

Visual Design

SWE 632
Fall 2015



Administrivia

- HW 4 due 11/5
- Midterms returned in-class 11/5

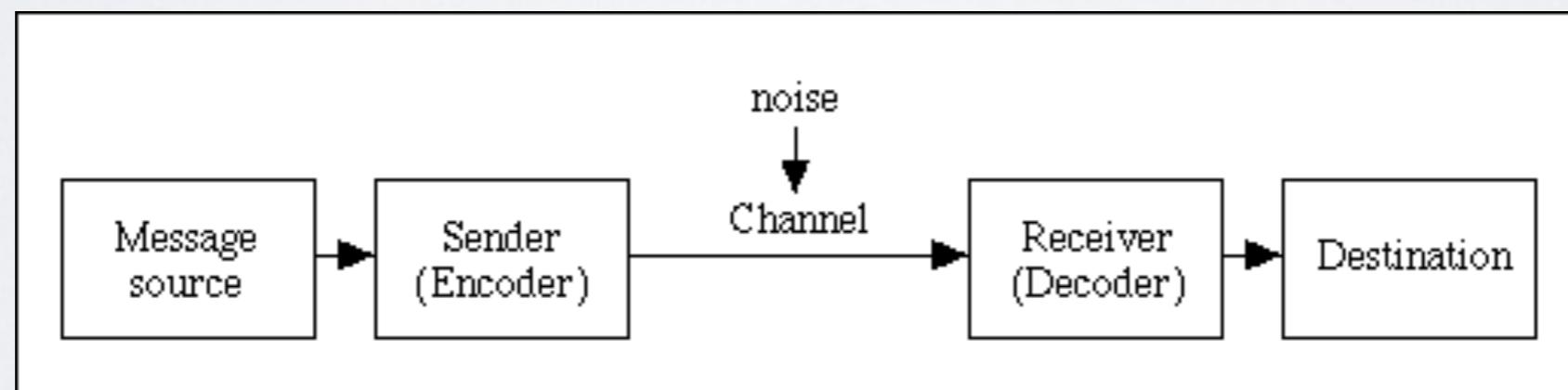
Visual Design

Visual design

- Solving **communications problems** in ways that are both functionally effective and aesthetically pleasing.
- Creating a visual language containing a vocabulary of design elements characterized by
 - Visual characteristics—shape, size, position, orientation, color, texture, ...
 - Organizational relations—balance, structure, proportion, ...
 - Visual syntax—rules for assembling elements w/in design language

Visual design as communication

- Goal: **efficiently** & accurately transmit information from system to user
- Visual characteristics & organization encode information



Goals for visual design

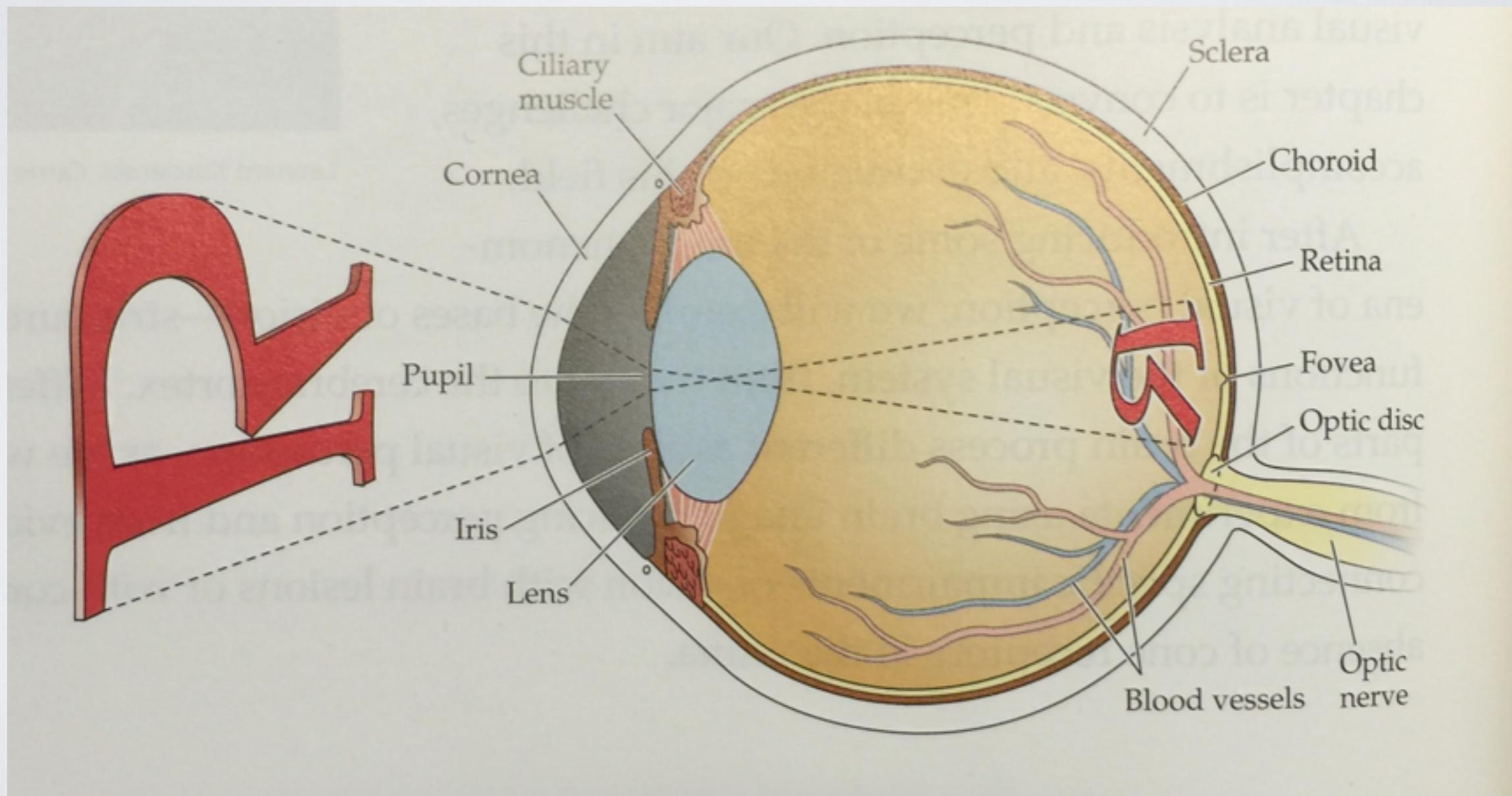
- Successfully **transmit** information
- Reduce visual **search** time through layout & organization
- Create desired **emotional** reactions through aesthetic choices
- Present coherent & consistent design that reduces ambiguity and potential confusion

Aesthetic-Usability effect

- Humans perceive more aesthetic designs as **easier** to use [1]
- Aesthetics
 - influence first impressions and initial adoption
 - foster positive attitudes, which increases tolerance of problems & increases creativity in users
- [1] Masaaki Kurosu and Kaori Kashimura. (1995). Apparent usability vs. inherent usability: experimental analysis on the determinants of the apparent usability. *Conference on Human Factors in Computing Systems (CHI)*, 292-293.

Human vision

Human eye



Sensation & perception

- Sensation - process of converting photons perceived by the eye into electric **signals** traveling through neurons
- Perception - process of **interpreting** bitmap of visual stimuli into figures & concepts

Fixation

- Eyes constantly moving around, changing focus on elements in visual scene
 - Average fixation duration ranges from 200 - 250 milliseconds
- Certain environments have preset scanning order (e.g., English text is left to right, top to bottom)
- Important consideration in visual design is the order in which elements may receive focus
 - Strong contrasts & structure can help draw focus to specific elements

Elegance & Simplicity

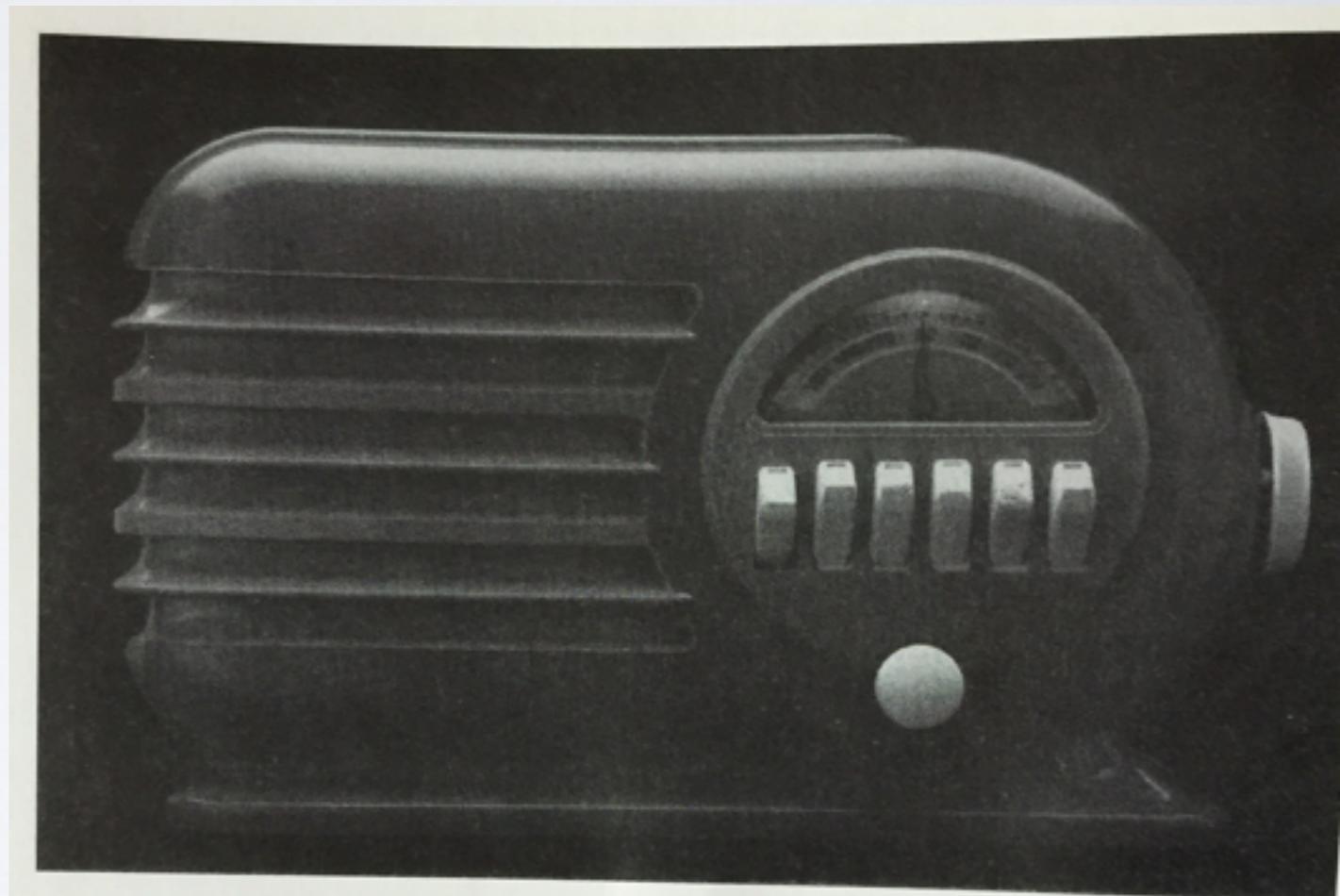
Elegance & simplicity

- *Elegance*—derives from Latin *eligere*, to “select carefully”
- **Judicious** selection of elements and economy of expression revealing an intimate understanding of problem
- Removing & combining superfluous elements until only the necessary remains



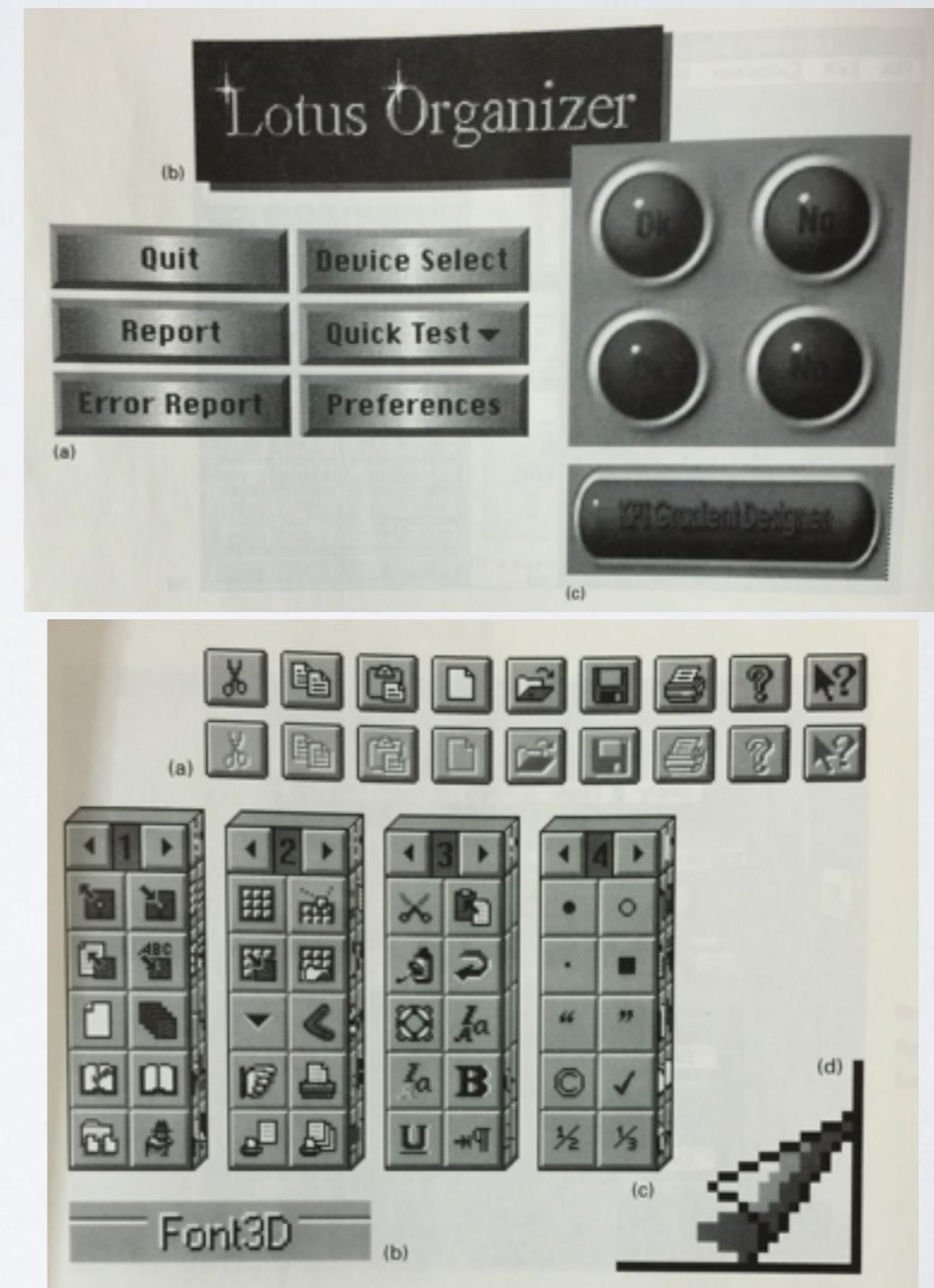
Benefits of simplicity

- Approachability - rapidly understood affordances, allowing glanceable understanding of possible interactions
- Immediacy - greater emotional impact because interactions can be quickly understood



