Trichromatic color vision in primates evolved largely to facilitate frugivory—this was very likely a co-evolution since several plant species would have benefited from the resulting seed dispersal. Psychophysiological research has shown that spectral tuning of the L and M cone pigments in many primates is optimal for detecting fruits among foliage.

But is there a more general role for color in object recognition? Does color enhance object encoding and retrieval? If so, what mechanisms are involved?

### Continuous Recognition Task

The Basic Question

Continuous Recognition Task

### Experimental Method

- Sequence of 120 images
- Color (C) or monochrome (M)
- Lag 1, 2, 4, 8, or 16
- 30 images for each condition {CC, CM, MC, MM}

### Task/Response Variables

- 4-Category rating method — Old-New
- Signal Detection Analysis
- For simplicity here, Percent Correct is reported

### Exposure Duration

- 20ms, 32ms, 48ms, 64ms, 300ms, 2000ms

### Results Using the Two Different Tasks

#### Continuous Recognition Task: The Present Experiment

<table>
<thead>
<tr>
<th>Exposure Duration</th>
<th>CC</th>
<th>CM</th>
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#### Delayed-Match-to-Sample Task: Gegenfurtner & Rieger (2000)

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### Comments Regarding the Two Experiments

#### Continuous Recognition Task: The Present Experiment

- Task eliminates focusing strategies and is ecologically valid
- Only natural scenes were used
- No lag differences were found; hence means are collapsed over lag
- Essentially the same pattern of means holds from 20ms to 2000ms
- The similar patterns suggest that both encoding and encoding specificity effects operate even at very short exposures
- Encoding accounts for 48% of variance
- Recognition accounts for 3% of variance
- Encoding-Recognition nonadditivity (Encoding Specificity) accounts for 51% of effect variance

#### Delayed-Match-to-Sample Task: Gegenfurtner & Rieger (2000)

- Strategy of focusing on a single small area can produce artificially high performance
- Non-nature stimuli included in set
- At 16ms, pattern suggests an encoding effect. G & R call this a “sensory” effect
- At 32ms (and above), the pattern suggests encoding and recognition main effects, and non-additivity of encoding and recognition
- G & R interpret this change as being due to the growing influence of “cognitive” effects
- G & R (2000) results are not consistent with Wichmann, Sharpe, & Gegenfurtner (2002) whose results are more similar to ours
- If the unreported G & R (2000) MC means were lower, their pattern of means would not be dissimilar to ours

### Conclusions

- Participants’ recognition memory for natural scenes is better with color images than with monochrome images
- The role of color is critical during the encoding phase
- There is no simple role for color during the recognition phase
- The large encoding-specificity effect suggests that color is “bound” in the representation and plays a more complex role than simply enhancing contour detection mechanisms
- This “binding” may even interfere at recognition since the MC condition was consistently worse than the CM condition
- Since the pattern of means is consistent at all exposures, color is probably “bound” in the representation at the very earliest stage
- If cognitive effects are involved, as suggested by Gegenfurtner & Rieger (2000), they probably operate even at the shortest exposures