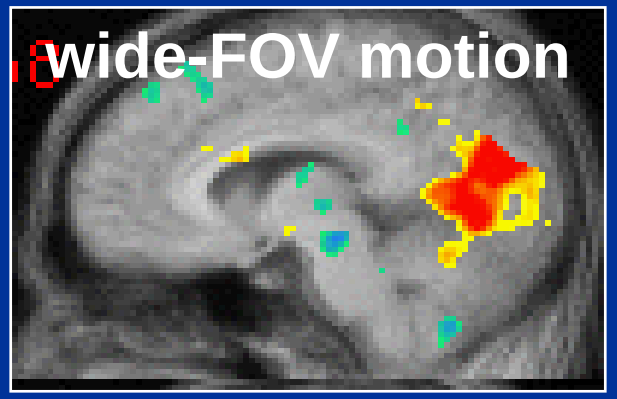

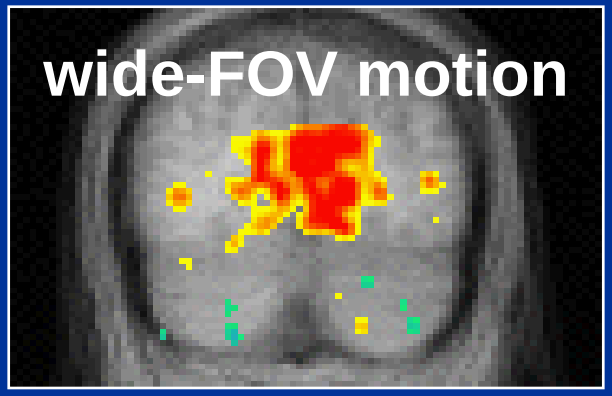

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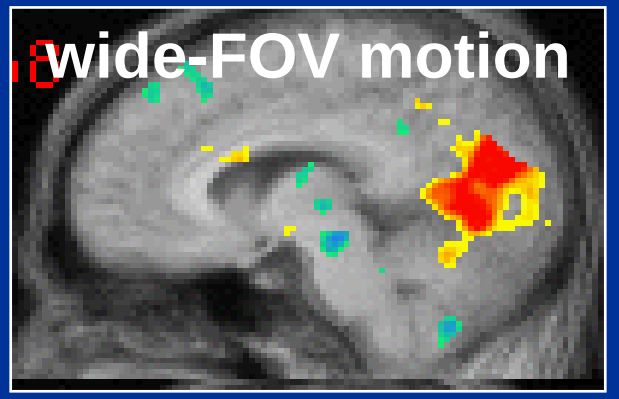

