

# Graphic Design and Gestalt Principles

CSI 60: User Interfaces  
Maneesh Agrawala



Keepin' it Real: Pushing the Desktop Metaphor with Physics, Piles and the Pen [Agrawala 06]

[VIDEO](#)

## Due Soon

### Interactive Prototype (due Apr 6)

- Redesign interface based on lofi feedback
- Create **first** working implementation
  - Can include Wizard of Oz parts where **justified**
  - Can include pre-built (canned) functionality **but only if heavily justified**

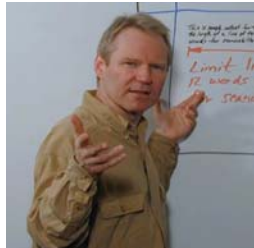
### In class Presentations (Apr 13, 15, 20)

- 10 min slide presentation (be careful about timing)
- Focus on showing prototype
- Feedback from class (you will need to provide feedback on each presentation on the wiki)

## Upcoming Lectures

### Apr 6: Stephen Few

- Information display



### Apr 8: Aaron Marcus

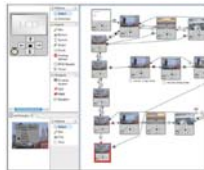
- UI design consultant
- **Elected to CHI Academy this year**



## Talk You Should Attend

Bjoern Hartmann

- HCI faculty candidate
- Works on design, implementation and evaluation of authoring tools for UIs



The *d.tools* visual authoring environment enables rapid construction of UI logic.



This evaluation participant used *Exemplar* to control 2D aiming in a game with an accelerometer, and shooting with a flick of a bend sensor.

**Mon Apr 13: 1-2:30pm Wozniak Lounge**

## Lofi Prototype

Graded: Pick up at end of lecture

- Avg 67.13      Stdev: 5.77

Videos great!

- Example: Dashr
  - Carol Chen
  - Timofey Titov
  - David Burban
  - Matthew Can

- Some videos lacked context



## **Topics**

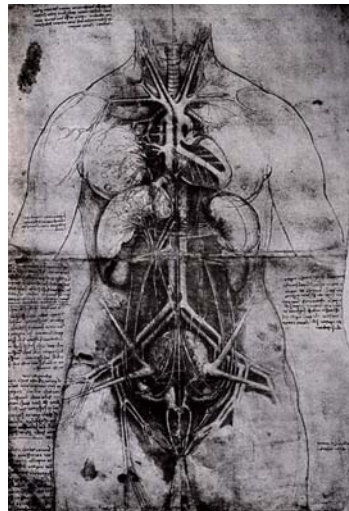
- Graphic design
- Simplicity and elegance
- Color
- Gestalt principles
- Grid-based design

## **Graphic Design**

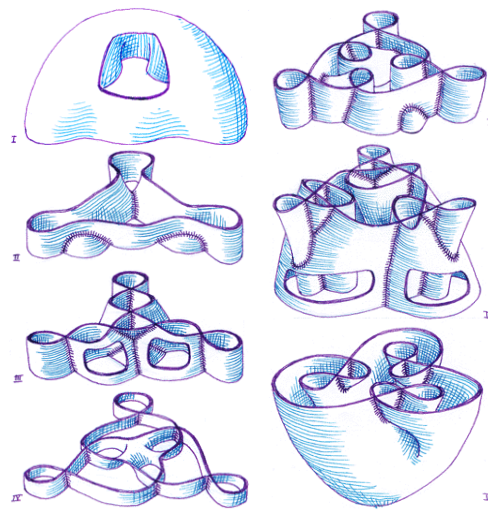
# Design is about Communication



# Design is about Communication



Principal organs & vasculature  
[Leonardo da Vinci ca. 1490]



Strange immersion of torus in 3-space  
[Curtis 92]

## Design is about Form and Function

- Form – good designs should be a pleasure to use
- Function – good design supports users' tasks



## Modern Design

Russian constructivism (1920s) was the first big influence. It had two themes:

- Technology
- Human behavior and rhythms



## Modern Design

The biggest influence on 20<sup>th</sup> century design was the Bauhaus School in Germany.

