PDP Models

Modelling Recognition

- One kind of basic question is simply, ‘could it work’? (hypothesis: this is a viable model for accomplishing object recognition)

- Finding that the PDP system is able to accomplish whatever task it was intended to doesn’t necessarily speak to how humans do that task but it’s a sort of proof of concept

- In other words, if our model can do it, and we understand that our model functions like interconnected neurons (a neural network), that *could* be how our brains do it

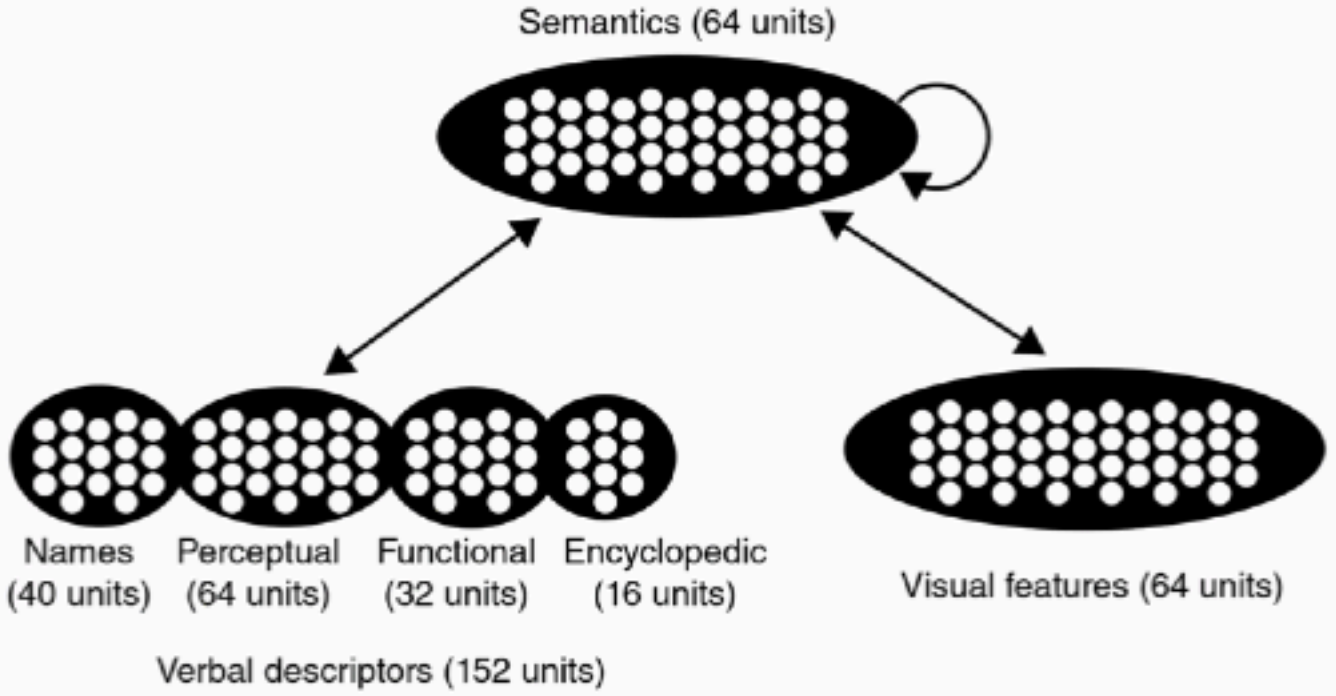
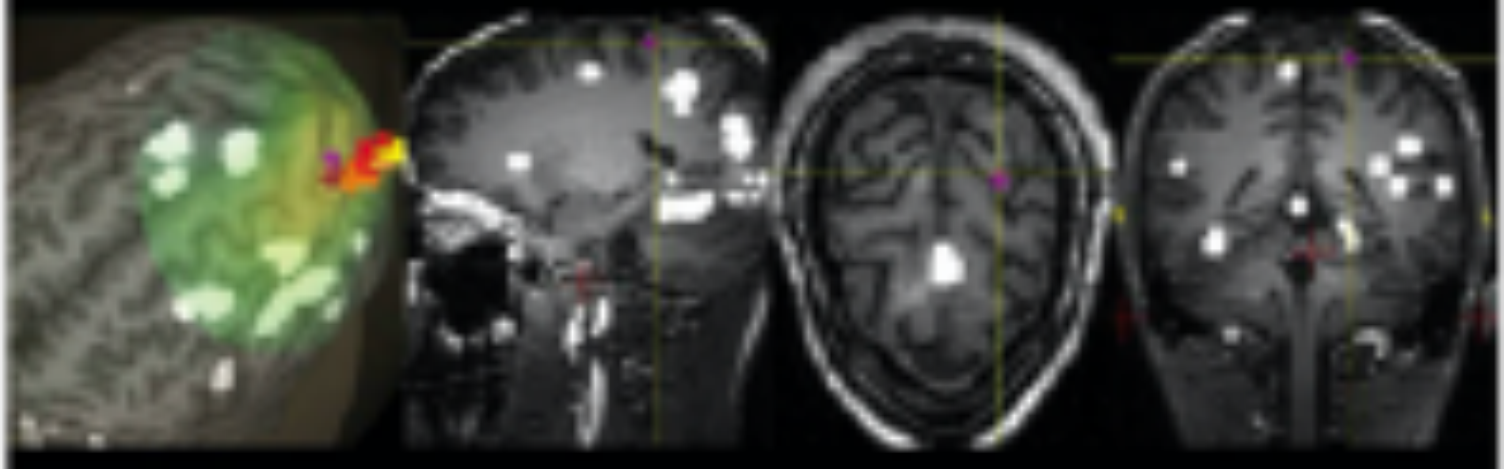