Error - excessive skeuomorphism

- Skeuomorphism - making visual design resemble reality
- Excessive skeuomorphism is distracting and wastes potential visual bandwidth that could encode meaningful information
 - (a.k.a. Tufte's "chart junk"
— see next lecture)



Reducing a design to its essence

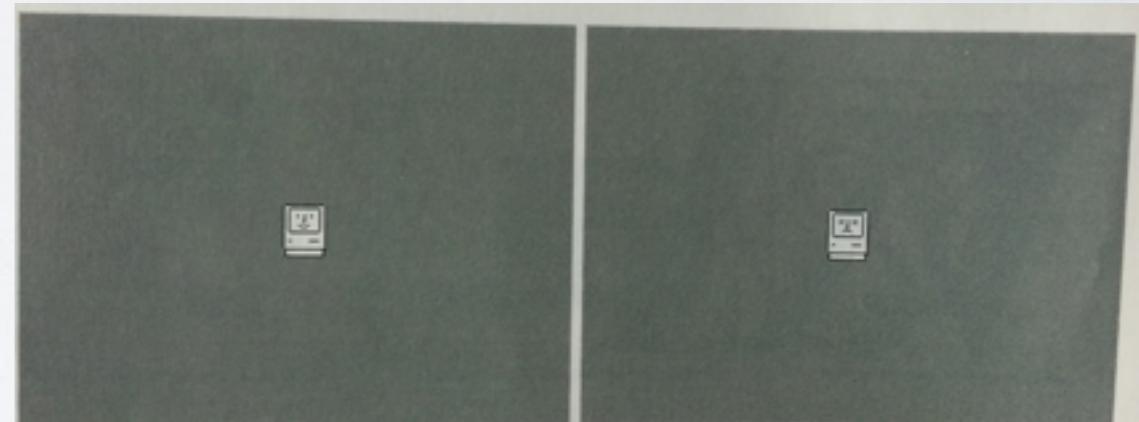
- Make design simple, bold direct by removing inessential details & elements

- Even essential elements may be suggested

1. Determine essential qualities & information to be conveyed

2. Critically examine each element & ask how design would suffer without it.

3. Try removing elements. What happens?



normal

abnormal

Regularizing the elements of a design

- Reduce information by repeating elements according to a rule, principle or rhythm
- Enable user to scan ahead

1. Use **regular** geometric forms, simplified controls, muted colors where possible
2. If multiple similar forms required, make them identical as much as possible in size, shape, color, texture, spacing, alignment
3. Limit variation in typography to a few sizes
4. Make sure critical elements intended to stand out are **not** regularized



train lines simplified
orientations of labels regularized with train lines



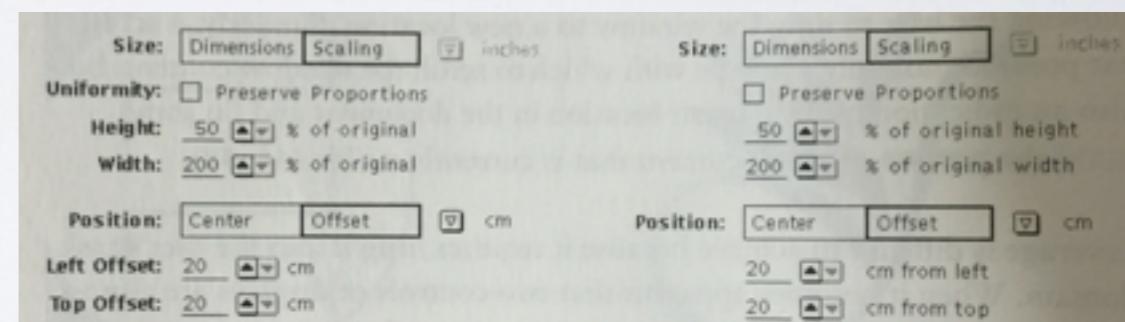
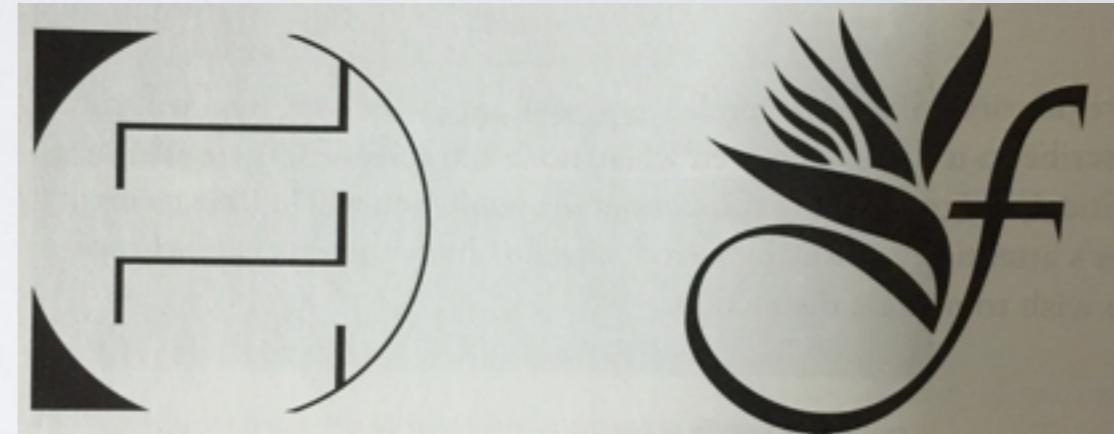
Combining elements for leverage

- Find points where one element can do the work of two

1. Review functional role played by each element.

2. Look for situations where multiple elements are filling the same role.

3. Combine redundant elements into single, simpler unit or common high-level idiom



Labels can set context for several controls, reducing visual interference

Scale, Contrast, & Proportion

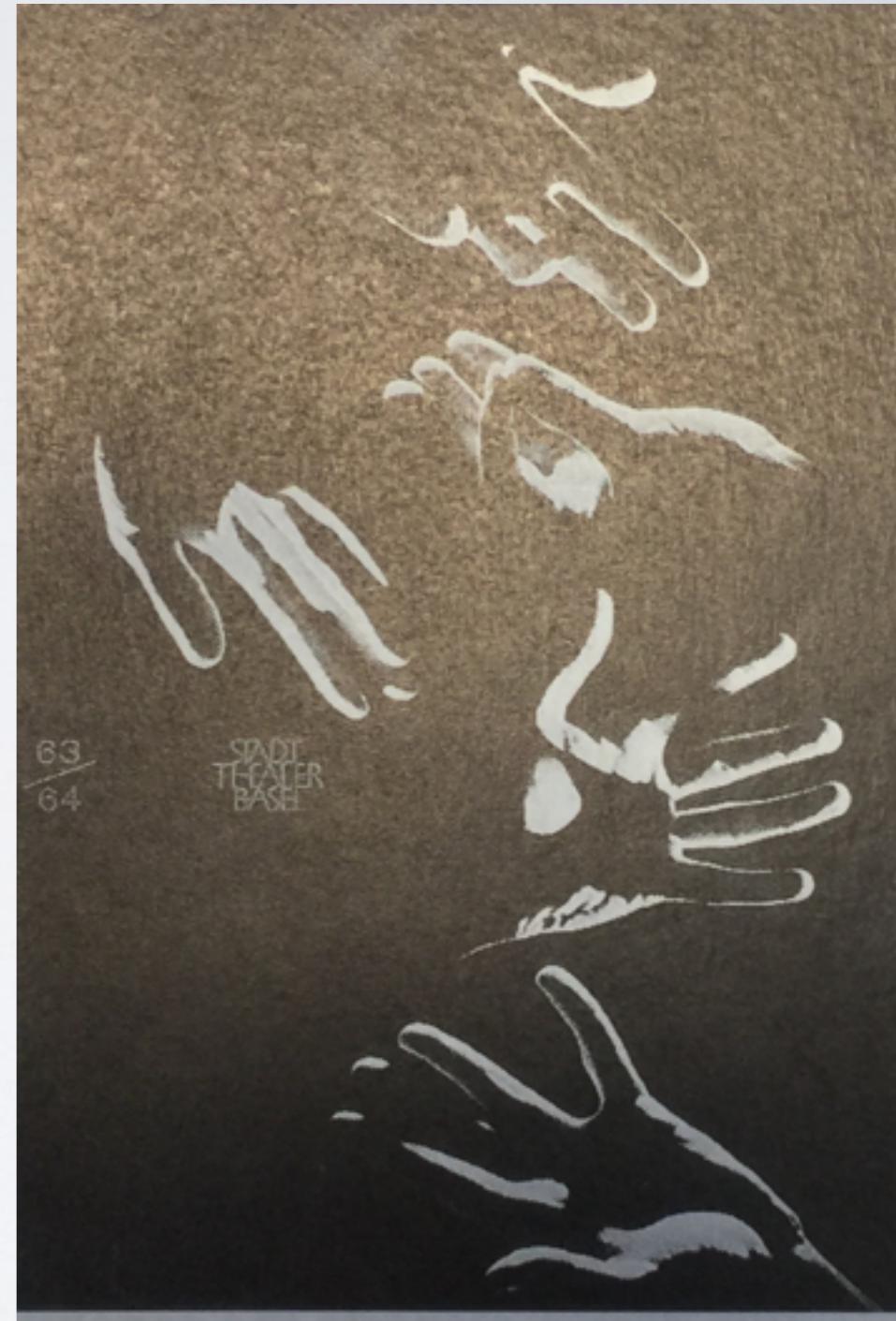
Scale, contrast, & proportion

Information consists of differences that make a difference. (Edward Tufte, Envisioning Information)

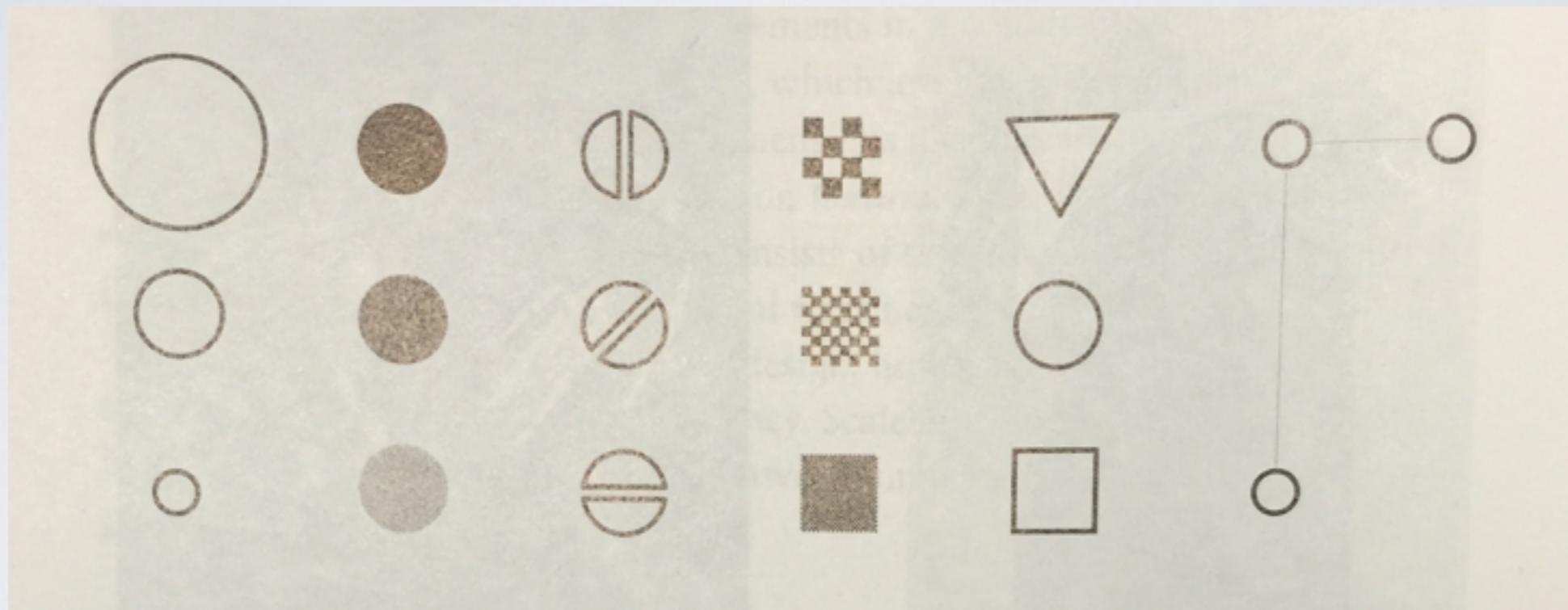
Individual visual attributes of design that encode information

Terminology

- Scale - **relative** size or magnitude of element in comparison to related elements
- Contrast - visually noticeable **distinctions** along a common visual dimension
- Proportion - ratio and **balance** between elements
- Emphasis - contrasts can emphasize important elements or areas & add visual **interest** by creating tension & drama



