

User-Centered Website Development: A Human-Computer Interaction Approach





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2. Capabilities of Human Beings



In this chapter you will learn about:

- ◆ Human senses, perception, memory, and interruptions
- ◆ Mental models, metaphors, and perceived affordance
- ◆ Some design guidelines based on these topics



Definitions

- ◆ *Cognitive psychology*: the study of how people perceive, learn, and remember
- ◆ *Cognition*: the act or process of knowing
- ◆ The issue: confronted with a new experience (or website) how does a user draw on past experience to make sense of it?
- ◆ Example: underlined blue text is understood to be a link



Why do we care?

- ◆ Because when people try to understand something, they use a combination of
 - ⊕ What their senses are telling them
 - ⊕ The past experience they bring to the situation
 - ⊕ Their expectations



Senses

- ◆ Senses (sight, hearing, smell, taste, touch) provide data about what is happening around us
- ◆ We are visual beings (“See what I mean?”)
- ◆ Designing good Web materials requires knowledge about how people perceive



Constructivism

- ◆ Our brains do not create pixel-by-pixel images
- ◆ Our minds create, or *construct*, models that summarize what comes from our senses
- ◆ These models are what we perceive
- ◆ When we see something, we don't remember all the details, only those that have meaning for us



Example: familiar objects that we see, but don't store in detail

- ◆ How many links are there on top menu of amazon.com?
- ◆ What are the colors on your favorite cereal box?
- ◆ How many lines are there in the IBM logo?
- ◆ Who cares?
- ◆ Moral: People filter out irrelevant factors and save only the important ones



Context

- ◆ Context plays a major role in what people see in an image
- ◆ Mind set: factors that we know and bring to a situation
- ◆ Mind set can have a profound effect on the usability of a web site



Example of context: What do you see?





Hint: it's an animal, facing you . . .



Hint: this animal gives milk, and her face takes up the left half of the picture . . .





Why couldn't you see the cow's face at first?

- ◆ It's blurry and too contrasty, of course, but more:
- ◆ You had no idea what to expect, because there was no context
- ◆ Now that you do have a context, you will have little difficulty recognizing it the next time

Another example of context: are these letters the same?



c

c



Well, yes, but now in context:

top ace



Exercise applying this idea

- ◆ Keep a diary of the number of times you couldn't "see" something that was in front of you, because you expected it to look different:
 - ⊕ The teabags that were in the "wrong" box
 - ⊕ The sugar container that was right *there*—but you were looking for small packets of sugar
 - ⊕ A book that you remembered as having a blue cover, but it's really green
 - ⊕ The button you couldn't "see" because it was flashing, and your mind set is that anything flashing is an advertisement

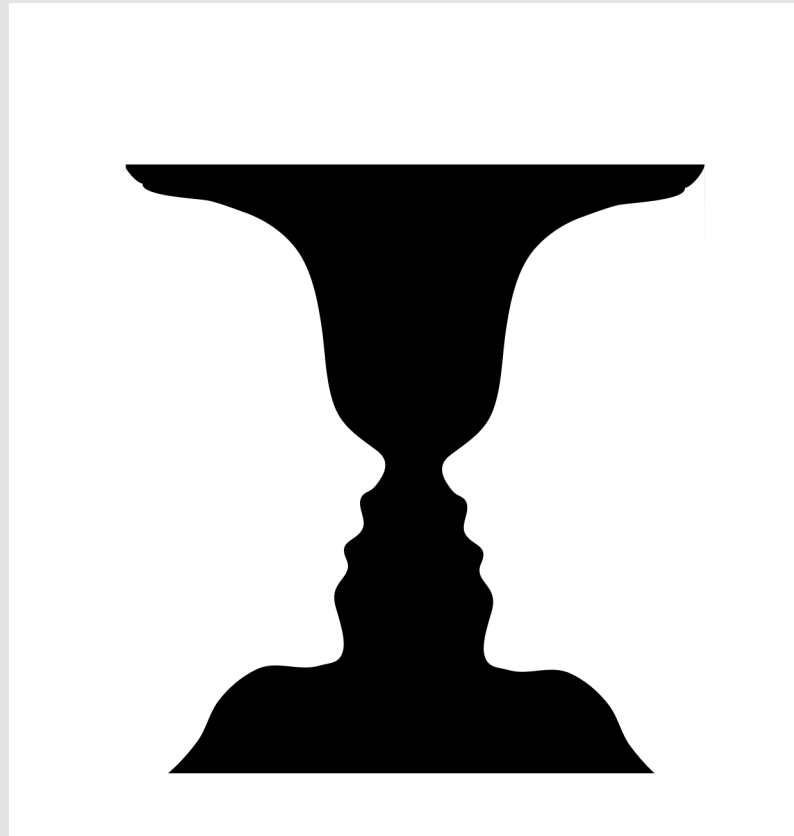


Figure and ground

- ◆ Images are partitioned into
 - ⊕ Figure (foreground) and
 - ⊕ Ground (background)
- ◆ Sometimes figure and ground are ambiguous



Figure and ground: What do you see?





