**9.65 November 7, 2001 Visual Knowledge HANDOUT**

Note: Quiz 2, covering everything since the last quiz, is next Wednesday the 14th; Monday the 12th is a holiday.

I. What is a mental code?
II. Imagery as a mental code
   Brief history
    A. What is imagery for?
    B. Relation of imagery and perception
    C. Imagery and the brain
    D. Why have more than one mental code?
III. Memory for pictures: Boundary extension

**I. What is a "mental code"?**

-a **mental code** is a hypothetical code used by the mind-brain to represent, store, and transform information: transforming the information includes the processes we call "thinking."

-Note that a mental code has two roles:

1) to make some information easily available

2) to serve as an <u>index</u> to other information:

E.g., holding words in an acoustic code in STM

**II. IMAGERY as a candidate for a major code**

History of ideas about imagery, in brief:

Greeks

Thoughts are faint mental images

Bishop Berkeley

Triangles

Fodor

Images are ambiguous, thoughts aren't

Pylyshyn

The Homunculus problem: who looks at the images?

Structural descriptions, not dense arrays

**A. What is imagery for ?**

Try answering these questions:

Which is larger, a golf ball or a tangerine?

A tiger or a Great Dane dog?

Is the hot water tap on the L or R?

Does a tractor have two big wheels in front?

Which is darker (on the outside), a cucumber or a watermelon?

-Did you feel that you used imagery to answer any of these?

So: One thing that imagery seems to be used for:

-Retrieving subtle spatial or perceptual information from memory that has (i) not been stored as such and (ii) that can't be deduced easily from other information.

Other possible uses for imagery:

-planning movements

-understanding descriptions (e.g., form a mental model)

-maintaining an image of the immediate environment?

-solving certain kinds of problems

-planning layouts (e.g., artist)

-getting around in the dark

-route-planning

-MENTAL ABACUS : highly skilled abacus users are faster in doing arithmetic than someone with a hand calculator: AND can use a "mental abacus."  Stigler (1984, **Cognitive Psychology**, p. 145 ff.)

Evidence for mental abacus: recognizing intermediate abacus layouts

**B. Relationship of visual imagery and perception**

-Selective interference: The Brooks experiment

-Spatial or visual interference?  Baddeley's experiment: Mental matrix task with two types of interfering tasks:

-blindfolded subject and pendulum (spatial, not visual)

-detect change in brightness of a stationary light (visual, not spatial)

**Constraints on imagery:  Like perception, it has some limitations:**

**(1) Visual angle of mind's eye** (Kosslyn, 1978)

INTERPRETATION: K: there's a specialized imagery ability that has constraints somewhat like those of vision itself, in this case with a limited "angle" of view. (Lab 2)

**(2) Imagery "acuity"**

-rabbit beside an elephant versus beside a fly:

-Image size can be changed: zooming.

**(3) Imagery "scanning"** [see Reisberg chapter]

-memorize map with places on it

-scan from designated start point to a place named by the experimenter

-critics: "demand characteristics" of experiment

**(4) Mental rotation** (Shepard, etc.: See Reisberg. Understand what a linear function tells us.)

**(5) Inspecting one's image** to read off information, like perception:

Weber and Castleman exercise in Lab 2.

**(6) Limited capacity of imaging**

(In class:) Try task in which you mentally create an image in an imaginary grid of large squares. When I say North, draw a mental line upward on the grid, one unit, when I say Northeast, draw one diagonally from that point to the next square up and over to the right, etc. Okay start: North, northeast,west, south, west, west, south, west, northeast, west, southwest, east. Now draw it.

**C. Imagery and the brain**

Imagery and perception overlap in the brain:

(1) Kosslyn and his colleagues: imaging activates the primary visual areas in the cortex. Larger,

smaller images generate larger, smaller areas of activation.

(2) O'Craven & Kanwisher (2001):

-Background: FFA (fusiform face area) and PPA (parahippocampal place area)

-task of viewing/imaging faces, or viewing/imaging places

(3) Lesions in the brain

-unilateral neglect patient (damage to R hemisphere, Bisiach and colleagues: described by Lila Davachi in her lecture)

**D. Why might it be advantageous to have more than one code?**

1. Different time courses (short-term; longer-term)

2. Different information is available on the surface--so suitable to different tasks.

-analog versus digital clocks

3. Can take advantage of reduction in interference when performing dual tasks

-using fingers to tally "targets" when listening to a list

So: just how many mental codes do we have?

We don't know for sure.

CONCLUSION: Imagery is a well-established code distinct from at least one other code--although there continue to be skeptics.

## III. Memory for pictures: Boundary extension

Even our immediate memory for pictures is schematic rather than literal (Intraub & Richardson, 1989).

Change blindness: It's difficult to spot a change in a picture, unless the change is central to your interpretation of the picture.

Y                    N

    Y                N

            Y                    N

Y                N

        Y                    N

    Y            N

        Y            N

    Y            N

Y            N

        Y                    N

    Y                N

        Y            N

    Y                N

        Y            N