Retinal variables

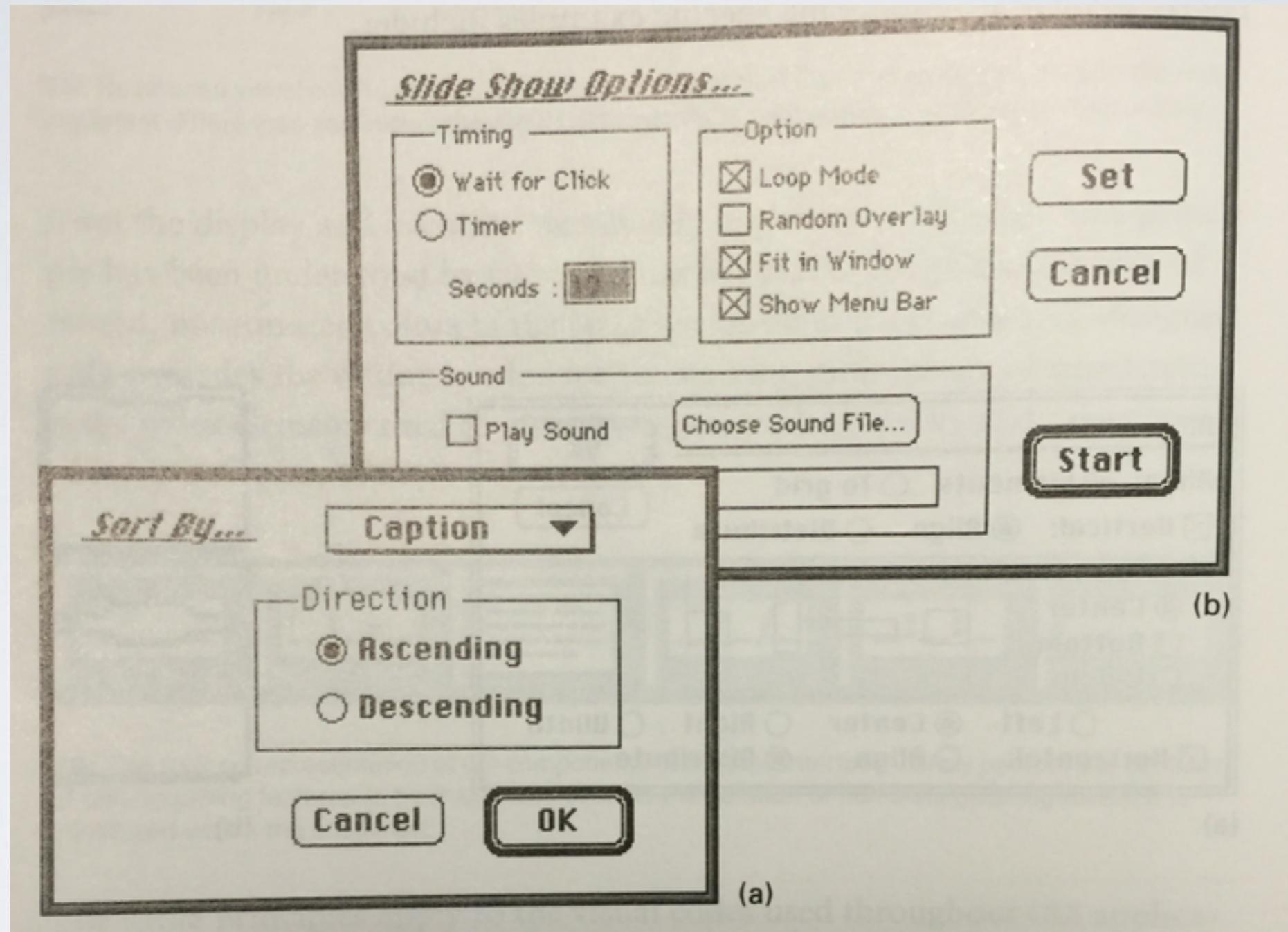


- Bertin's retinal variables: size, value, orientation, texture, shape, position, and hue

Principles

- Clarity - contrasts should be clear and easily differentiated, not slight and subtle
- Harmony - proportions and ratios should be harmonious
- Activity - use contrasts to maintain orientation & context within design
- Restraint - contrasts should be conscious, strong, few in number, and never overwhelming

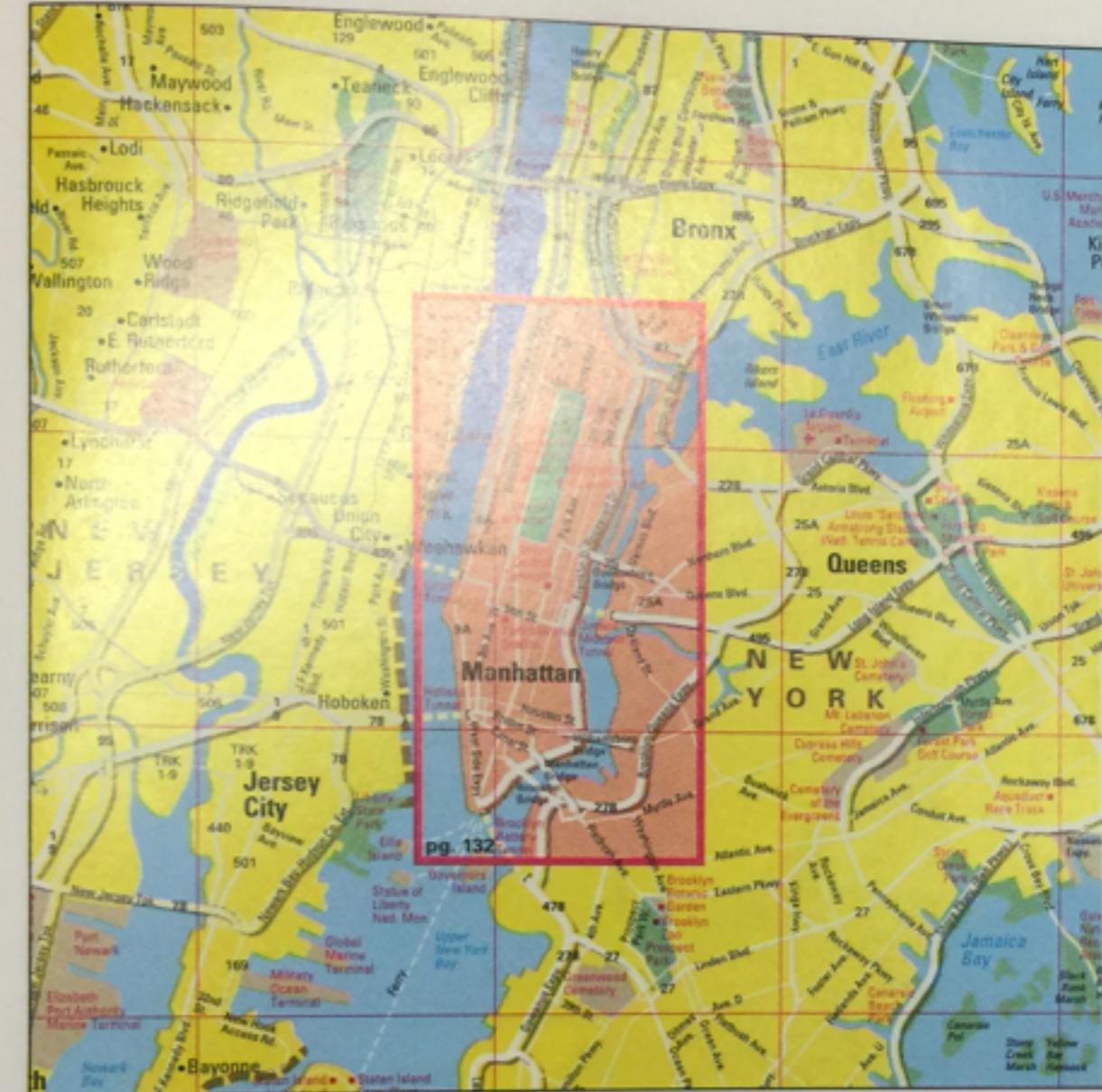
Error - excessive typographic contrasts



5 different types sizes in 3 different fonts (!!)

Layers

- Contrasting color, value, texture can segregate information into separate layers
- Supports **overlapping** information in displays, allowing selective processing of specific sets of elements
- Allows different layers to be read and interpreted **separately**



Creating layers

1. Group items into categories based on intended use
2. Determine rank & importance of groups
3. Use perceptual variables (size, value, hue, etc.) to establish layering effect
4. Maximize differences between groups while minimizing differences within groups
5. Use squint test to ensure elements in group retain together but visually separated

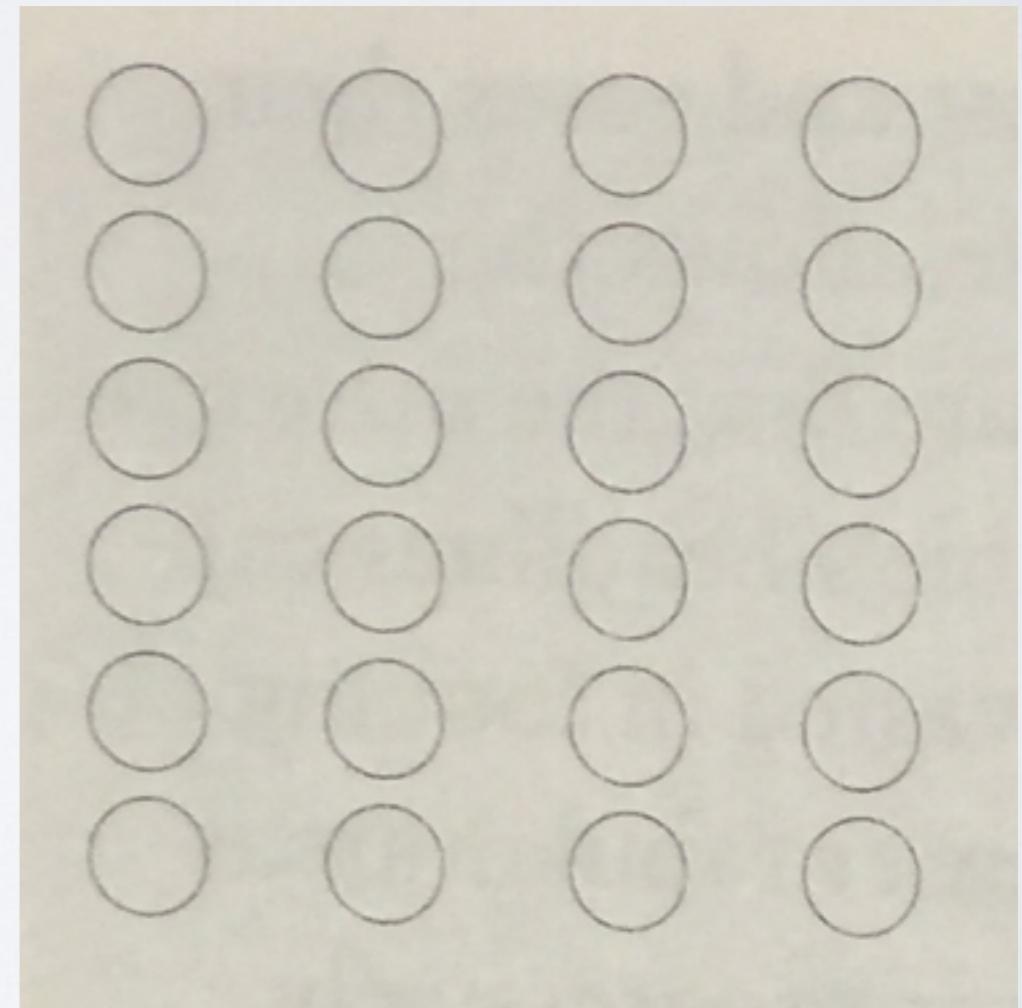
Organization & Structure

Organization & structure

- Benefits
 - Unity - ties together related elements so that they work **together**
 - Integrity & readability - offers structure that helps user to easily scan & make comparisons
 - Control - determines where user will focus **attention** in the design

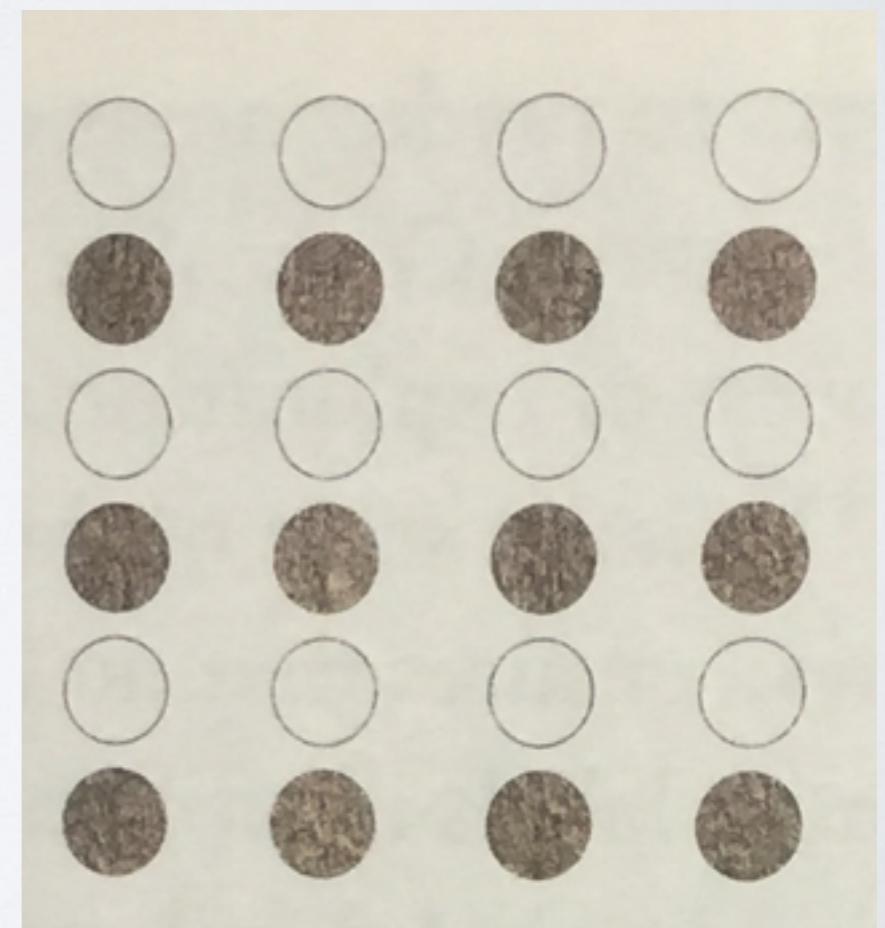
Gestalt principle - Proximity

- Elements associated must strongly w/ **nearby** elements
- parsed as 4 columns based on close vertical spacing
- then parsed as two sets of two columns based on spacing