Gestalt psychology

- ◆ “Gestalt” is German for “shape,” but as the term is used in psychology it implies the idea of *perception in context*
- ◆ We don’t see things in isolation, but as parts of a whole



Five principles of Gestalt psychology

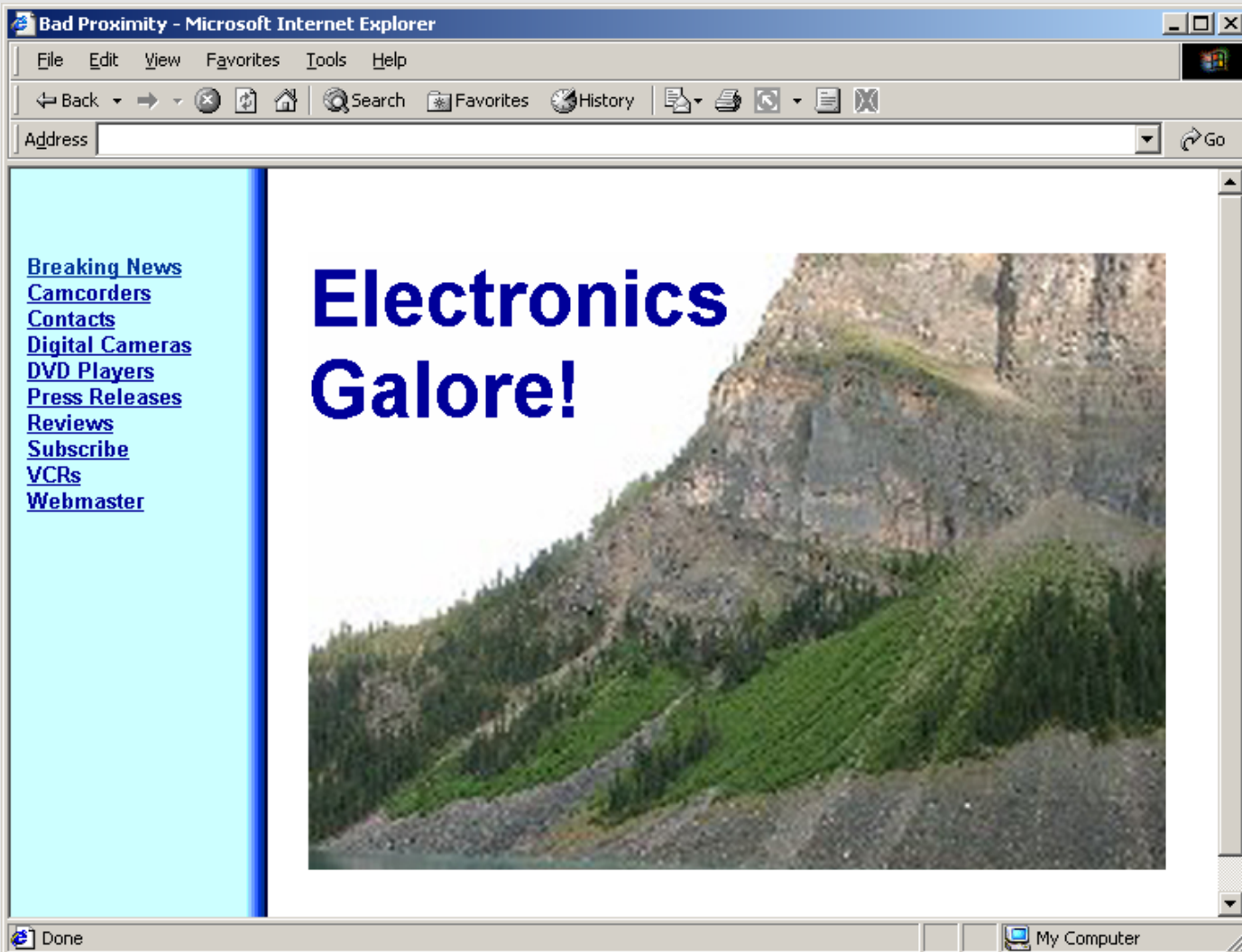
- ◆ We organize things into meaningful units using
 - ⊕ **Proximity:** we group by distance or location
 - ⊕ **Similarity:** we group by type
 - ⊕ **Symmetry:** we group by meaning
 - ⊕ **Continuity:** we group by flow of lines (alignment)
 - ⊕ **Closure:** we perceive shapes that are not (completely) there