Formed after the collapse of the German monarchy and loss in WWI, it was part of a cultural renaissance in Germany.



The Russian and German movements sought to escape “ornamentation” which linked to their imperial past.

## Principles of Modern Design

I. Form follows function



# Principles of Modern Design

## 2. Economy of form - limited vocabulary - minimalism



# Principles of Modern Design

## 3. Integrity of materials

– Use materials' natural affordances, don't hide them





# Principles of Modern Design

## 3. Integrity of materials – not just a modern principle



Shaker Furniture



Wood Veneer

# Principles of Modern Design

## 4. Integrity of structure

– Show the structure how it supports and shapes the object



# Principles of Modern Design

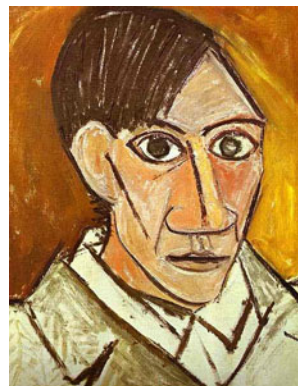
## 4. Integrity of structure



# Steal Good Design Ideas

“Good artists borrow (from other artists), but great artists steal !” - Pablo Picasso

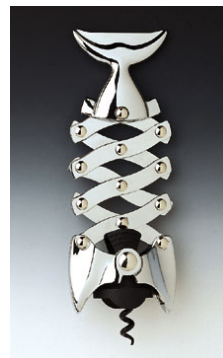
Compelling visual design takes practice and experience –a natural part of which is study and critique of other’s work



## Simplicity and Elegance

### Simplicity

Simple, *minimalist*, designs are usually the most effective



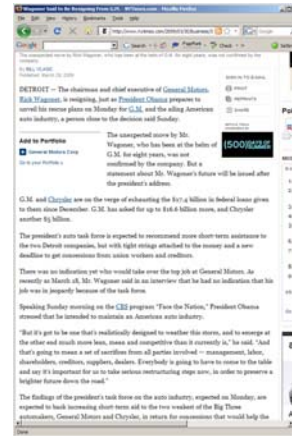
# Elegance

**Reduction:** Only include essential elements

**Regularization:** Use one set of shapes, colors, forms etc.

**Leverage:** Use elements in multiple roles

- scrollbar allows scrolling and indicates position in document



# Benefit: Approachability



Visual elements rapidly understood - invite further exploration

## Benefit: Recognizability



Less visual clutter makes it easier to recognize what is there

## Benefit: Immediacy

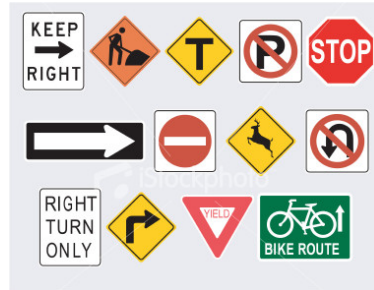


Eye is immediately drawn to important visual elements  
– Details that remain are more prominent

# Unity

One path to simplicity & elegance is through unifying themes:

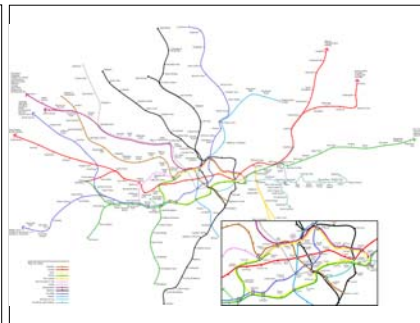
- Forms, colors, components with like qualities



# Refinement



London Underground [Beck 33]



Geographic version of map

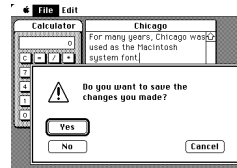
Draw viewers' attention to essential information