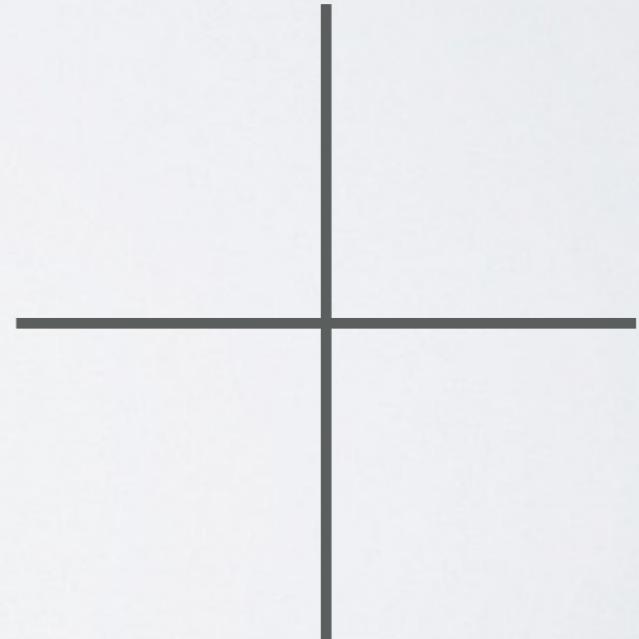
Gestalt principle - Similarity

- Elements associated more strongly when share common visual attributes than when they differ
- parsed as rows based on fill similarity, despite closer column spacing



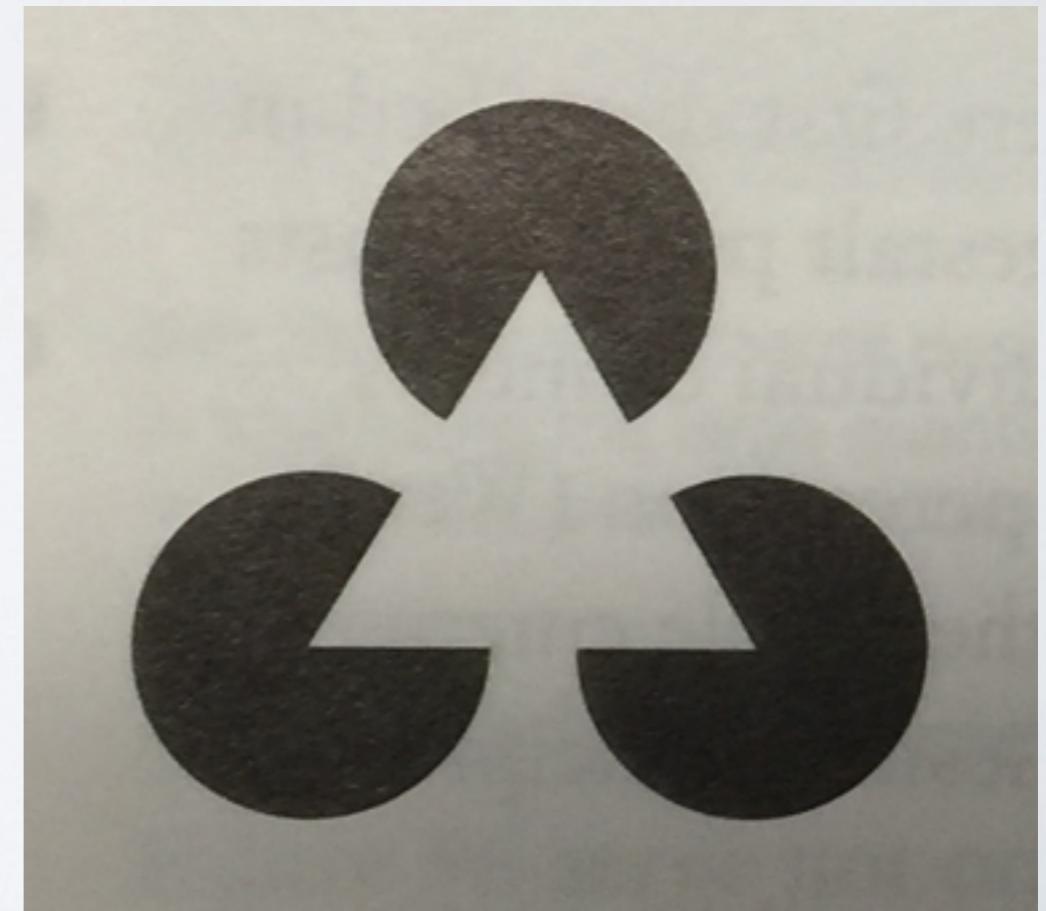
Gestalt principle - Continuity

- Preference for **simplest** physical explanation of complex figure
- parsed as two lines, rather than 4 separate lines or 4 opposing angles



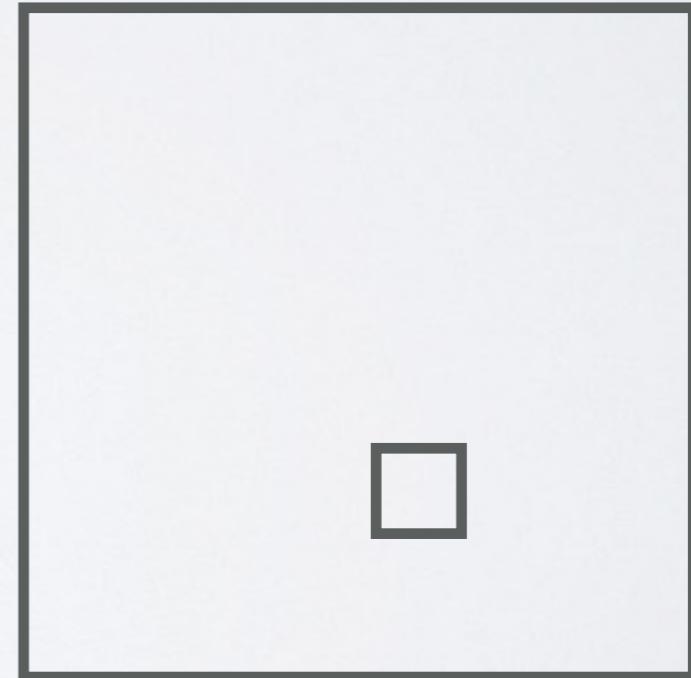
Gestalt principle - Closure

- Preference to interpret figures as complete, even when missing information
- Parsed as triangle superimposed on 3 complete circles, even though none of these is actually present



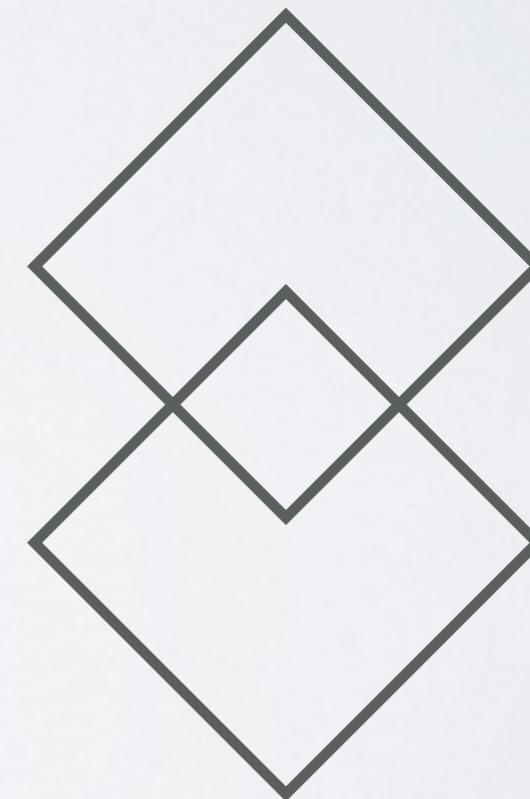
Gestalt principle - Area

- Preference to interpret smaller overlapping elements as figure, larger as ground
- Small rectangle parsed as small rectangle on top of larger, rather than hole



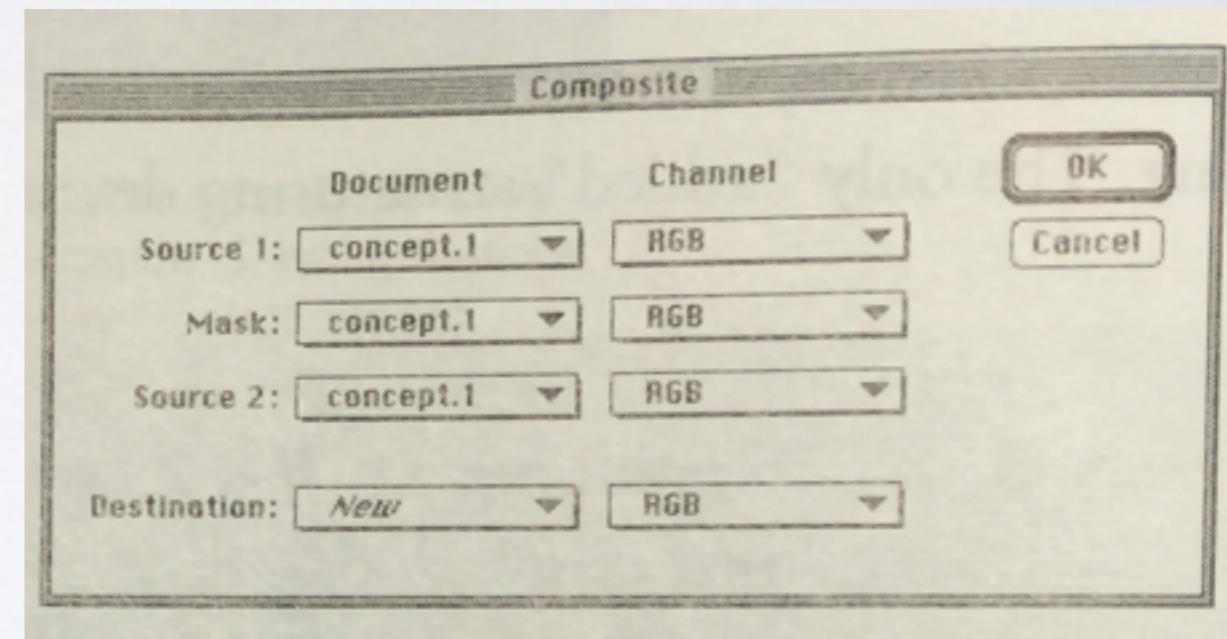
Gestalt principle - Symmetry

- Preference to interpret ambiguous form as multiple symmetric elements
 - Parsed as two overlapping objects rather than 3 separate shapes



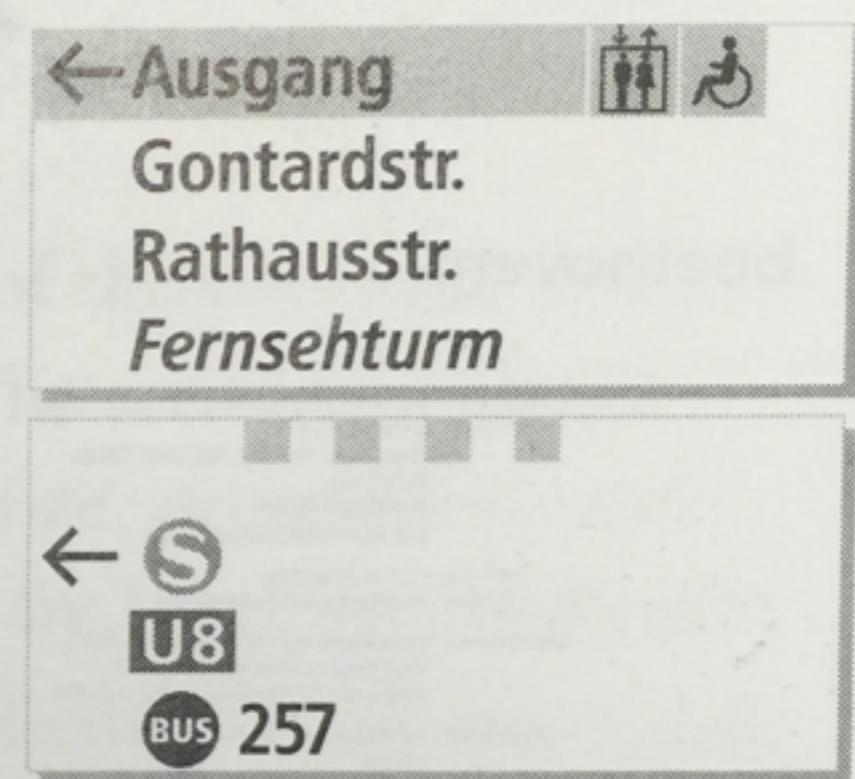
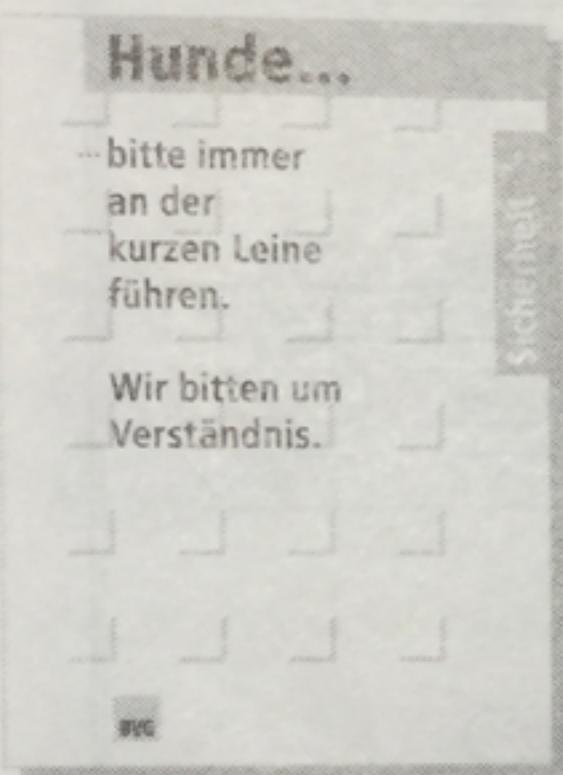
Grouping

- Binding UI elements tightly together while distinguishing them from surrounding controls
- Can be achieved through
 - Bounding boxes (not recommended)
 - Negative space & contrasts
 - Arrangement & alignment