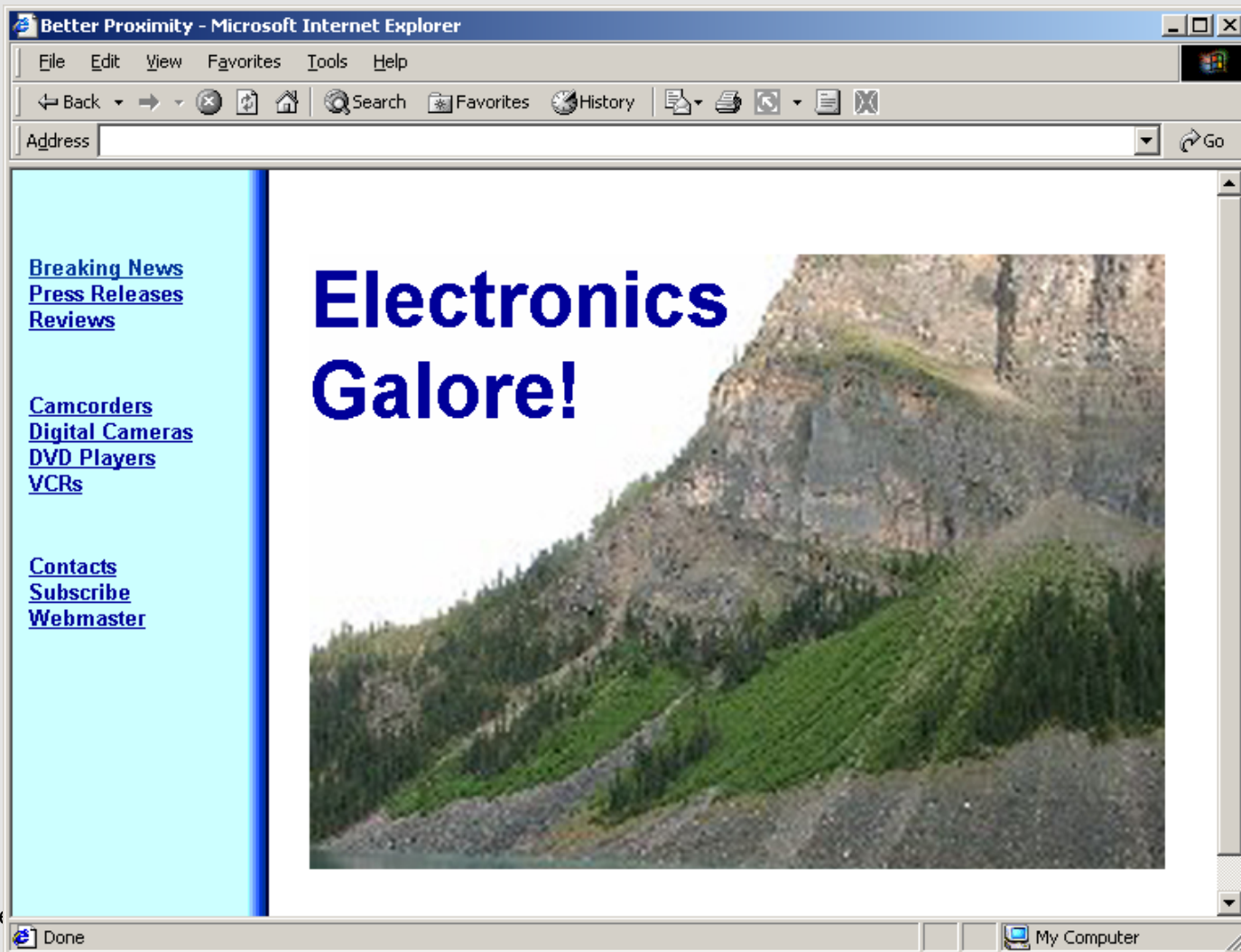
Proximity



Example: a page that can be improved . .