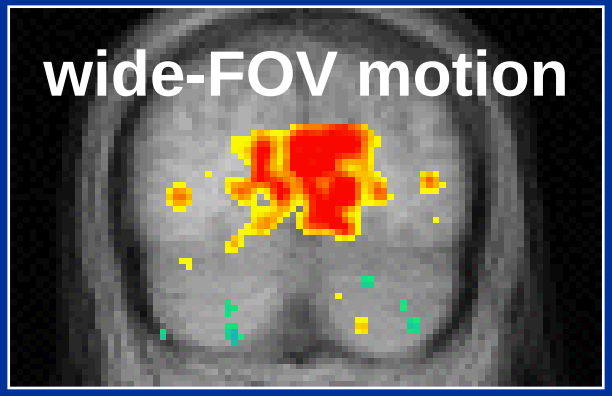

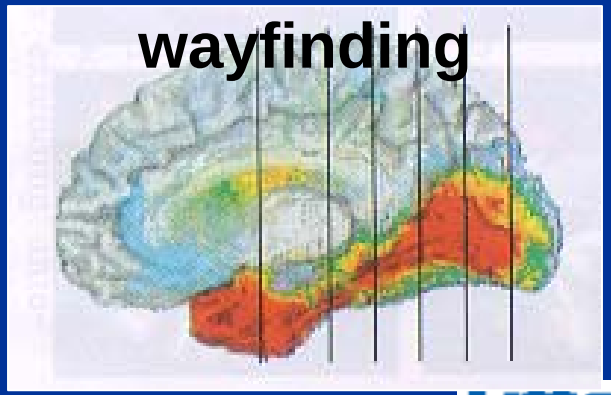

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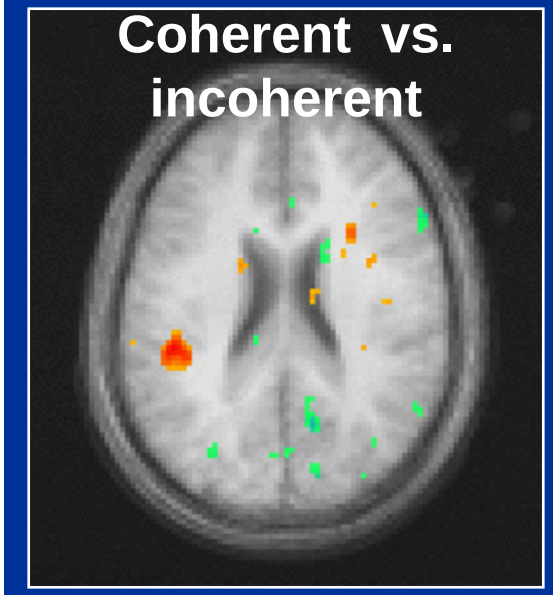

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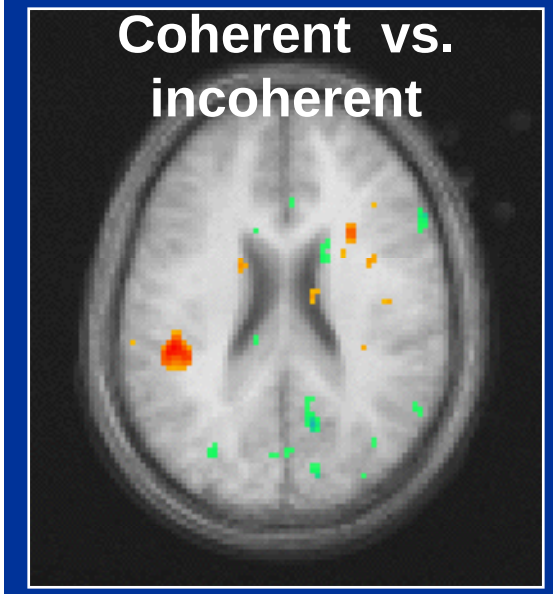
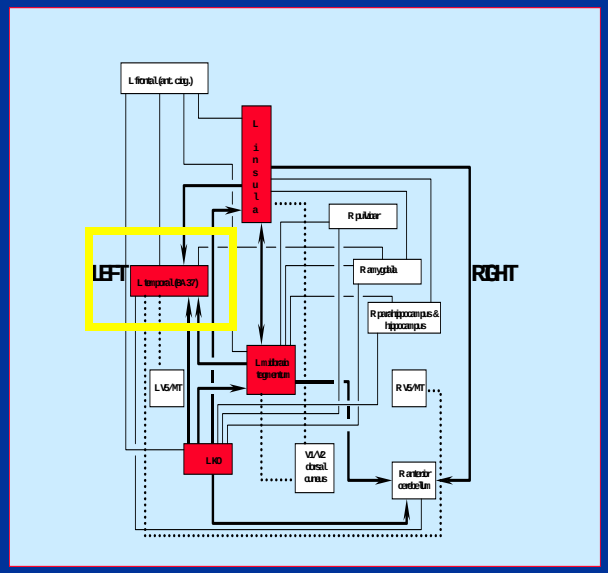


Coherent vs. incoherent (Beer et al., 2000)



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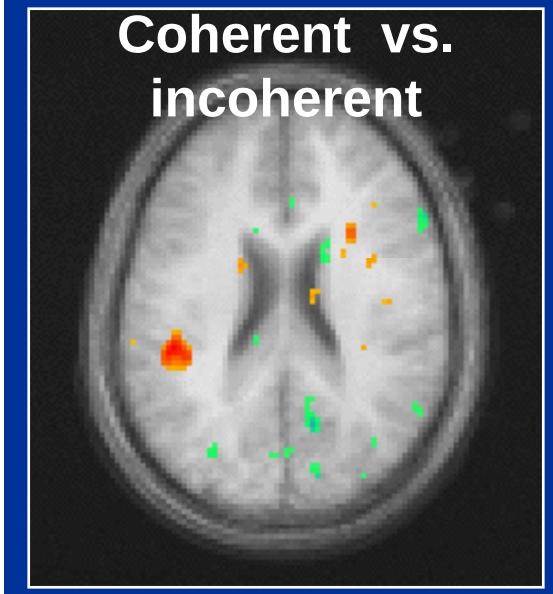