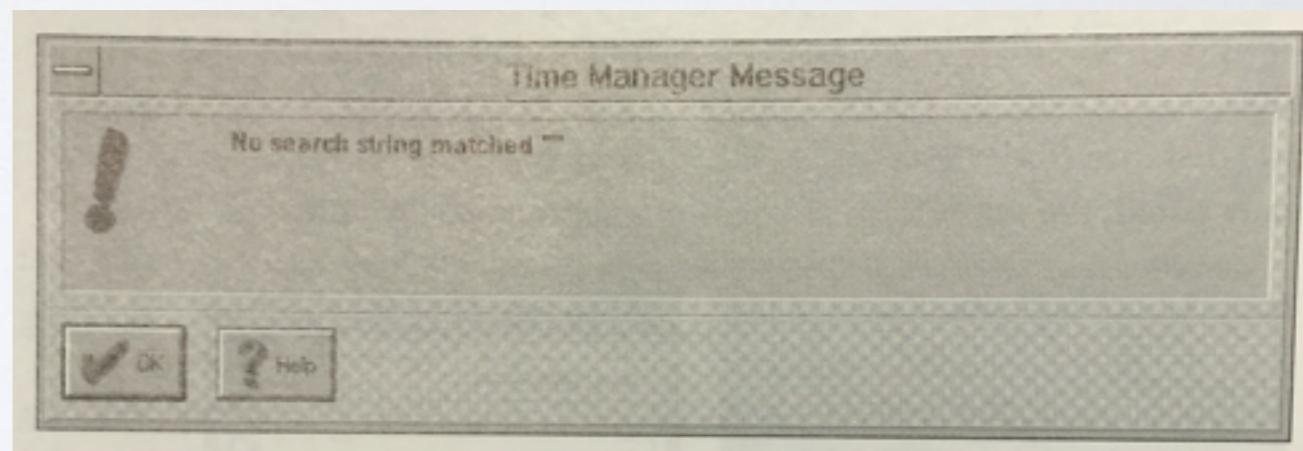
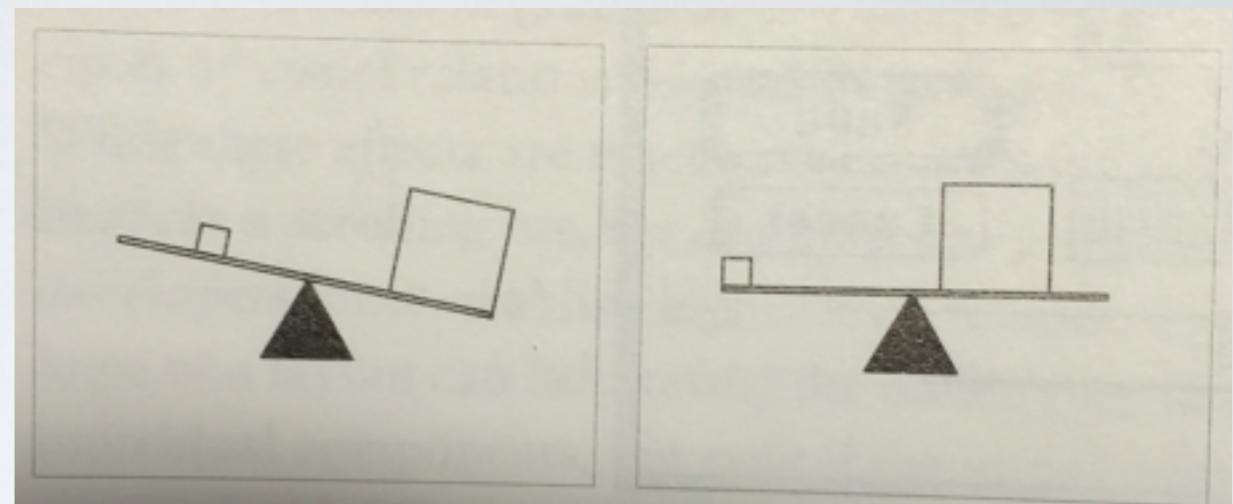
Hierarchy

- Order groups based on perceptual prominence corresponding to intended reading sequence



Balance

- Ensure that display remains stable in its position on screen by balancing visual weight on either side of diagram
- Can be done w/ asymmetric layouts by balancing heavier elements w/ lighter elements



off balance - too much on left

Error - Haphazard layout

xbugtool 2.0 Beta 2 Server: elmer-bb.Corp

Bug Id: _____ Cc: _____ Mode:

Category: <input type="text"/>	Priority: <input type="button" value="1"/> <input type="button" value="2"/> <input type="button" value="3"/> <input type="button" value="4"/> <input type="button" value="5"/>
Subcategory: <input type="text"/>	Severity: <input type="button" value="1"/> <input type="button" value="2"/> <input type="button" value="3"/> <input type="button" value="4"/> <input type="button" value="5"/>
Resp Mgr: <input type="text"/>	Bug/Rfe: <input type="button" value="bug"/> <input type="button" value="rfe"/>
State: <input type="text"/>	Responsible Engineer: _____

Synopsis: _____

Keywords: _____

State triggers:

-
-
-
-
-
-
-
-
-

Duplicate of: _____

Interest list: _____

Patch id: _____

See also (bugids): _____

History:

Submitter: _____	Date: _____
Generic SVR4 problem?: <input type="checkbox"/> no <input type="checkbox"/> yes	
Dispatch operator: _____	Date: _____
Evaluator: _____	Date: _____
Commit operator: _____	Date: _____
Fix operator: _____	Date: _____

(a)

weak relationships, varying widths

Bugtool

Bug ID: Type:

Category: XVview Subcategory: library

Release: 1.0 Severity:

Status: Submitted

Synopsis: _____

Keywords: _____

Pub Summary: _____

See also: _____

Interest List: _____

Root Cause: documentation-confusing

Same as: _____

Resp Mgr: none

Resp Engr: none

Hook 1: _____

Hook 2: _____

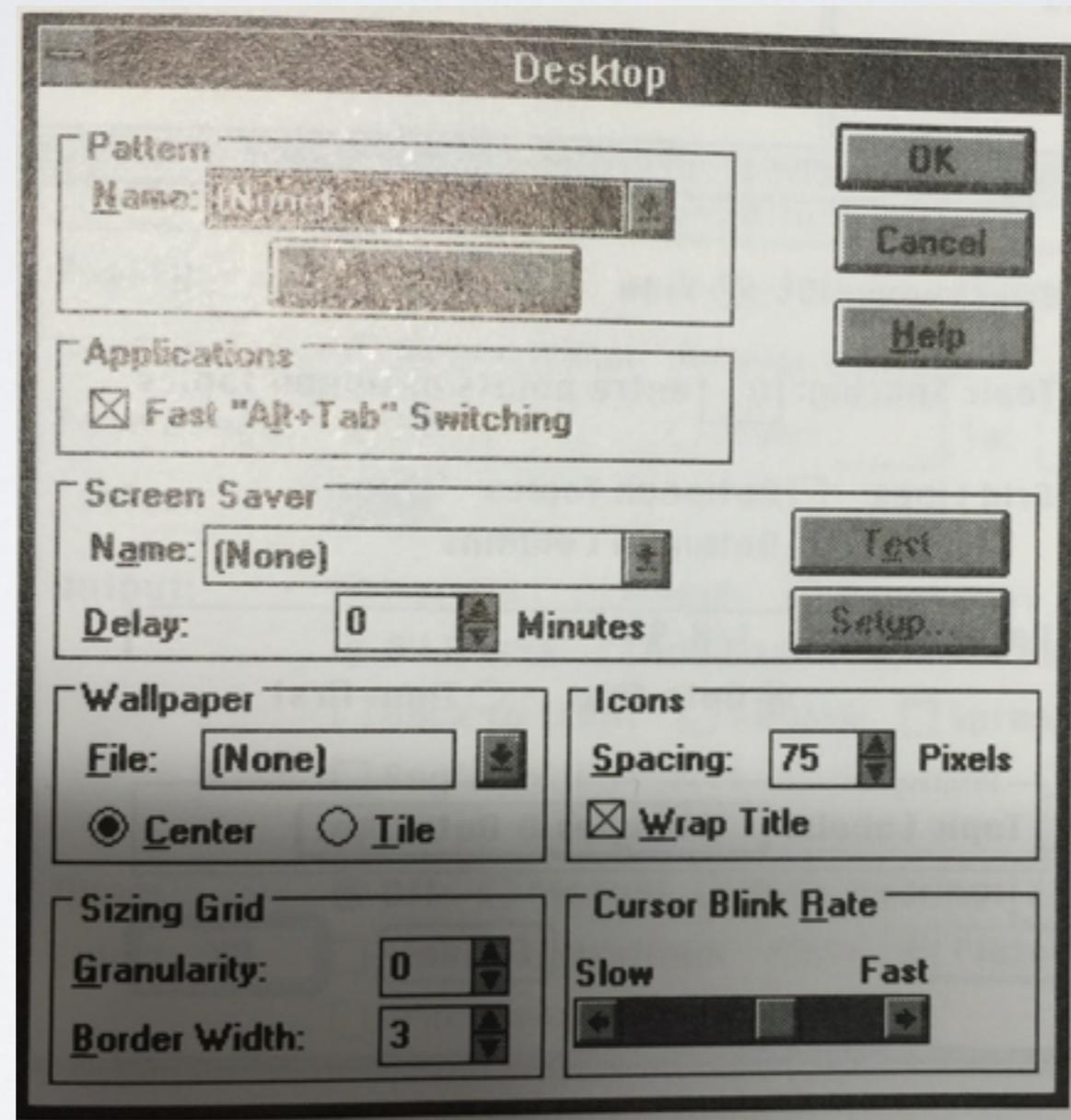
Flags: Fix Affects Documentation

Generic SVR4 Problem

(b)

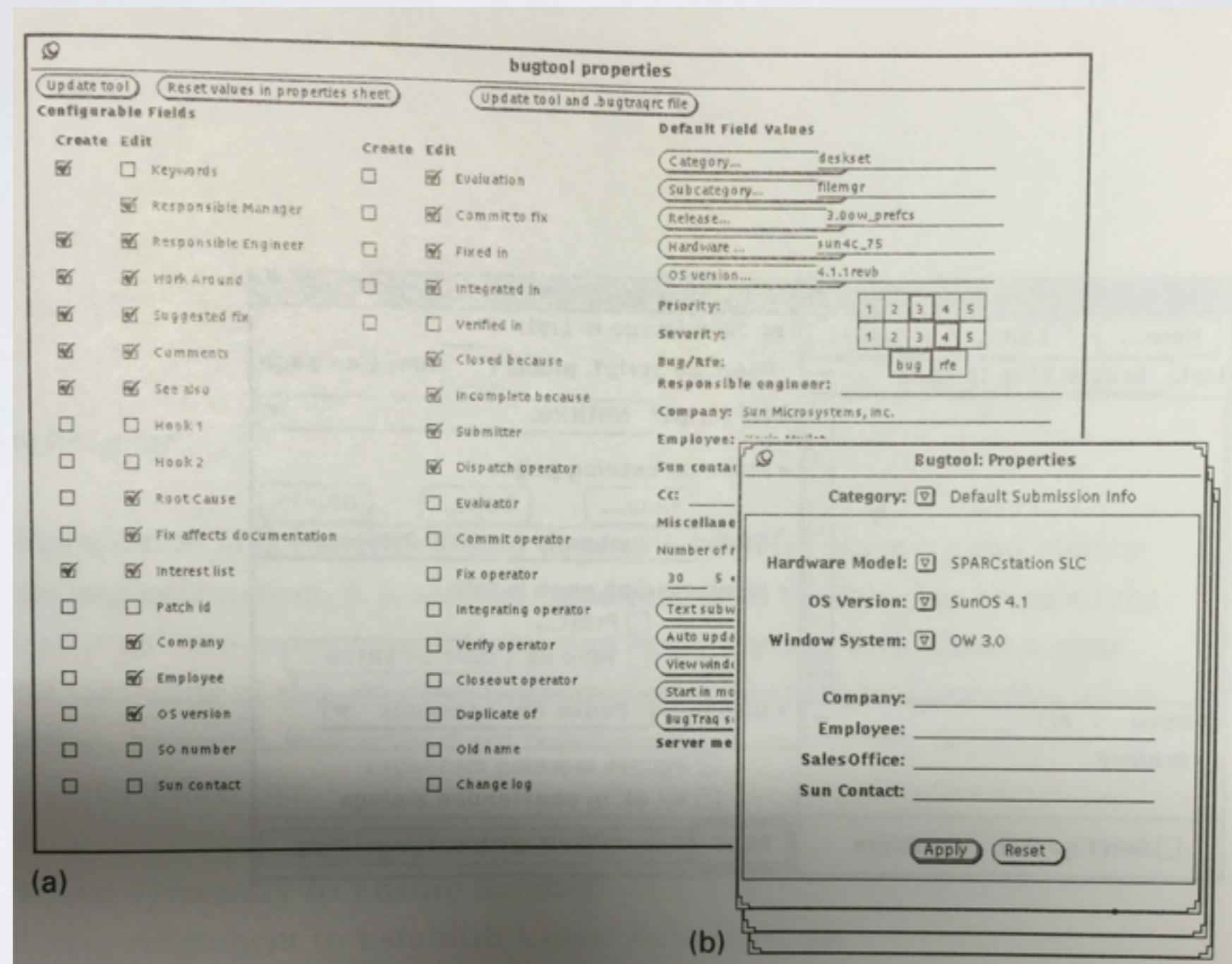
stronger relationships,
constant axis

Error - Ambiguous internal relationships



items almost, but not quite, in alignment

Error - Excessive display density

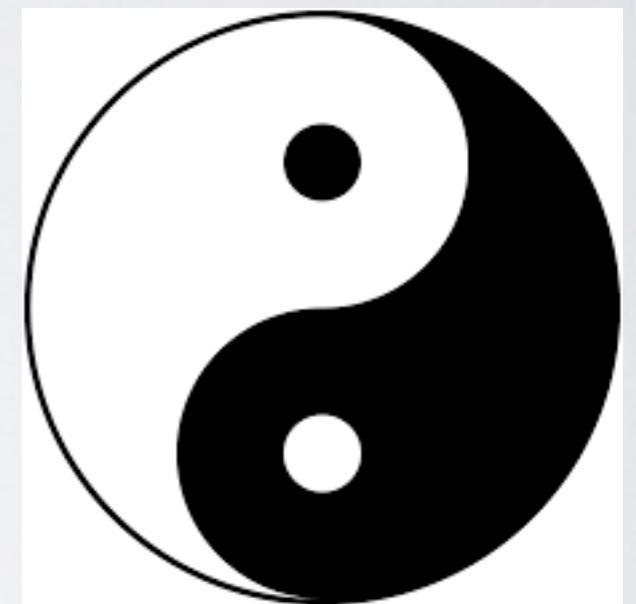


fixed by breaking into separate panes

Using symmetry

- Repetition of a form in translation, rotation, or reflection that unifies configuration