- Straigten subway lines to emphasize sequence of stops

# Fitness

Match design to capabilities of technology and user

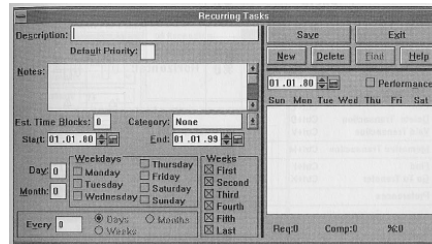
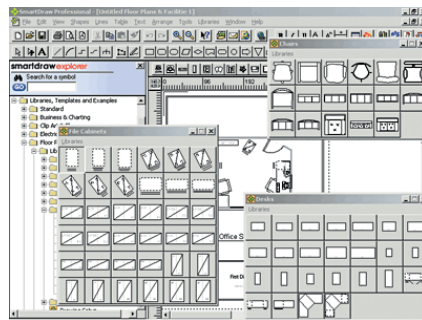
**The Quick Brown  
Fox Jumps Over  
The Lazy Dog.** **g**  
abcdefghijklmnopqrstuwxhyz0123456789 [ ] { } / \ < > ?



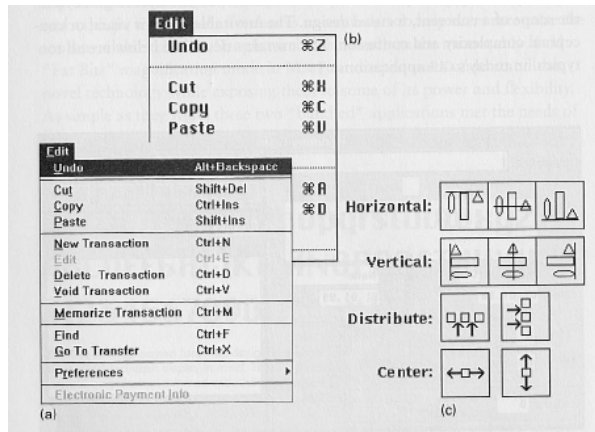
Chicago screen font designed for early low-res Macintosh display

- Thick verticals ensure visibility after applying 50% gray pattern
- Used as default font 1984-1997

# Mistakes: Clutter & Noise

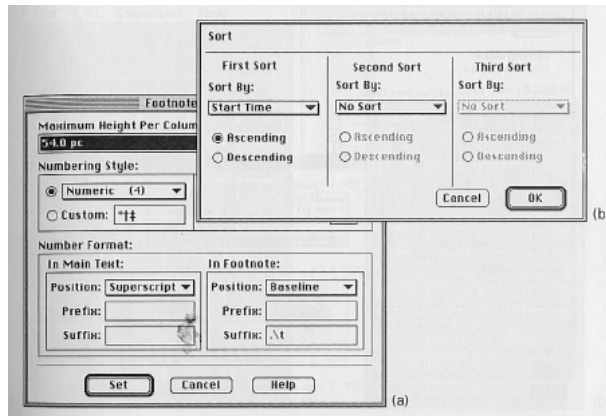


## Mistakes: Interference



Shortcuts interfere with menu labels in (a) not in (b).  
Different shapes cause confusion in alignment tools