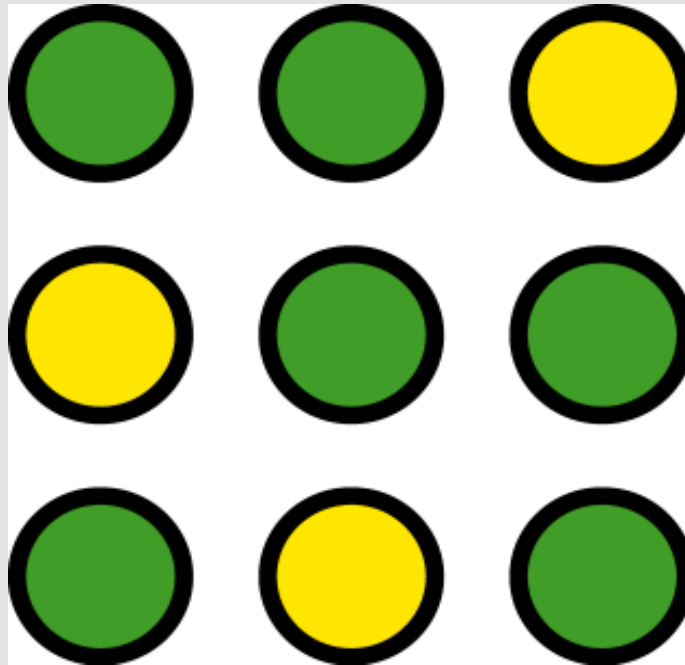


By using proximity to group related things

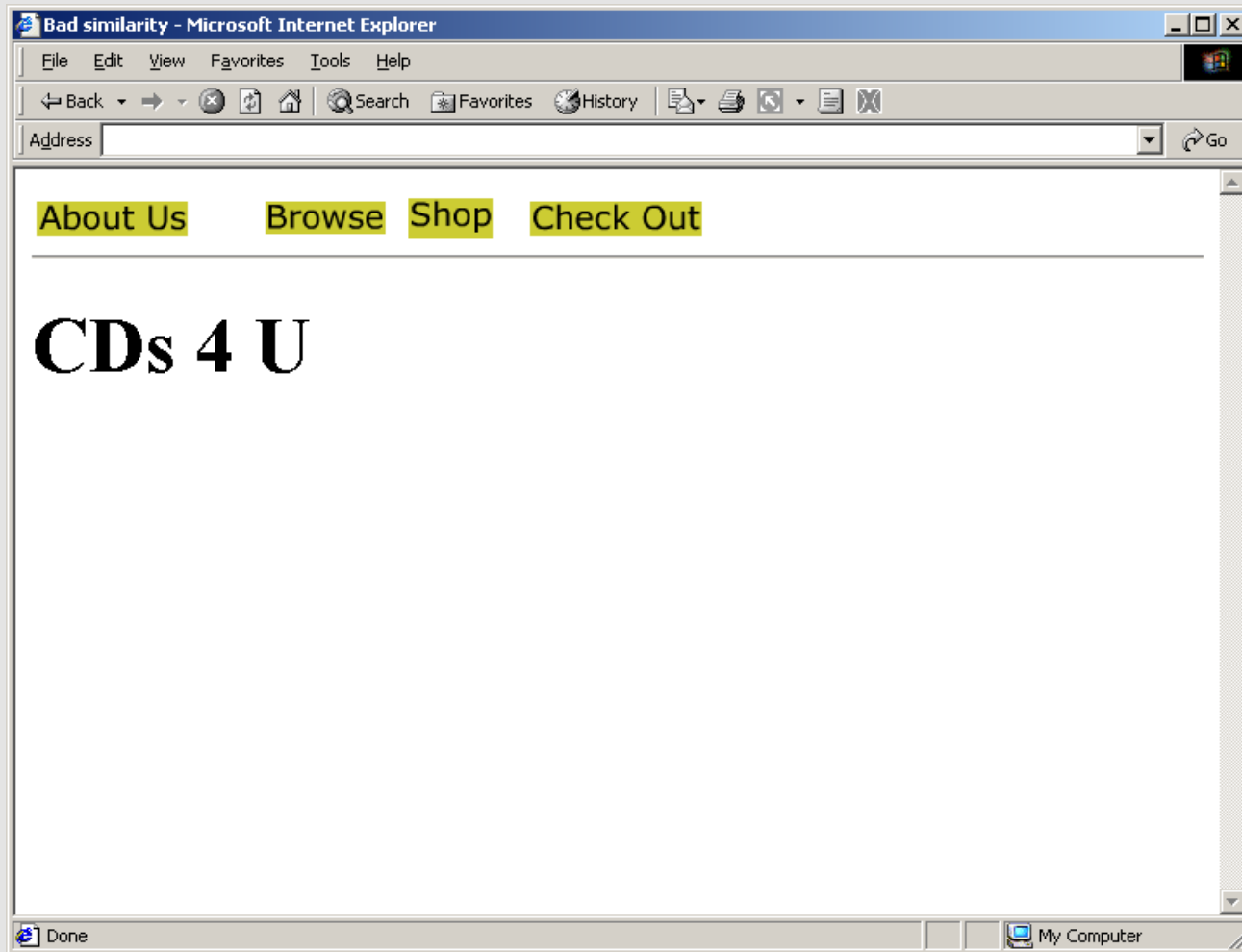




Similarity

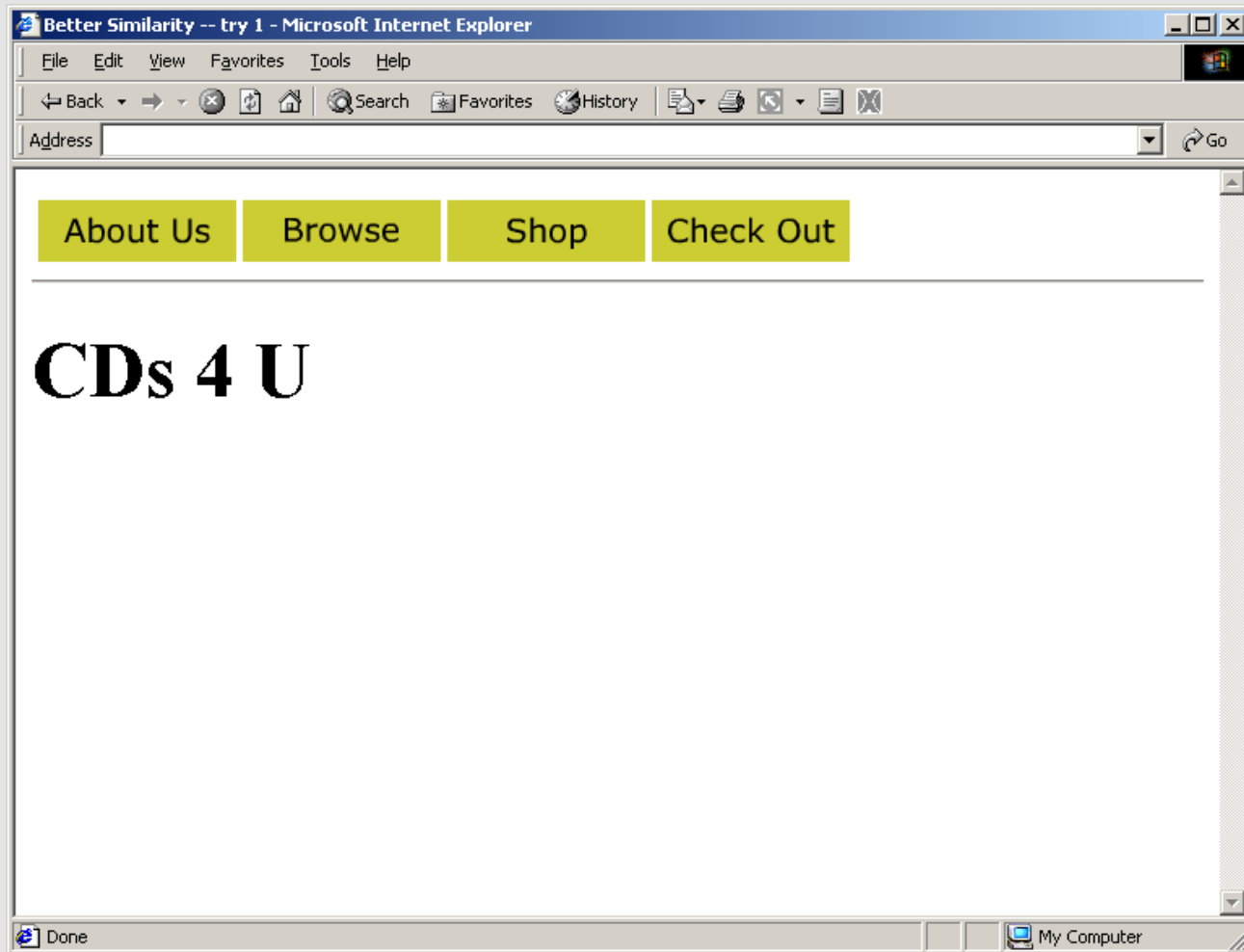


Example: can you use similarity to improve this page?