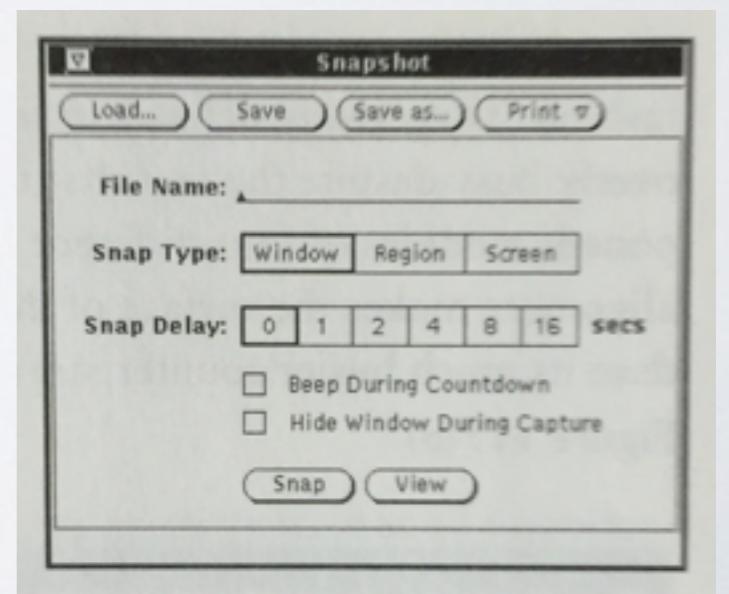
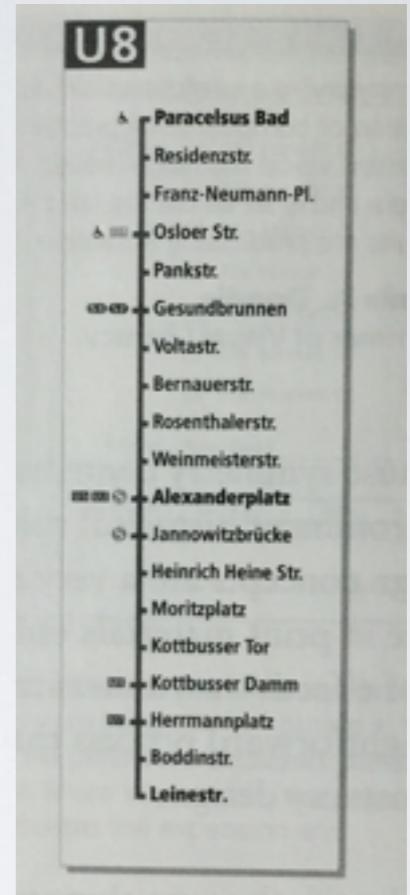
1. Identify axes of symmetry (vertical more prevalent)
2. Balance information about each side of the axis
3. Ensure axis is centered within overall display context



Using alignment to establish relationships

- Alignment reduces visual **noise**, making intentional deviations more salient
- Establishes **relationships** between aligned elements

1. Identify major boundaries of existing layout
2. Look for elements that are **almost** but not quite aligned
3. Look for **free-standing** elements and align
4. If no element to align with, align to overall display

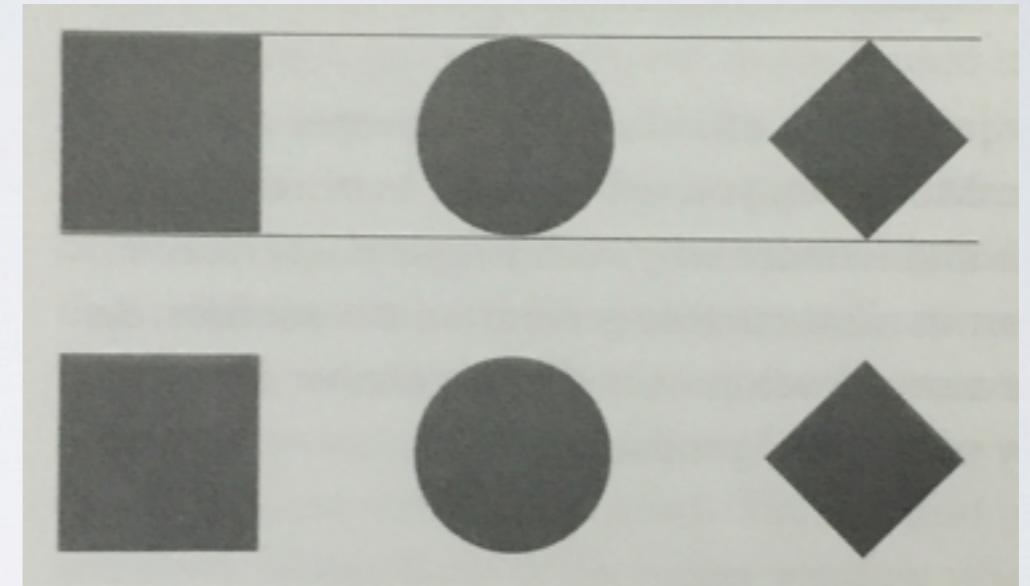


Optical adjustment for human vision

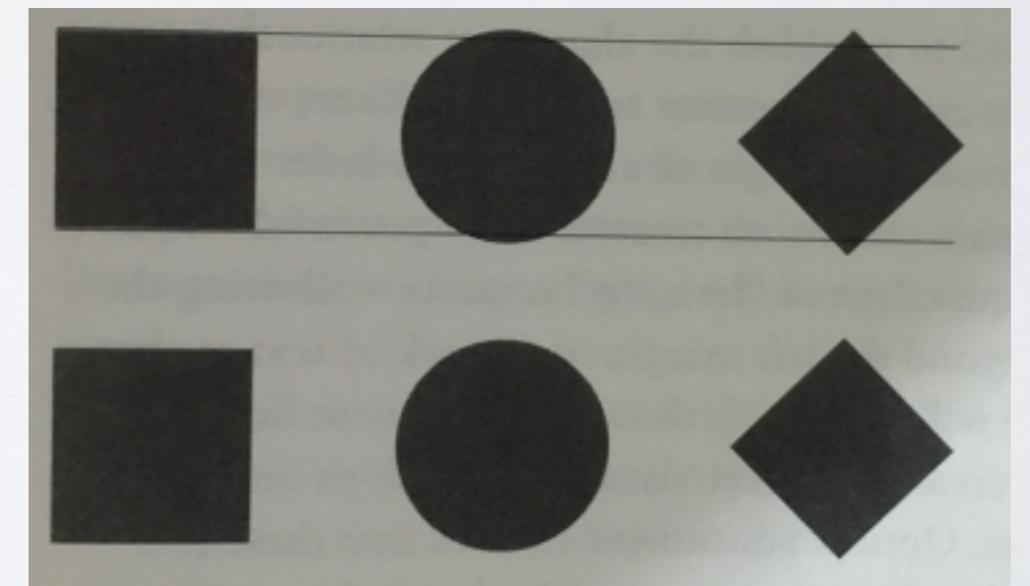
- Extend round or acute elements beyond target dimension to optically equivalent scaling