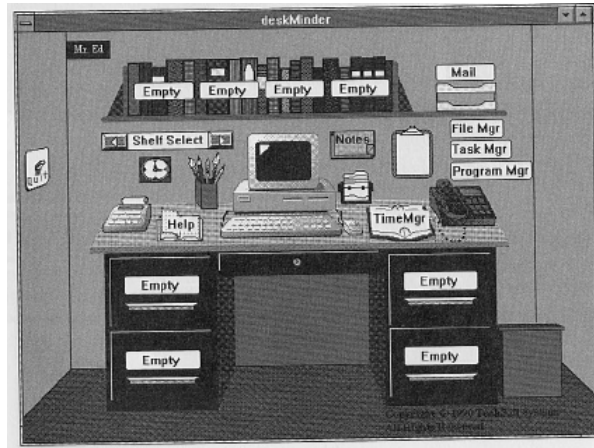
## Mistakes: Too Much Structure



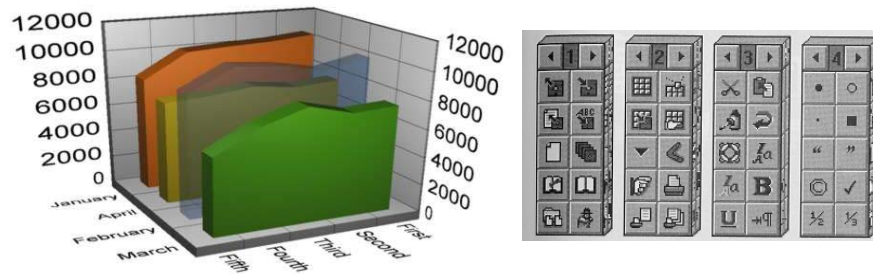
Bounding boxes in (a) adds unnecessary structural information  
Simpler structure in (b) using space rather than lines is better



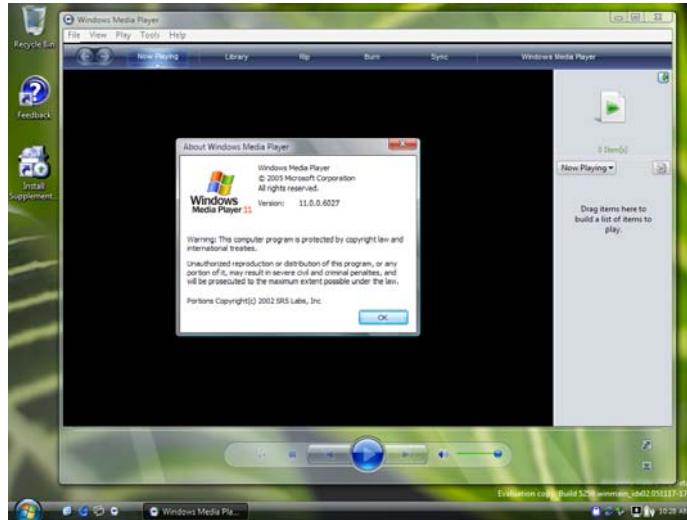
## Mistakes: Belaboring the Obvious



## Mistakes: Gratuitous use of 3D



## Mistakes: Excessive Embellishment



Minimalists hate it, but sometimes users like embellishments (i.e. Apple's designs)