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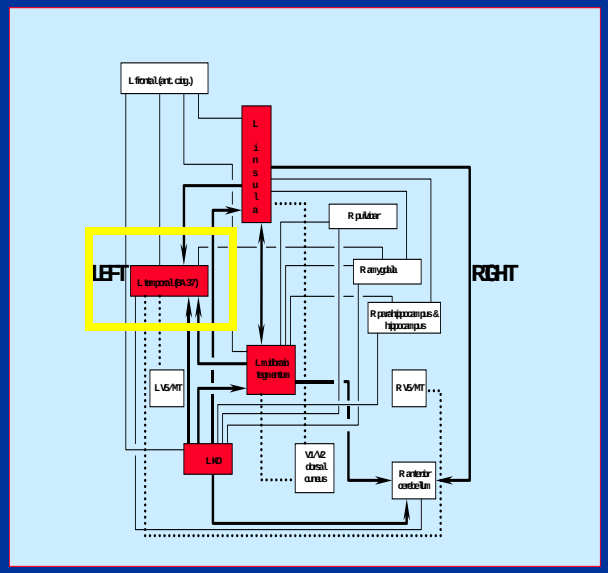

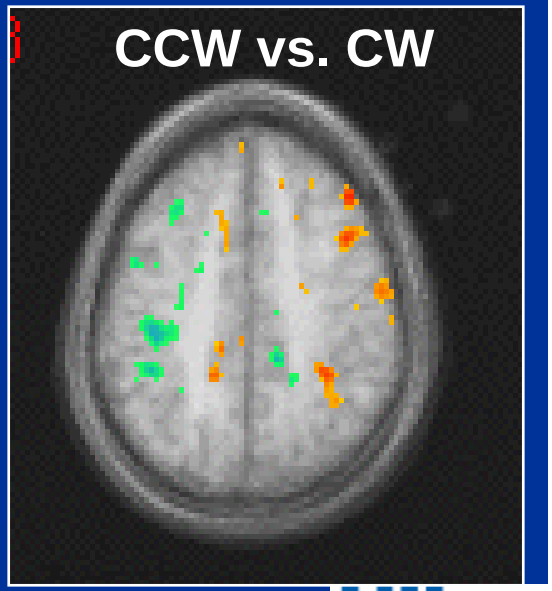

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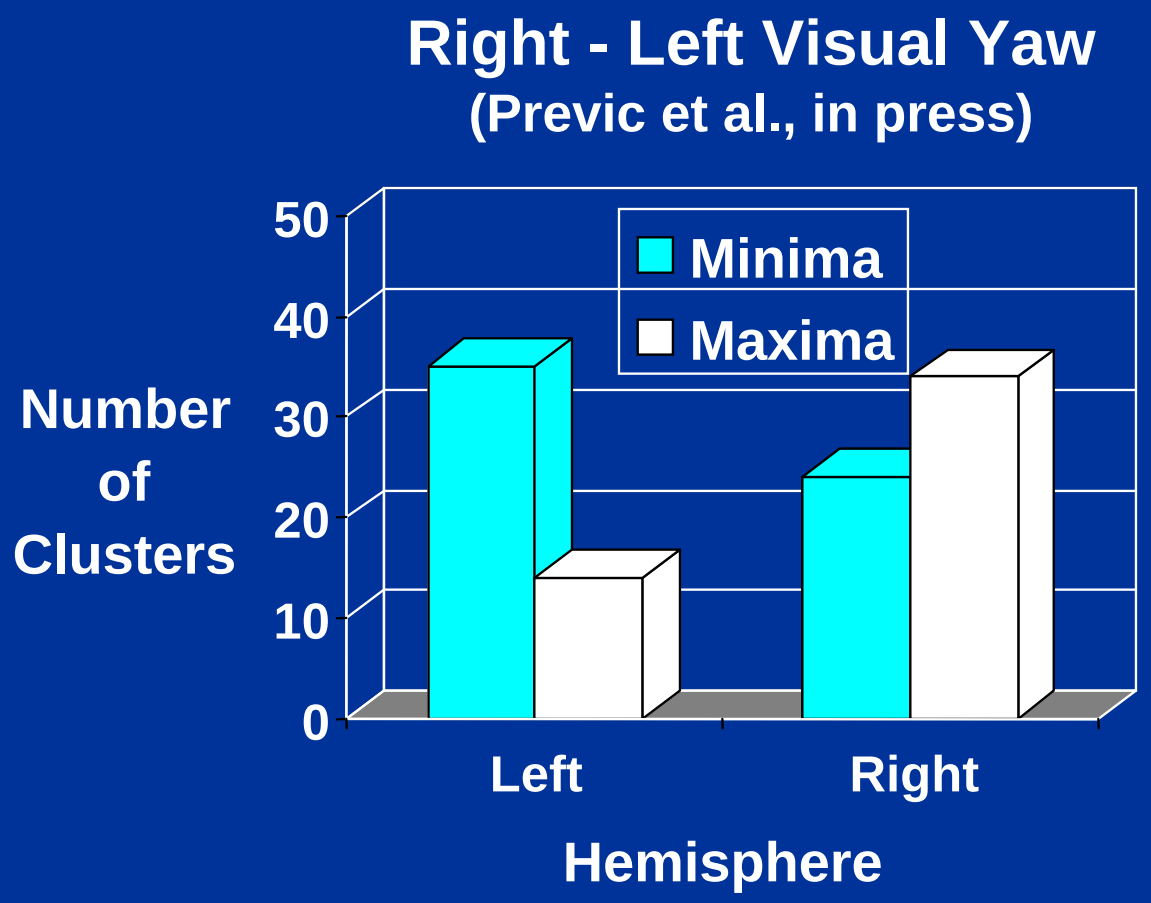