FIGURE 9.2.B PDP model of visual cognition. Source: Rogers, Lambon Ralph, Garrard, Bozeat, McClelland, Hodges, and Patterson, 2004. Reproduced with permission of APA.

The model was trained with 48 simulated items, half corresponding to living things (birds, mammals, fruits) and half to nonliving (vehicles, household objects, tools). Each item was presented both as a visual object and as a verbal label once per block, for 400 blocks. Upon completion of training, the model could be presented with any stimulus in either modality, and produce the appropriate response in the other modality. E.g., present the word "apple" to its verbal layer, it produces the representation of *apple* in its visual layer, and vice versa. The key implication of this result is that the model achieved object recognition without explicitly containing two kinds of "internal" representation – those that encode structural information sufficient to support stimulus recognition, and those that encode semantic content, or "meanings." This challenges not only explicit neuropsychological models (e.g., *Figure 9.2.A*), but also the common intuition held by scientists and nonscientists alike, conveyed in the Fuster (2003) statement, that "Perceiving must essentially involve the matching of external gestalts to internalized representations in long-term memory." The need for putative "grandmother" units is obviated.



ESSENTIALS OF COGNITIVE NEUROSCIENCE

Bradley R. Postle

WILEY Blackwell

RESEARCH SPOTLIGHT

9.1 Where's the recognition in visual object recognition?

PDP Models

Modelling Recognition

RESEARCH SPOTLIGHT

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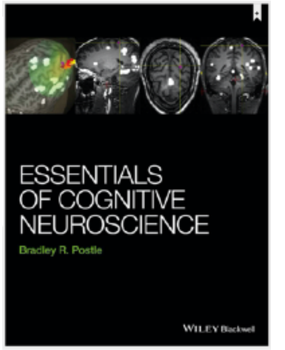

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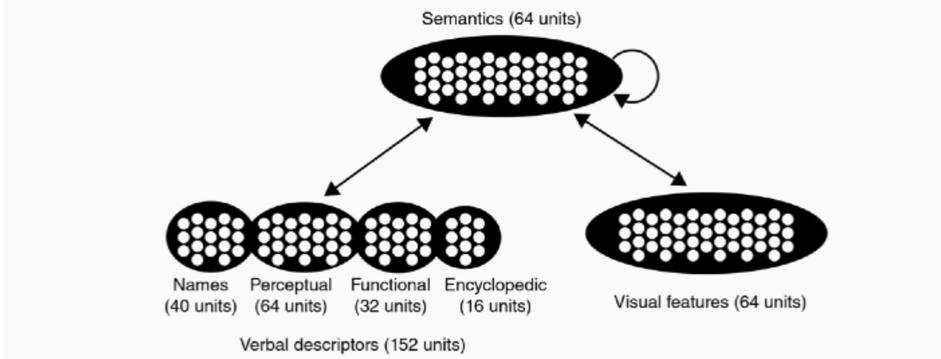

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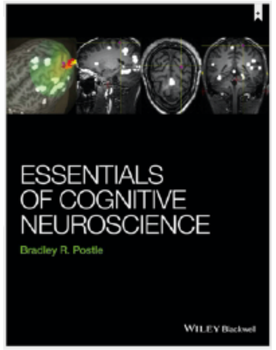
PDP Models

Modelling Recognition



- Beyond simply being a proof of concept, we can also use PDP models to test more specific hypotheses
  - e.g. does the particular pattern of deficits in a 'damaged' (compromised in some way) PDP model resemble what happens to humans with neurological damage (e.g. a stroke)?
- Rogers et al. (2004) programmed simulated 'lesions' into the system to see how disabling/ compromising a random assortment of units affects the output
- They found the errors made by the compromised system were qualitatively similar to those shown by patents with semantic dementia
  - Again, this doesn't mean that *must* be how it works in happens with human stroke damage, but rather that *could* be how it works in humans with stroke damage