## Color

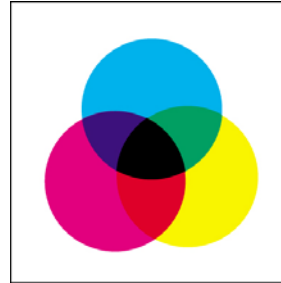
# Color Spaces



**RGB**

**Additive**

**Electronic Media**



**CMY**

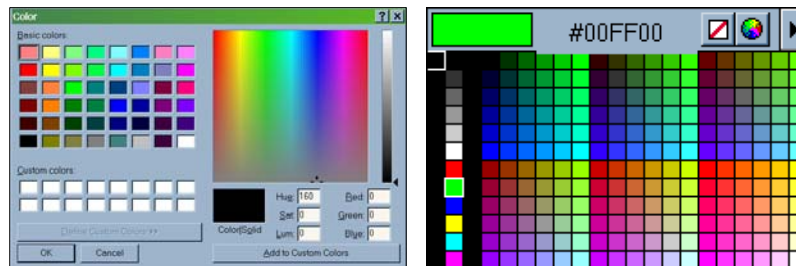
**Subtractive**

**Printed Media**

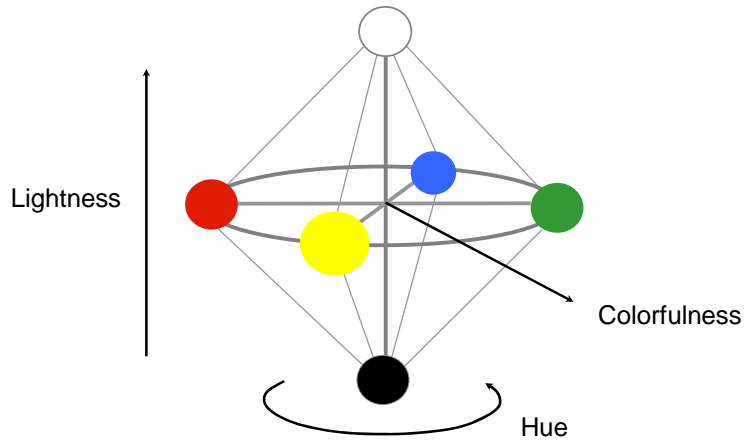
Parameters of color space driven by technology

# Technology-Centered Colors

- Nice RGB Hex codes, “evenly” distributed
- But, lime green and hot pink?



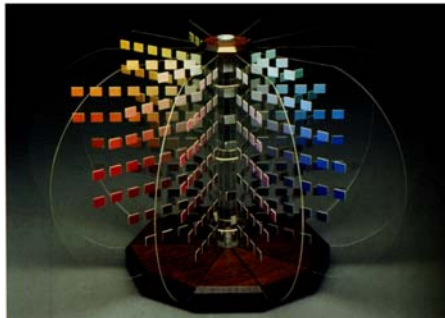
# Perceptual Organization



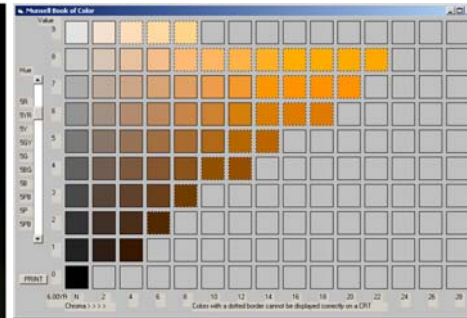
Parameters of color space driven by perception

# Munsell Color Space

Perceptually uniform book of painted chips



Hue

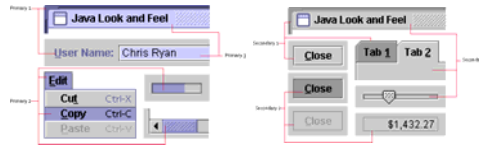


Chroma vs. Value

Munsell Color Utility: [www.wallkillcolor.com](http://www.wallkillcolor.com)

## Tips for Picking Colors

- Use a small palette (6 color Java look and feel)



- Don't use all fully saturated colors



- Ensure good color contrast for text

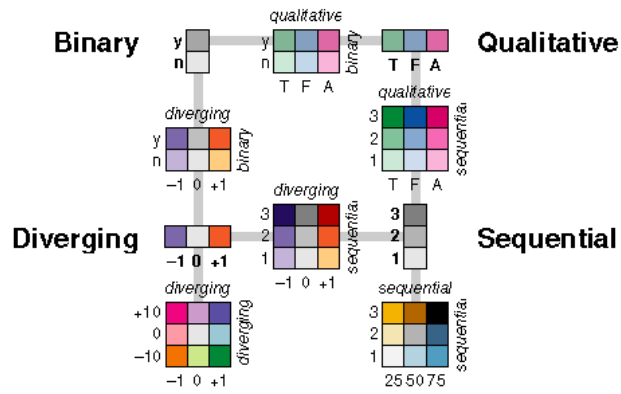


## Let Someone Else Pick For You



Inhof, Cartographic Relief Projection

# Let Someone Else Pick For You



ColorBrewer.org

# Gestalt Principles

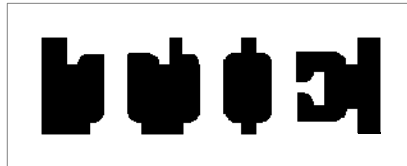
# Principles

- figure/ground
- proximity
- similarity
- symmetry
- connectedness
- continuity
- closure
- common fate
- transparency