1. Determine **true** point of alignment

2. Extend elements beyond margin, according to acuteness of angle



physically equivalent scaling



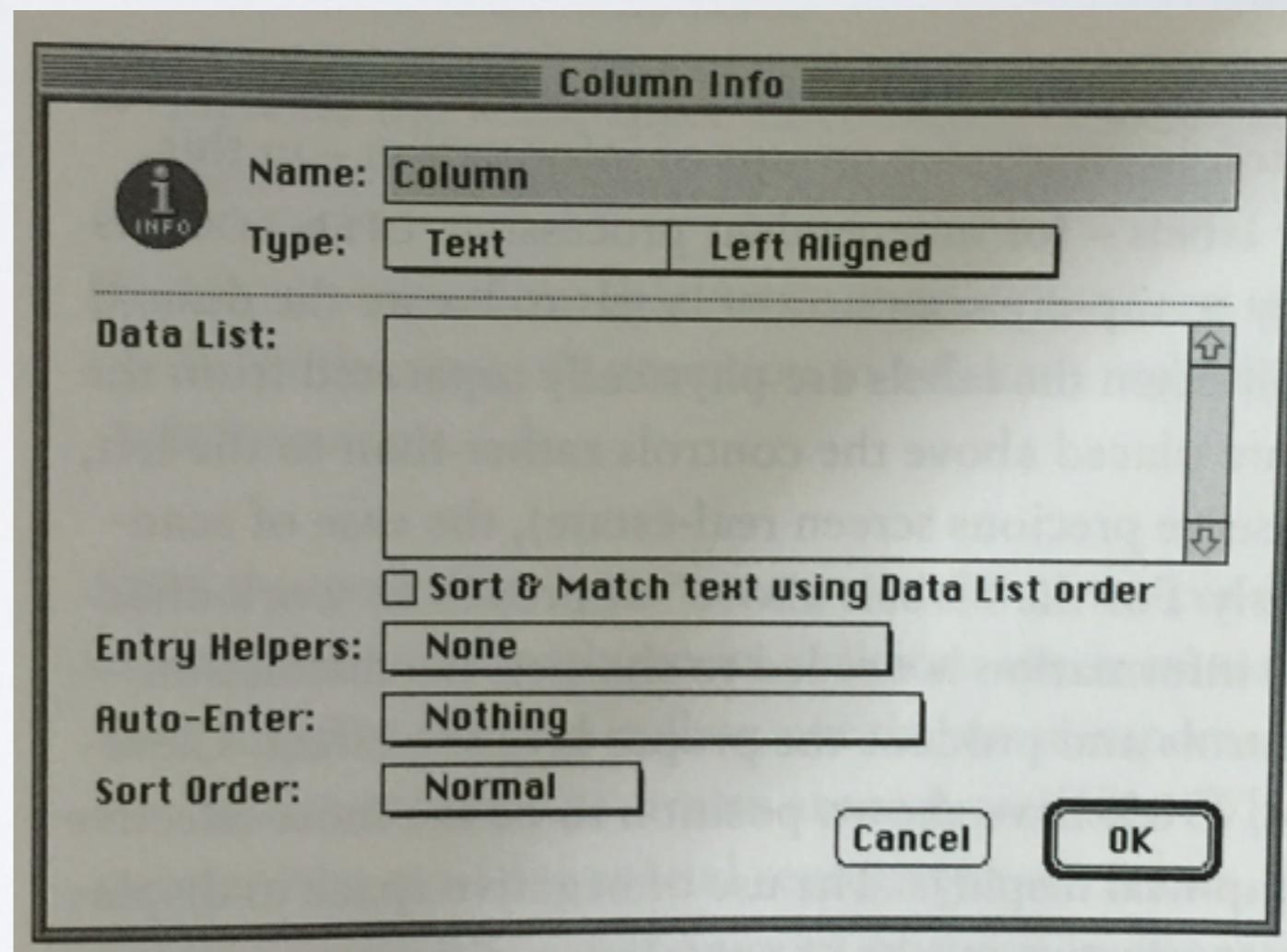
optically equivalent scaling

Use negative space

- Directs **attention** to critical regions of display

1. Review design, prioritizing groups

2. Add extra **space** to ensure spatial separation & emphasis, particularly for important elements

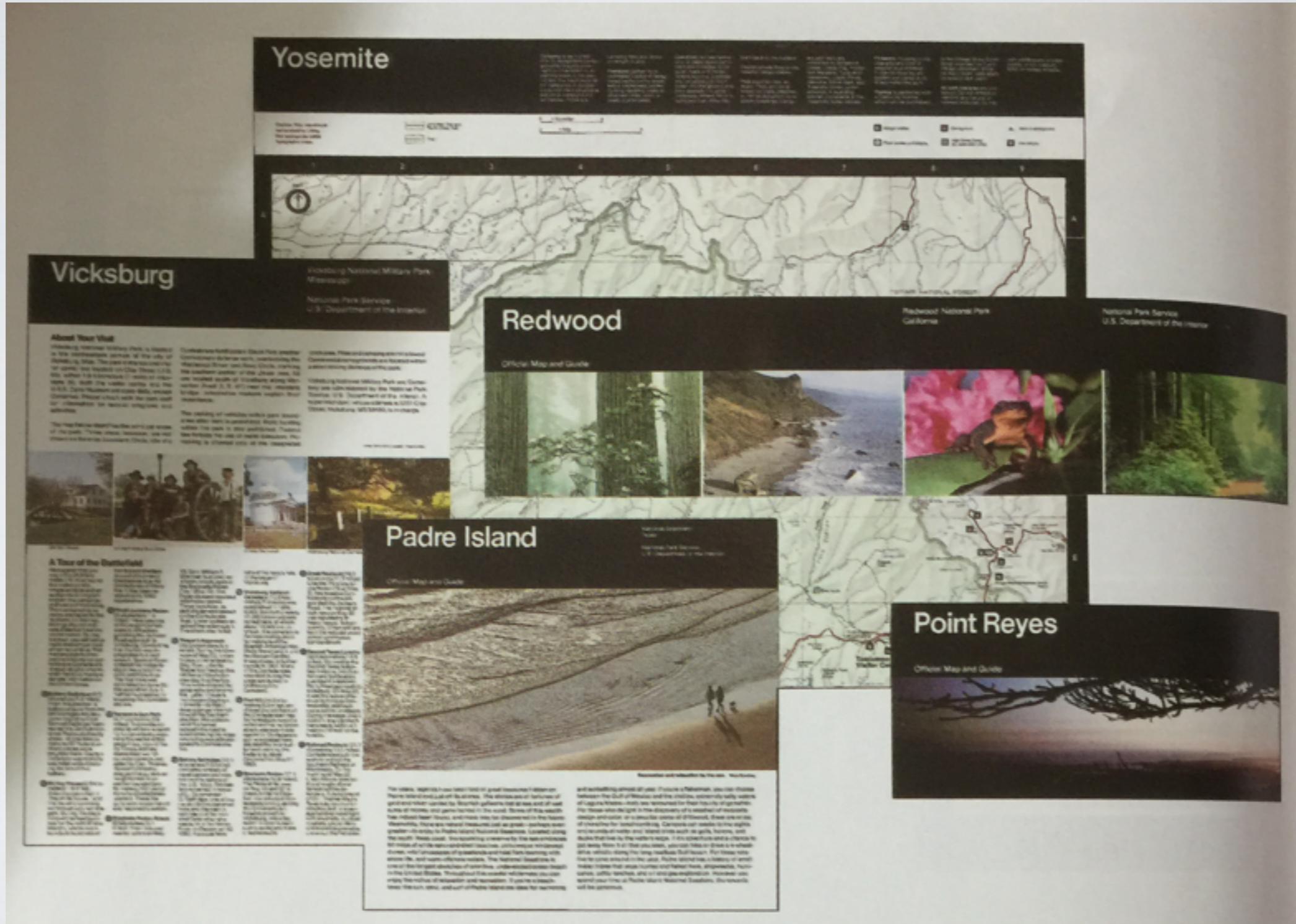


Module & Program

Module & program

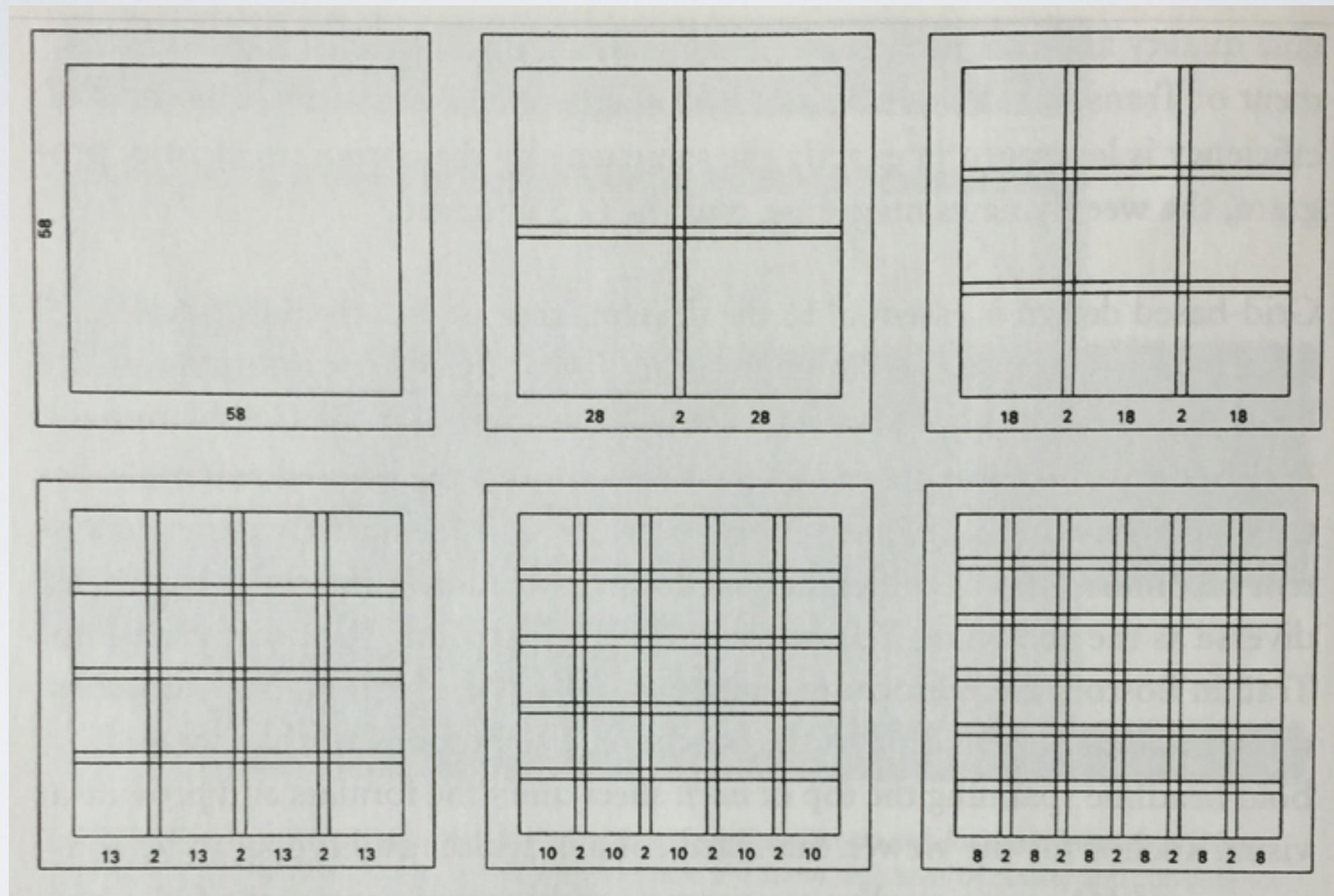
- Program - a comprehensive system of organization, using repeated sizes & proportions (modules) that bring **regularity** & structure
- Benefits
 - Predictability - prepares the user to respond to a small number of familiar patterns in **predictable** ways (consistent mapping)
 - Efficiency - enables lots of content to be quickly designed by reusing basic **underlying** structure

Grid layouts - example



repetition of strong elements & use of identical modular units for text

Grid layouts - example



divides content into rows and columns

Grid layouts - examples

Neue Typographie als Schlagwort und als Titel hatte zur Zeit des Erstehens von Tschichold's Buch *schöne Geschichte* (Die Neue Typographie war der Titel eines programmatischen Aufsatzes von Laszlo Moholy-Nagy im «Bauhausbuch» 1923, das im Zusammenhang mit der «Bauhaus-Ausstellung» in Weimar erschienen ist, die auch Jan Tschichold umgekettelt hat; Moholy-Nagy fordert dann «außerordentliche Einheitlichkeit in allen typographischen Werken. Die Lesbarkeit – die Mitteristung darf nie unter einer sogenannten Ästhetik leiden. Die Buchstabenzytopen dürfen nur in eine vorausbestimmt Form, z. B. ein Quadrat gezwungen werden») Ein Jahr später, 1924, schreibt Moholy-Nagy seinen Aufsatz «Zwanzigjährige Typographie-Ziele, Presse, Kritik, und 1928 neuen Aufsatzes zur Schriftform von Josef Albers und Herbert Bayer im Bauhaus-Sonderheft der Zeitschrift Schlagworte und Fortschritte sind «Ausnutzung maschineller Möglichkeiten, «Klarheit, Knaptheit, Präzision», «Einheitsschrift, ohne Minusstell und Majusstell, nur Einheitsbuchstaben – nicht der Größe, sondern der Form nach». Herbert Bayer ist später auf die Briefpflümer des Bauhaus dagegen in der Impressumssatz drückt, «er schreibt alles klein, denn wir sparen damit Zeit». Drei Monate nach die «Offizin» Nummer erscheint das Sonderheft «elementare typographische der Typographischen Mittelungen, der Zeitschrift der Setzer und Drucker, herausgegeben von kein Tschichold, «Typographie des Herbsts, kein Tschichold, Leipzig». Sein weiterer Aufsatz «Die Neue Gestaltung» nummert das Methoden des Buches «Die Neue Typographie» vorweg. Tschichold referiert das Entwickelung der Avantgarde, insbesondere der Malerei der letzten Jahrzehnte und versucht, die neue Typographie als Ergebnis der «konsequenter Arbeit des russischen Suprematismus, des holländischen Neoplastizismus (De Stijl) und insbesondere des Konstruktivismus» darzustellen. «Neue Typographie» ist Schlagwort und als Titel hatte zur Zeit des Erstehens von Tschichold's Buch *schöne Geschichte* (Die Neue Typographie war der Titel eines

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Neue Typographie als
Sachkunstwerk
und als Thea-
terstück zur Zeit

das Erstaunens von Tschichold. Buchsachen Geschichte „Die Neue Typographie“ war der Titel eines programmatischen Aufsatzes von László Moholy-Nagy im „Bauhausbuch“ 1923, das im Zusammenhang mit der „Bauhaus“ Ausstellung in Berlin erschienen ist, die auch Jan Tschichold umgebracht hat. Moholy-Nagy fordert dann qualifizierte, endgültige Klarheit in allen typographischen Werken. Die Leserwerke – die Mitterung darf nur unter einer sogenannten Aesthetik leiden. Die Buchstabenhypen dürfen nie in eine vorbestimmte Form, z.B. ein Quadrat gezwängt werden – ein Jahr später 1924, Schreibt Moholy-Nagy seinen Aufsatz „Zwergmälde Typographie“ Zeitschrift, Praxis, Kritik und 1926 weitere Aufsätze zur Schriftkunst von Josef Albers und Herbert Bayer im Bauhaus Sonderheft der Zeitschrift „Offenes Schriftwesen“ und fordernungen sind ausnutzung maschineller Möglichkeiten, Klarheit, Knapperheit, Präzision, Effizienz, schrift, ohne Minuskeln und Majuskeln, nur Einheitsbuchstaben – nicht die Gräfin, sondern die Form nach Hartmut Beyer 1952 später auf die Briefkasten des Bauhauses dessen in der Typographieproduktion herzuschreiben dieses Mann, dann wir sparen damit auf. Die Minuskeln nach der „Offenen“ Nummer erscheint das Sonderheft als markante typographische „Typographie“

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Steve Typographic als
Schriftguru und als The-

Ein Jahr später, 1824,
nahm der Maler Gustav Adolph
Aurivillius (1784-1854)

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hette zur Zeit des Erscheinens von
Tschichold's Buch etlichen Geschicht-
-Die Neue Typographie war der Titel
eines programmatischen Aufhefts
von Laszlo Moholy-Nagy im Bau-
hausblatt 1923 das im Zusammen-
hang mit der Bauhauss Ausstellung
in Weimar anlässlich ist, die auch
Jan Tschichold umgedacht hat.
Moholy-Nagy fordert dann zentral
eine andeutende Klarheit in allen
typographischen Werken. Das Le-
bendkunst - die Mimesierung darf nur

Topographie. Zeigt, Preise, Kritik und 1928 neben Aufsätzen zur Schriftform von Josef Albers und Herbert Bayer im Bauhaus Sonderheft der Zeitschrift *Offene Schriften* und Forderungen und Wurzelnotung maßnahmreicher Möglichkeiten, Klarheit, Knappeit, Präzision, einheitsschrift, ohne Minuskeln und Majuskeln, nur Einheitsbuchstaben – nicht der Größe, sondern der Form nach! Herbert Bayer ist später auf die Briefschriften des Bauhauses ebenfalls der Impressionenstil drücken

2 28

Review Typographical and Book Reviews

Ein Jahr später, 19
ausdrückt Mischoly
Hörer seines

Two months nach der
dritten Runde

und als Titel hatte zur Zeit des Erscheinens von Tschichold's Buch schon Geschichts- (Die Neue Typographie) war der Titel eines programmatischen Aufsatzes von Leopold Móchov Nagy im «Bauhausbuch» 1923, das im Zusammenhang mit die «Bauhaus» Ausstellung in Weimar erschienen ist, die auch an Tschichold umgesetzt

Aufzüts „Zengenmäßige Typographie. Ziele, Praxis, Kritik“ und 1926 neben Aufzüts über Schriftformen von Josef Albers und Hartbert Besser im Bechsteinschen Sonderheft der Zeitschrift *OFFEN*. Schlagworte und Forderungen sind akzentuierungen maschineller Möglichkeiten, „Klarheit, Knappheit, Präzision, Einheitlichkeit, ohne Minutigkeit und Meisterschaft, nur Einheitlichkeit, nicht der Größe.“

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Neue Typographie als Schlagwort und als Titel

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hette zur Zeit des Erscheinenes von Technoheile Buch schen Geschichte. Die Neue Typographie war der Titel eines programmatischen Auftrittes von Laszlo Moholy-Nagy im Bauhausalmanach. 1922, das im Zusammenhang mit der Bauhaus-Ausstellung in Weimar erschien, ist die auch hier Technoheile umgetauft hat. Moholy-Nagy fordert dann visualisierter ausdrückliche Klarheit in allen typographischen Werken. Die Lesbarkeit – die Mitalterung darf hier unter einer a priori angenommenen Ästhetik haben. Die Buchstabenstriche dürfen nie in eine vorbestimmte Form, z. B. ein Quadrat gewellt werden. « Ein Jahr später, 1924, Schreibt Moholy-Nagy seinen Aufsatz *Zerstörung* Typographie. Zeigt mediale Typographie Zeitschriften, Kritik und 1926 haben Aufsätze zur Schriftform von Josef Albers und Herbert Bayer im Bauhaus-Sonderheft der Zeitschrift *Offen*: Schlagworte und Forderungen sind Wahrung maschinelner Möglichkeiten, Klarheit, Knappeit, Präzision, « Einheitsschrift, ohne Minuskel und Majuskeln, nur Einheitsstrichen – nach der Größe, sondern der Form nach. Herbert Bayer wird später in die Befreiung der Schrift, dass es in der Immaginea zwei drücken, zwei schreiben, alles kann, dann kann ich sparen, dann kann ich mehr. Drei Monate

10 2 10 2 10 2 10 2 10

Neue Typographie als Schlagwort und

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als Titel hatte zur Zeit des Erreichens von Tschichold's Buch schon Geschichte. «Die Neue Typographie» war der Titel eines programmatischen Auftritts von Laszlo Moholy-Nagy im «Bauhausbuch» 1923, das im Zusammenhang mit der «Bauhaus»-Ausstellung in Weimar erschienen ist; die auch Jan Tschichold umgesetzt hat. Moholy-Nagy fordert dort in kriegerischer und durchdringlicher Kürze in allen typographischen Werken die Lesbarkeit – die Mitteilung darf nur unter einer e praeconit angenommenen Ästhetik leben. Die Buchstaben-typen dürfen nur in eine vereinfachte Form, z. B. ein Quadrat geändert werden. Ein Jahr später, 1924, schreibt Moholy-Nagy seinen Auftritt «Zur neuen Typographie». Zeits. Preiss, Kritik und 1928 haben Aufsätze zur Schriftform von Josef Albers und Herbert Bayer im «Bauhaus». Sonderheit ist das Zeitschrift «Offenes Schlagwort» und Forderungen sind ausnutzung menschlicher Möglichkeiten, klarheit, Knaptheit, Präzision, «Einfachheit», ohne Monostyl und Maystrial, nur Einheitsschärfepunkten – nicht

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selecting a single layout provides unifying theme & expectations