Sure: make the buttons the same size:

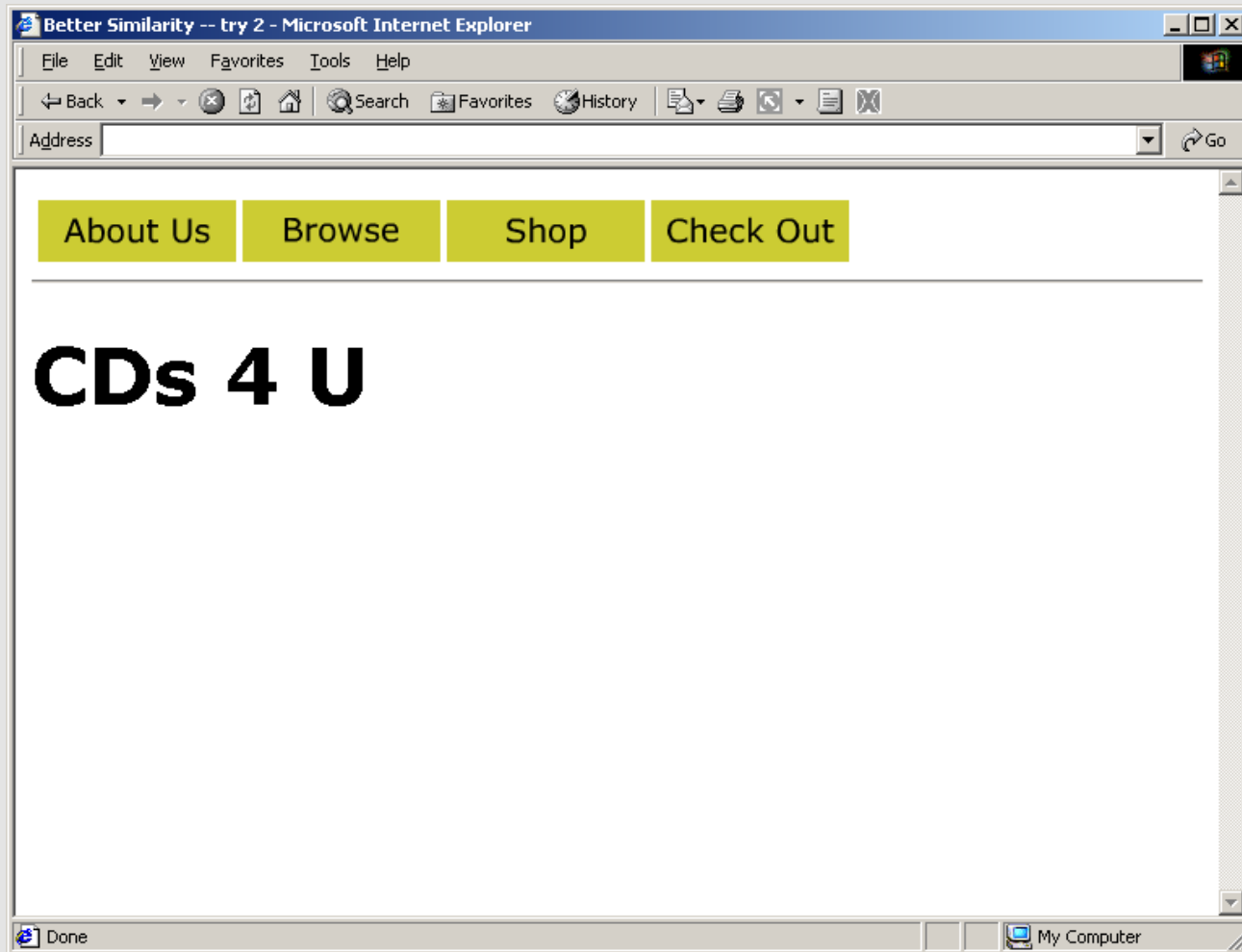


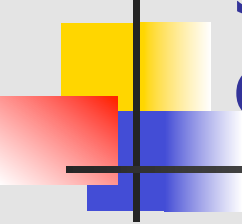


Anything else?

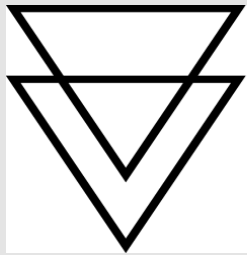


Sure: use the same font everywhere:

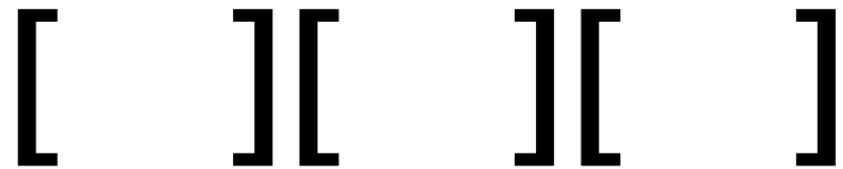




Symmetry: we use our experience and expectations to make groups of things



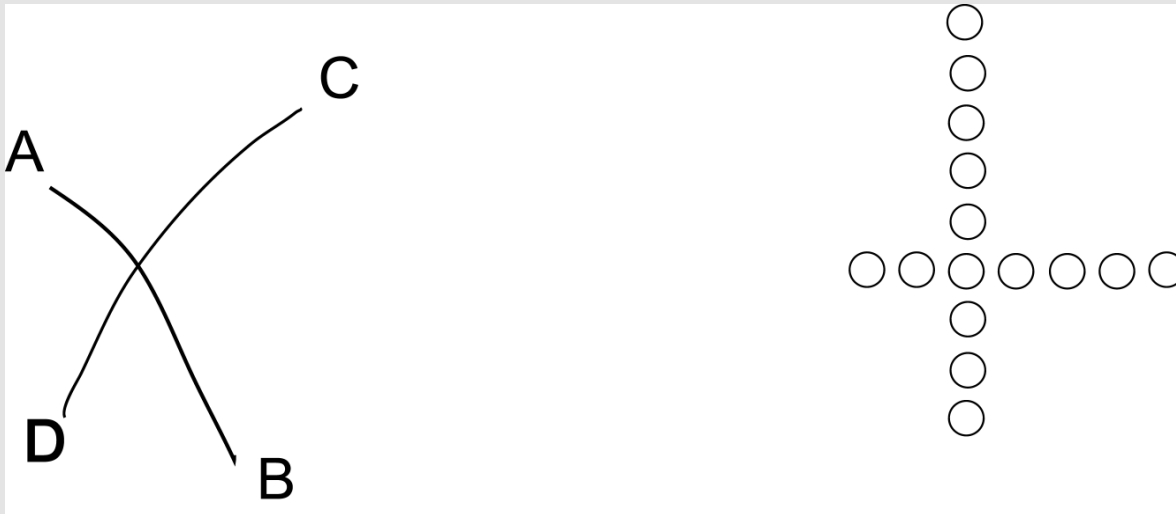
We see two triangles.