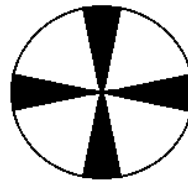
## Figure/Ground



**Ambiguous**



**Principle of surroundedness**



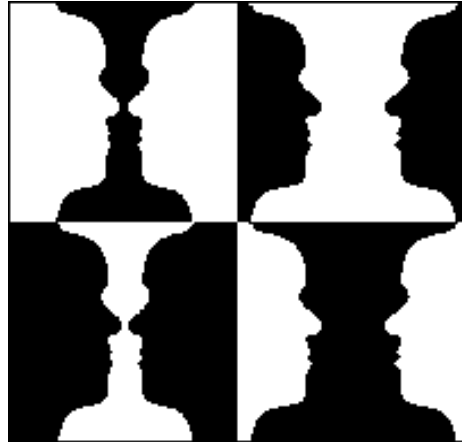
**Principle of relative size**

<http://www.aber.ac.uk/media/Modules/MC10220/visper06.html>

# Figure/Ground



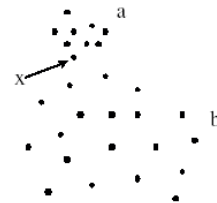
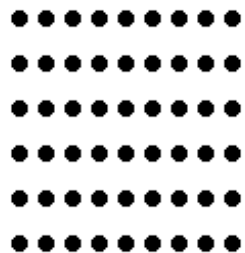
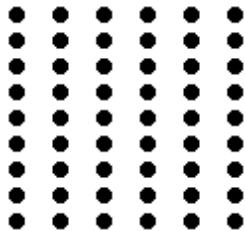
Ambiguous



Unambiguous

<http://www.aber.ac.uk/media/Modules/MCI0220/visper06.html>

# Proximity



Dots that are near one another are grouped  
Dots that are concentrated are grouped

[from Ware 00]



## Proximity

Elements that are near each other will seem to be related...

### Dinner

Bison  
Chicken  
Salmon  
Crab  
Pork

### Farm

Calf  
Elk  
Goat  
Rabbit  
Deer

## Proximity

Elements that are near each other will seem to be related...

### Farm

Bison  
Chicken  
Salmon  
Crab  
Pork

### Dinner

Calf  
Elk  
Goat  
Rabbit  
Deer

## Proximity

Think about which elements are logically related – draw a graph if necessary. Then lay them out so that the graph is as untangled as possible.

Use size and typeface to allow scanning for groups.

## Proximity

Tuesday, November 4

Election Day

**An American Menu \$75**

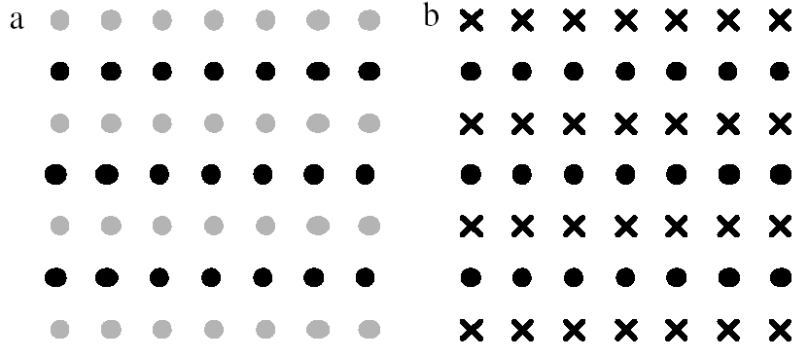
**Caesar salad** with anchovies, egg,  
and Parmesan cheese