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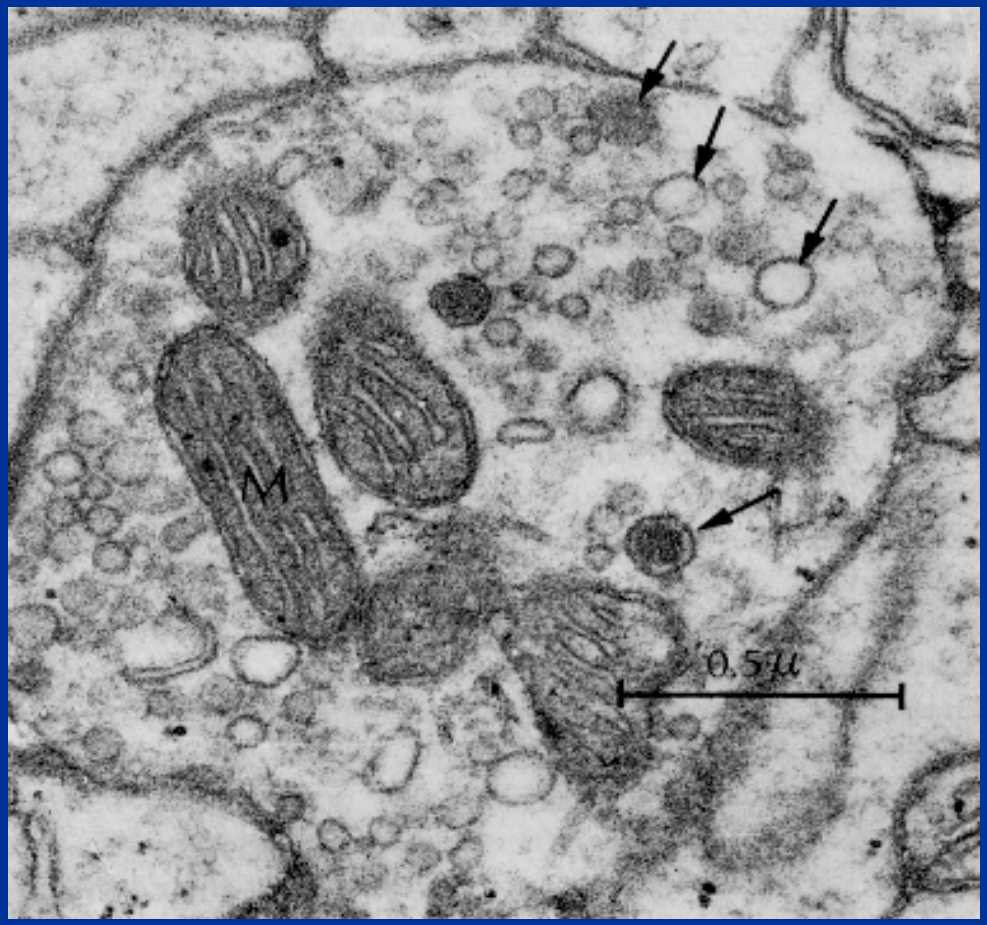
AMBIENT VISION: Its Footprints?



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AMBIENT VISION: Summary

- Ambient vision mostly relies on wide-FOV, distant inputs
- Ambient vision dependent on preconscious inferences
- Current computer-generated displays can only partially duplicate ambient vision
- Ambient vision uses separate visual pathways; may ultimately prove to be a highly distributed system

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