We see three groups of paired square brackets.



Continuity: flow, or alignment



We see curves AB and CD, not AC and DB, and not AD and BC

We see two rows of circles, not two L-shaped groups

Can you use alignment (one form of continuity) to improve this page?

Bad Layout - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites History Print Copy Paste

Address Go

ASLIP

Association of Societies for Literacy in Primates

Our Journal (1996 -)

Reading for Primates

[vol.1 1996](#)
[vol.2 1997](#)
[vol.3 1998](#)
[vol.4 1999](#)
[vol.5 2000](#)
[vol.6 2001](#)

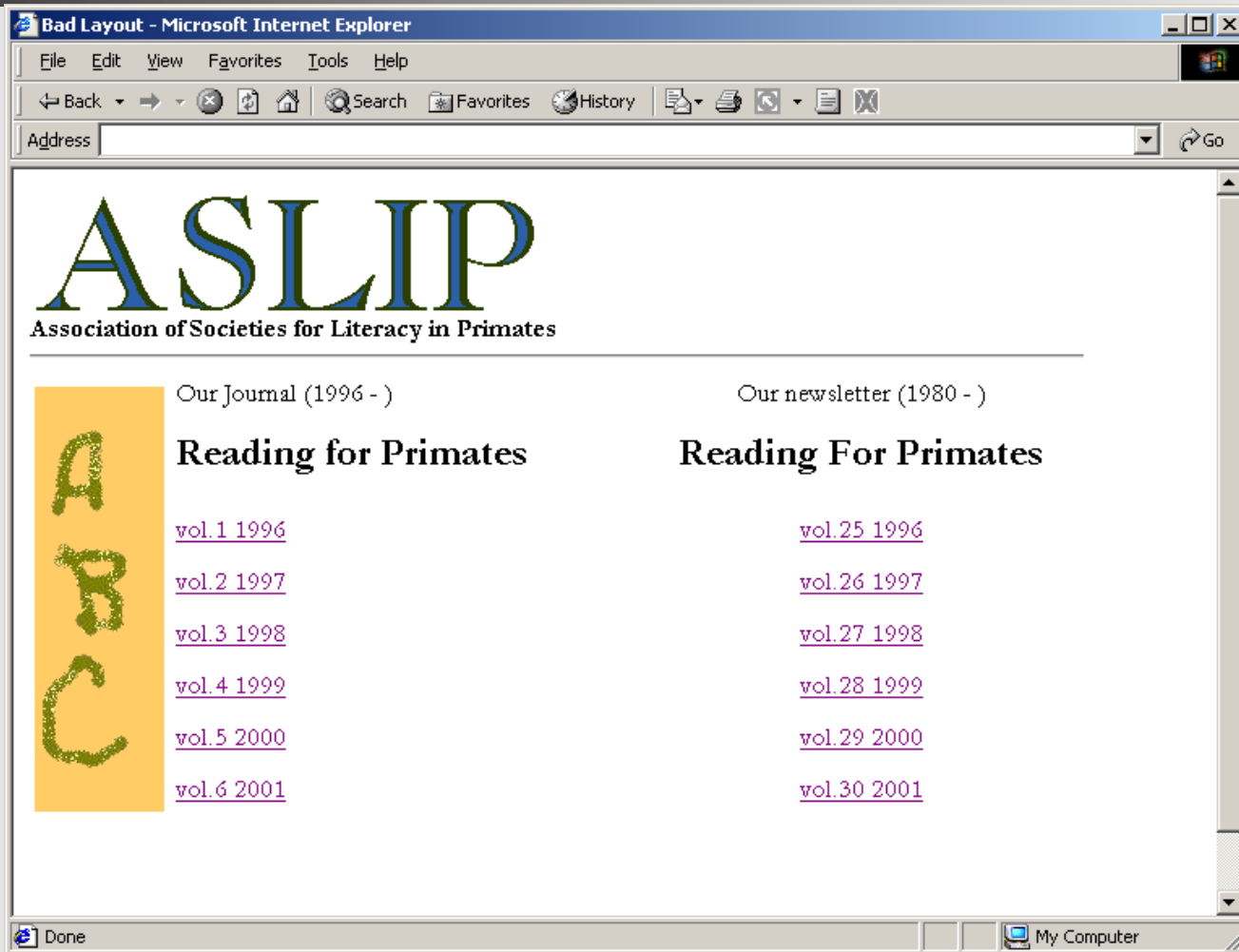
Our newsletter (1980 -)