**Clam chowder** with Maine lobster  
and pancetta

**Grilled chicken** with house-made barbeque  
sauce with potato purée and greens

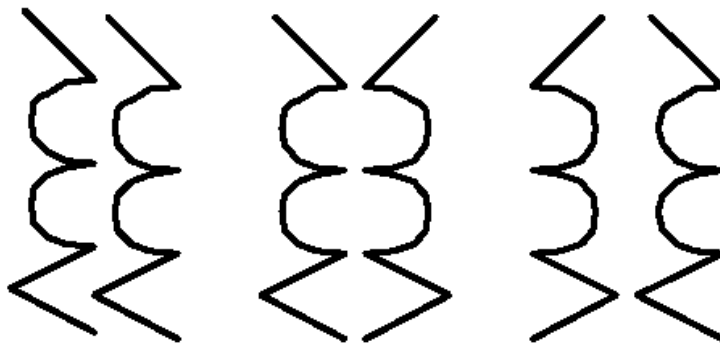
**Apple and raspberry pecan crisp**  
with vanilla ice cream

## Similarity



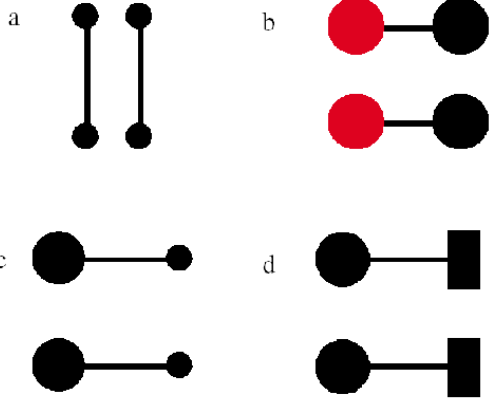
Rows dominate due to similarity [from Ware 04]

## Symmetry



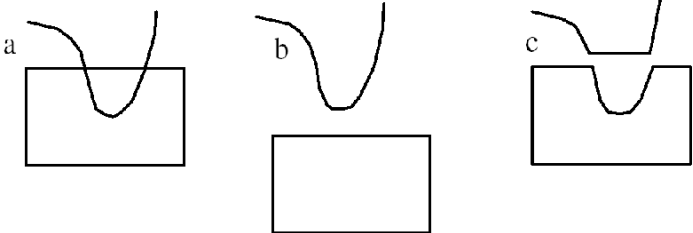
Bilateral symmetry gives strong sense of figure [from Ware 04]

# Connectedness

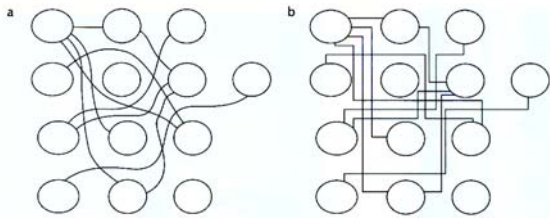


Connectedness overrules proximity, size, color shape [from Ware 04]

# Continuity

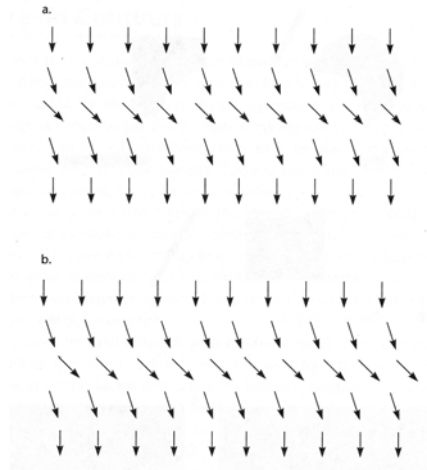


We prefer smooth not abrupt changes [from Ware 04]



