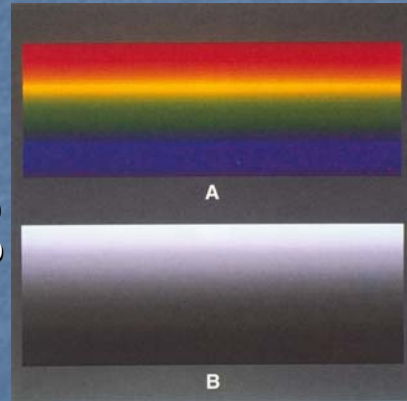




Category Based Stage

- We are incredibly good at identifying colors by name
- Question is
 - Did this naming develop just because we have to name to communicate?
 - OR, Does our biological responses have anything to do with the way we name it?



Slide 1

ICS 280: Visual Perception



Previous Theory

- Completely dependent on culture
- Our biological make up does not have any influence
 - Cultural Relativism
 - Sapir-Whorf Hypothesis
 - Prevalent for a long time
- Refuted by famous study by Berlin and Kay

Slide 2

ICS 280: Visual Perception



Berlin and Kay Theory

- Identified 11 *basic colors* in English
 - Monolexemic
 - No whitish-brown or light-blue or off-white
 - Primary chromatic reference
 - No gold, silver, lime
 - Orange was allowed since in many cultures this is not associated with the fruit

Slide 3

ICS 280: Visual Perception



Berlin and Kay Theory

- Identified 11 *basic colors* in English
 - General Purpose
 - Widely applied to different kinds of objects
 - No blonde (for hair) and roan (for horses)
 - High frequency
 - Must be used frequently in the language
 - No mauve, taupe, burgundy

Slide 4

ICS 280: Visual Perception



Berlin and Kay Theory

- Identified 11 *basic colors* in English
 - Red, Green, Orange, Blue, Yellow, Black, White, Gray, Purple, Pink, Brown
- Studied color naming in 20 languages
 - 16 basic terms
 - Term for sky blue
 - Warm (red and yellow)
 - Cool (blue and greens)
 - Light warm (white or red or yellow)
 - Dark cool (black or green or blue)
 - Arranged in similar hierarchy

Slide 5

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How to create categories?

- What is categories?
 - Is it a set of items that all follow a set of rules?
 - Aristotle's definition
 - More of a prototyping
 - May not follow all rules of one category
 - Thus may belong *kind of* to both

Slide 6

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Experiments

- Recognized a set of focal colors
 - Boundary Method
 - Which focal color does each of 329 color chips belong to?
 - Focal Method
 - Which chip is the best example of the focal colors?
- Second was much easier for people
 - Proportional to the time taken
- Tested with different focal colors

Slide 7

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Rosch's Experiment with the Dani's

- Dani: Old tribe in New Guinea
 - Two terms of color: *mili* (light warm) and *mola* (dark cool)
- Tried to teach them colors
 - Learned red, green, blue and yellow very easily

Slide 8

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More Experiments

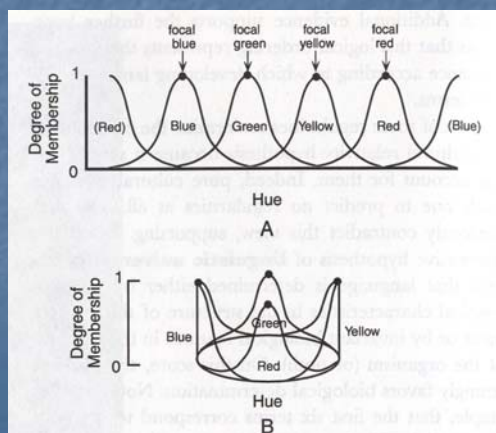
- Present a series of colors
- Identify if the color was an instance of the category name mentioned before
 - Faster for focal colors
 - Time to identify increased proportionally with the increase in distance from the focal colors

Slide 9

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Focal Colors

- Rosch proposed focal colors and boundary colors around it



Slide 10

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Fuzzy Set Theory

- Set theory
 - Element belongs to a set or does not
- Fuzzy set theory
 - Element can belong to a set partially
 - Hence, can belong to more than one set
- Focal colors have a membership of value 1
- Boundary colors have a membership depending on the distance from the focal color

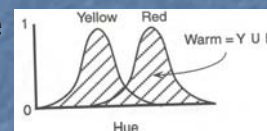
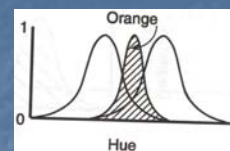
Slide 11

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Fuzzy Logic Model of Color Naming

- Primary Colors
 - Focal colors
 - White, Black, Red, Green, Yellow and Blue
- Derived Colors
 - Fuzzy AND
 - Orange (Red-Yellow), Purple (Red-Blue), Gray (Black-White), Pink (Red-White), Brown (Yellow-Black)
- Composite Color
 - Fuzzy OR
 - Warm (Red-Yellow), Cool (Blue-Green), Light warm (white-red-yellow), Dark Cool (Black-blue-green)



Slide 12

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Development of Color Vision

- Are not born with full color vision
- By two months they have full color vision
- Less than that they cannot discriminate yellow greens and mid purples from white
- Color constancy is not fully developed till four months of age
 - Experiments