Reading For Primates

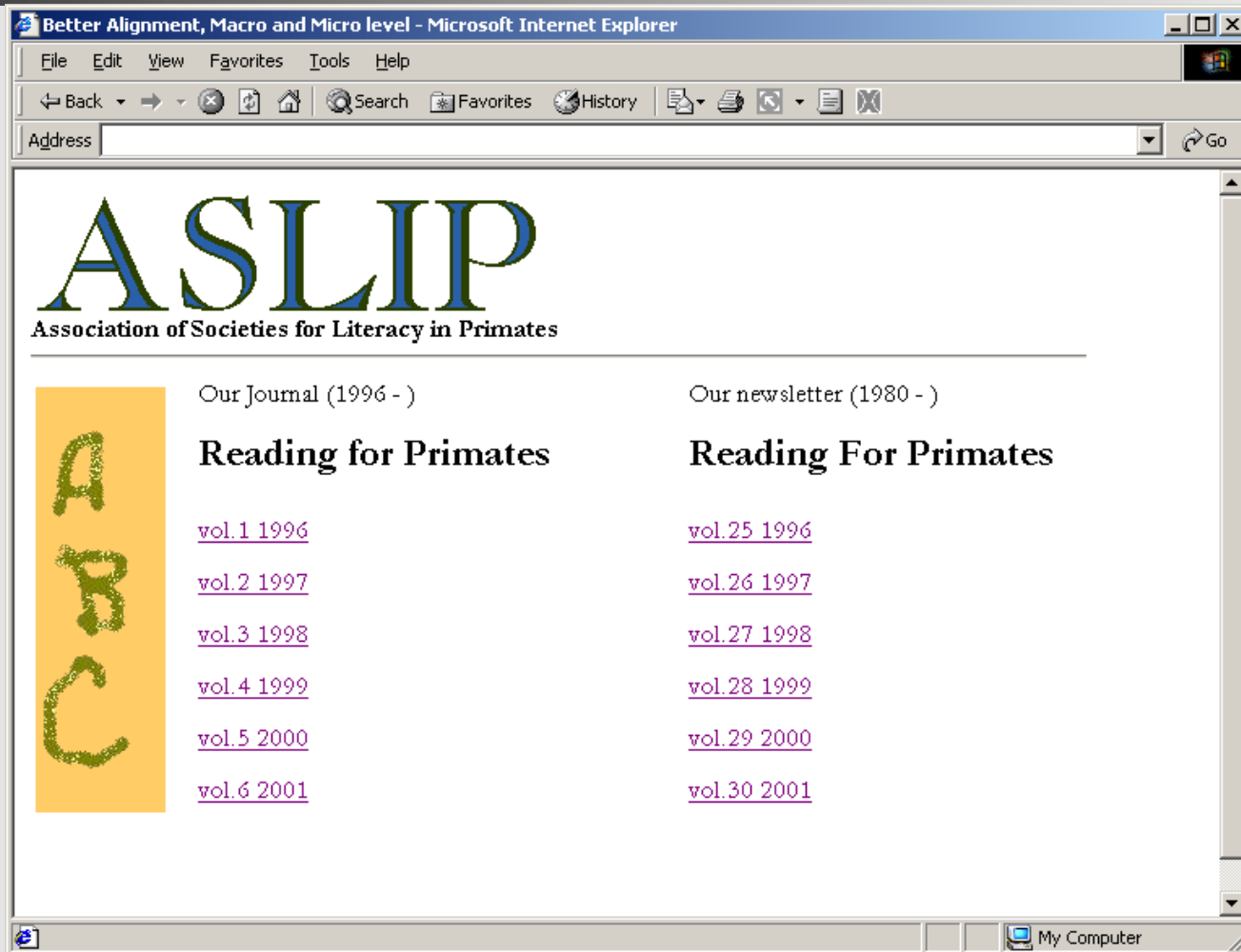
[vol.25 1996](#)
[vol.26 1997](#)
[vol.27 1998](#)
[vol.28 1999](#)
[vol.29 2000](#)
[vol.30 2001](#)

Done My Computer

Sure: the lines on the previous slide show how to use horizontal alignment

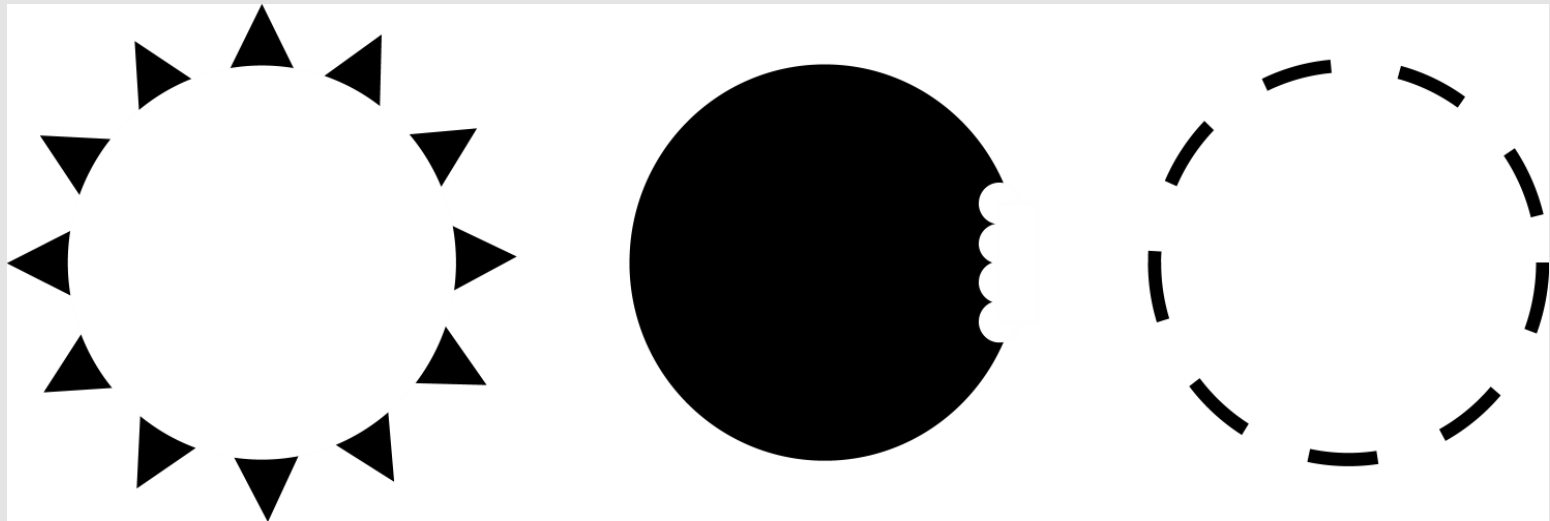


But why stop? Left-align both columns to get vertical alignment also





Closure: we mentally “fill in the blanks”