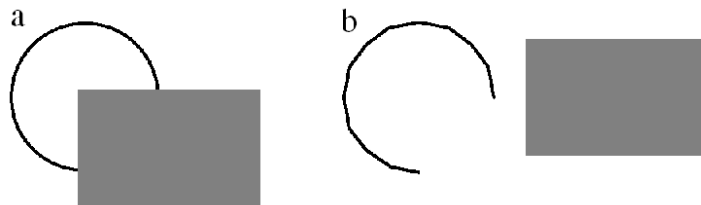
Connections are clearer with smooth contours [from Ware 04]

## Continuity: Vector Fields

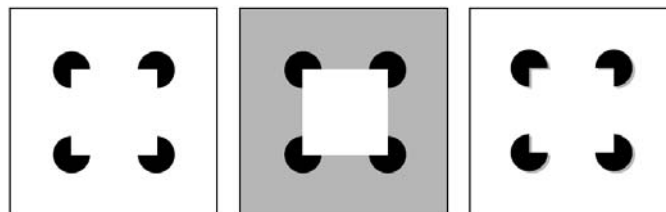


Prefer field that shows smooth continuous contours [from Ware 04]

## Closure



We see a circle behind a rectangle, not a broken circle [from Ware 04]



Illusory contours [from Durand 02]

## Common Fate



Dots moving together are grouped

<http://coe.sdsu.edu/eet/articles/visualperc1/start.htm>

## Transparency



Requires continuity and proper color correspondence [from Ware 04]

# Grid-Based Design

## Grid Systems



**142:** These typographic grids for book design subdivide the page uniformly into one to six columns. Grids for book design have important differences, but the goal of providing systematic structure is the same. From *Basic Typography: Design with Letters*, by Ruedi Ruegg, ABC-Verlag, Zurich, 1987.

**143:** Each of the grids in Figure 142 leaves a distinct imprint on the resulting layout. When the same grid is used throughout a book – or any application – this imprint becomes a unifying element for the entire work. From *Basic Typography: Design with Letters*, by Ruedi Ruegg, ABC-Verlag, Zurich, 1987.

# Web Page Layout

Grids can shape layout without over constraining it

- Grid is not always obvious from page layout
- Produces good repetition of size and shape



# Alignment

Every item on a screen has a relationship to the other items. Elements that are almost collinear should be aligned.

Left, right and both-justified alignments create strong boundaries around a piece of text.

Its best to stick with one kind of justification within a page.



## Common Mistakes

- Arbitrary component positions and dimensions
- Random window sizes and layouts
- Unrelated icon sizes and imagery
- Poor alignment

## Techniques

Reinforce structure through repetition

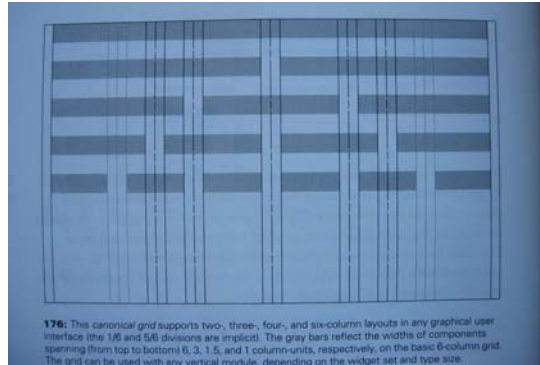
- Repeat design elements across the layout
- Stylesheets can help



# Techniques

## Canonical Grid

- Six-column grid with column separators and label templates
- Covers most common grid-based layouts
- Can be implemented with HTML tables



# Summary

- Design is about communication, form and function
  - Simplicity and elegance are keys to good design
  - Minimalism constrains you and reduces chances of bad design
- Use a small palette of colors
  - Let others pick them for you ([colorbrewer.org](http://colorbrewer.org))
- Human vision is organized by Gestalt Principles
  - Be aware of these principles as you design the visual look
- Avoid common layout mistakes using grid-based design

## Next Time

### Visualization

- [Information Visualization](#). *Readings in Information Visualization*. Chap 1. Card, Mackinlay, Schneiderman.