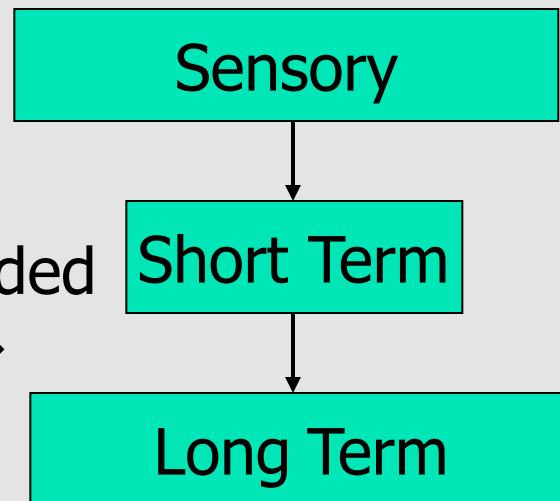


All are seen as circles

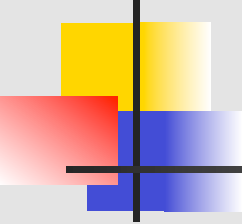


2.4 Memory

- ◆ Hierarchical Model



Practice and effort needed
to make this transfer →



“The Magic Number 7, Plus or Minus 2”

George Miller, 1956

- ◆ Value of “ chunking”
 - ⊕ 2125685382 vs. 212DanHome
 - ⊕ 10 chunks vs. 3 (assuming 212 is familiar)
- ◆ Can you remember:
 - ⊕ Vsdfnjejn7dknsdnd33s



How many chunks in . . .

- ◆ www.bestbookbuys.com
- ◆ 20? Not really:
 - ⊕ www.
 - ⊕ best
 - ⊕ book
 - ⊕ buys
 - ⊕ .com



Recognition vs. recall

- ◆ Why is a multiple choice test easier than an essay test?
 - ⊕ Multiple choice: you can recognize the answer
 - ⊕ Essay: you must recall the answer
- ◆ A computer with a GUI allows us to recognize commands on a menu, instead of remembering them as in DOS and UNIX



Memory aids

- ◆ Post-It[®] notes
- ◆ In Windows
 - ⊕ ctrl- N (new)
 - ⊕ ctrl- C (copy)
 - ⊕ ctrl- S (save)
- ◆ Favorites List and bookmarks to store URLs
- ◆ Hyperlinks—if their wording indicates the content of the target page. (“Click here” is not a memory aid.)



2.5 Interruptions

- ◆ Focusing attention and handling interruptions are related to memory
- ◆ In website design you need to give cues or memory aids for resuming tasks:
 - ⊕ Back button
 - ⊕ Followed links change color
 - ⊕ When filling in forms, blank boxes show where to pick up the job



Interruptions, continued

- ◆ How fast must a system respond before the user's attention is diverted? (Robert Miller, 1968)
- ◆ **Response time**
 - < 0.1 second
 - < 1 sec
 - > 10 sec
- User reaction**
 - Seems instantaneous
 - Notices delay, but
does not lose thought
 - Switches to another task



2.6 Mental Models

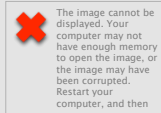
- ◆ How do people use knowledge to understand or make predictions about new situations?
- ◆ People build mental models
- ◆ For example, a car: put gas in, turn key, and it runs. (Not exactly a car mechanic's model!)
- ◆ Can't ignore user's mental model
- ◆ And how do we know what the users' mental models are? **Through user testing.**



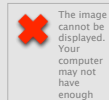
2.7 Metaphors

- ◆ Way to relate a difficult or more abstract concept to a familiar one

- ◆ Open file



- ◆ Save file





Metaphors have problems



- ◆ Disadvantage: metaphor may not be widely known or correctly understood
- ◆ The mailbox icon meant nothing outside rural United States until explained. And it's backwards: we put the flag up *to tell the mailman* that we have put mail in the box *to be picked up*.



2.8 Affordance

- ◆ Affordance: “The functions or services that an interface provides”
 - ⊕ A door affords entry to a room
 - ⊕ A radio button affords a 1-of-many choice
 - ⊕ On a door, a handle affords pulling; a crash bar affords pushing

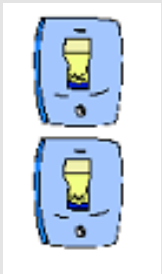


Perceived affordance

- ◆ We want affordance to be visible and obvious to the user
 - ⊕ The Up and Down lights on an elevator door should have arrows, or they should be placed vertically so that the top one means Up
 - ⊕ On a car, turning the steering wheel to the left makes the car go left



Example of perceived affordance



Top switch controls top lights

By convention, with a light switch “up” is “on”



2.9 Design Guidelines for the Web

- ◆ Lessen burden on user's memory:
 - ⊕ Use recognition instead of recall
 - ⊕ Help users chunk information
 - ⊕ Require as little short-term memory as possible
- ◆ Consider user's mental models
- ◆ Provide visual clues and memory aids
- ◆ Provide feedback: let users know their input was received



Summary

In this chapter you learned that

- ⊕ Sight is the most important sense—on the Web and in general
- ⊕ We construct mental models; we don't store bitmaps
- ⊕ Context and expectations influence what we see
- ⊕ Five principles of Gestalt psychology: proximity, similarity, symmetry, continuity, closure
- ⊕ Metaphors are tricky
- ⊕ Chunking helps memory
- ⊕ Perceived affordance depends on users' backgrounds, mental models, and expectations