Grid layout principles

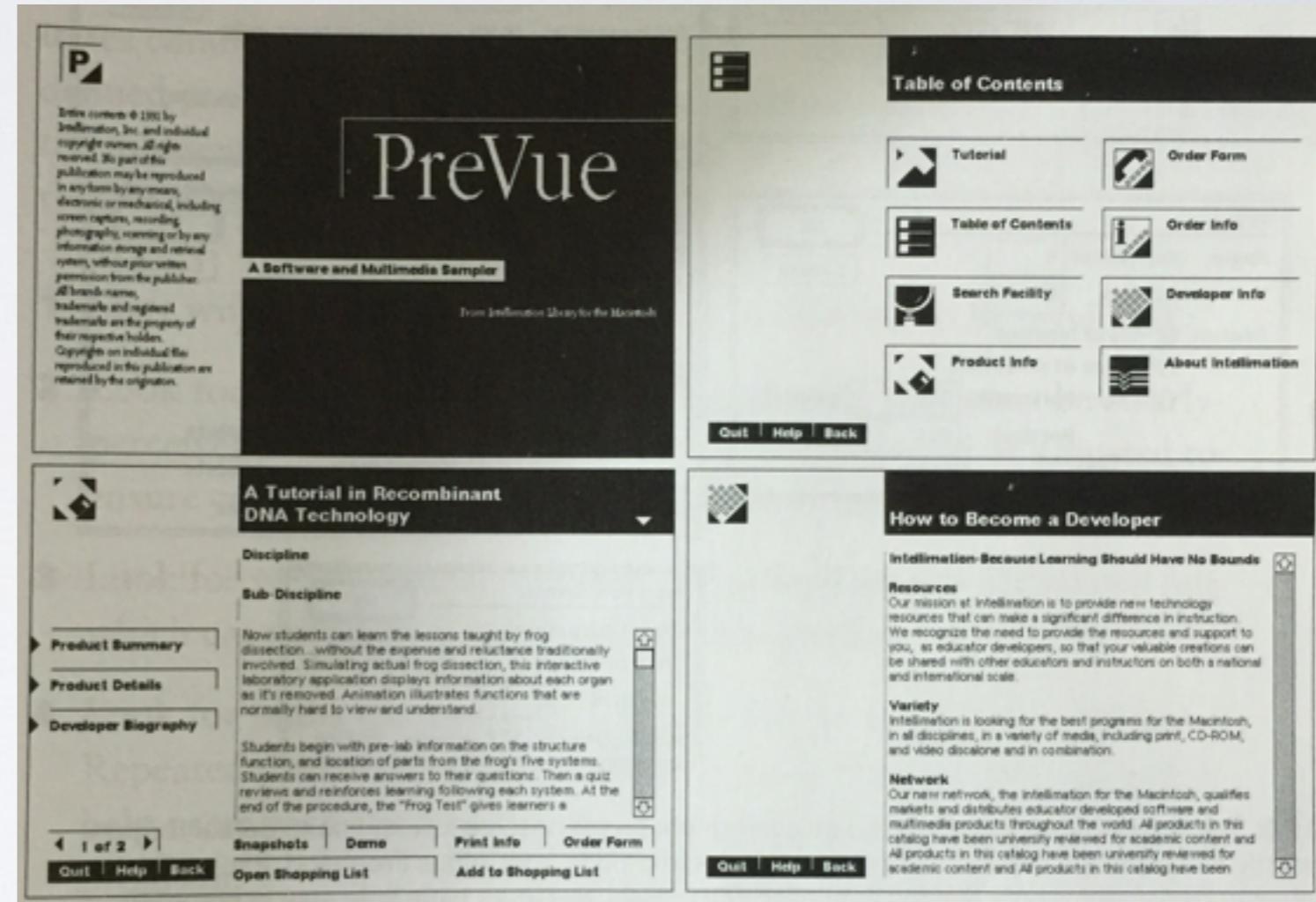
- Focus - introduce a rhythm and regularity that makes structure **predictable** & explicit
- Flexibility - enable program to be used in multiple **contexts** (e.g., different number of columns)
- Consistent application - used consistently to become expected & familiar

Reinforce structure through repetition

1. Look for common margins or functional **units**

2. Look for **paths** user's eye needs to follow, repeating structural elements to serve as landmarks

3. Use standard **locations** & consistent presentation style



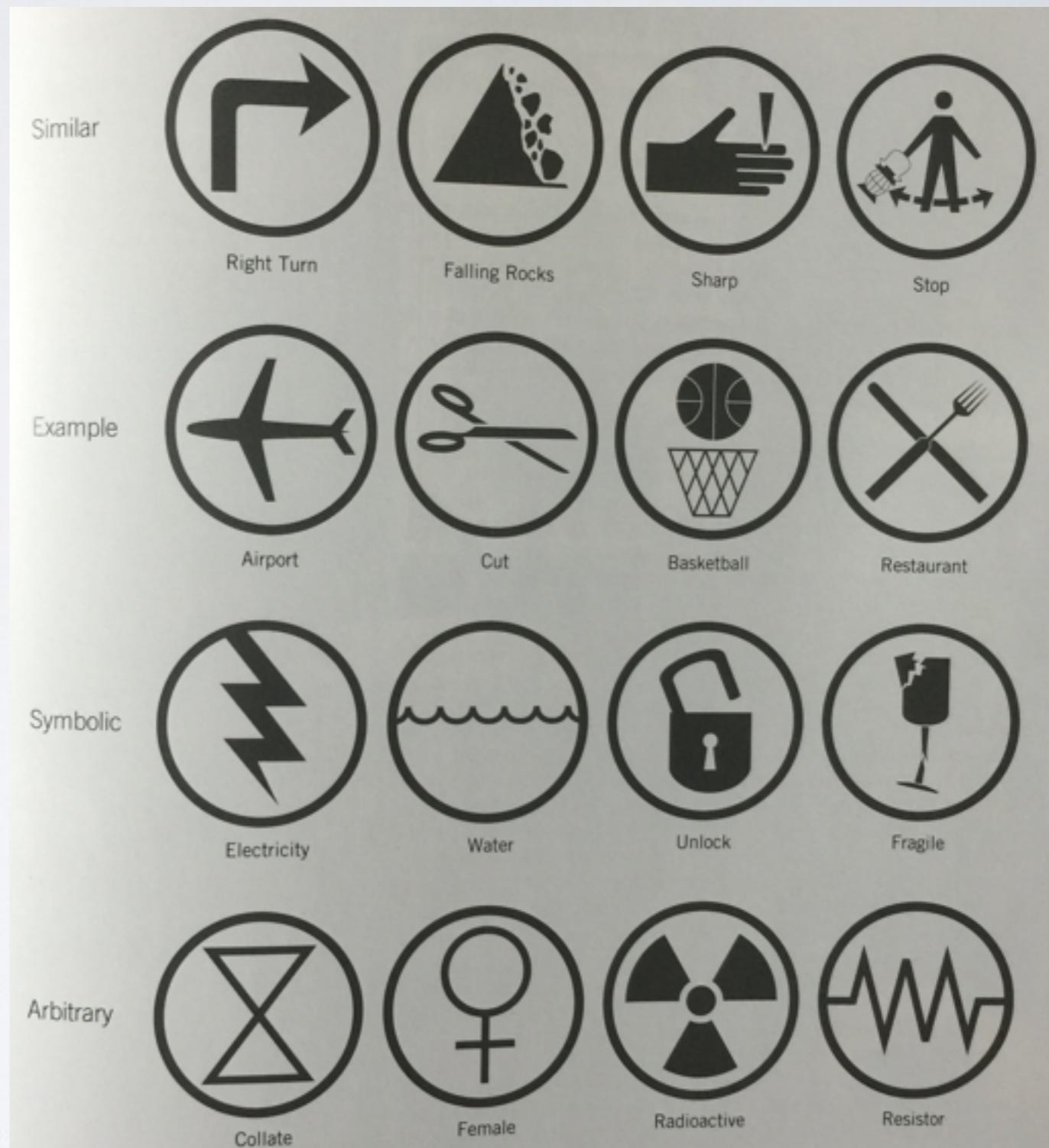
Images & Icons

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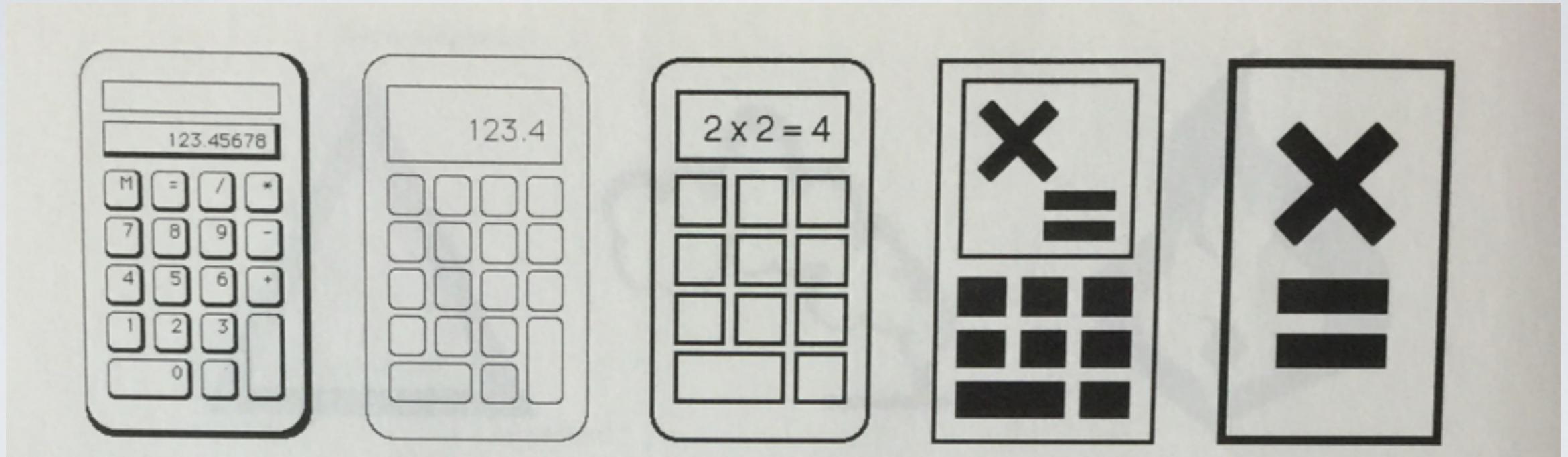
- Benefits
 - Identification - images are easy to recognize
 - Expression - breadth of artistic expression that can make design more engaging & enjoyable

Types of iconic representation

- Similar - visually **analogous** to action, object, concept
- Example - things that exemplify or are commonly associated
- Symbolic - represent concept at higher level of **abstraction**
- Arbitrary - little or no relationship to concept, must be learned through **standard**



Use of abstraction



- Simplifying highly concrete, realistic representations makes them easier to interpret up to the point at which further abstraction obscures icon's semantics
- Makes icon more generic, more canonical, less complex

Principles of icon design

- Immediacy - can be perceived effortlessly & involuntarily by being **bold**, clear, balanced



- Generality - represents a **class** of items, rather than an individual element, by removing details that may vary



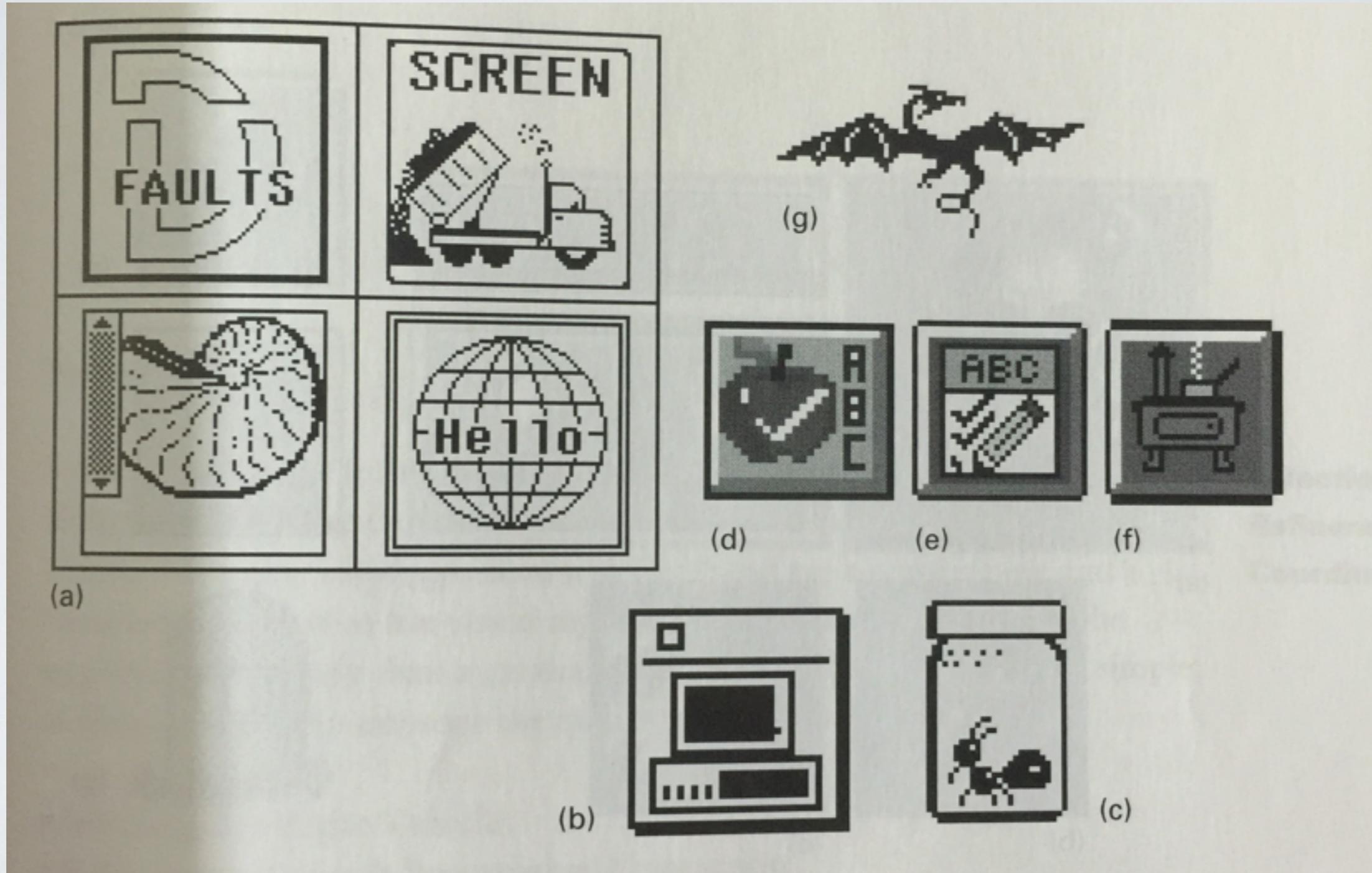
- Cohesiveness - set of icons that function **together** by sharing visual variables



- Characterization - call to mind one or more **distinctive** features



Error - Cultural or language dependence



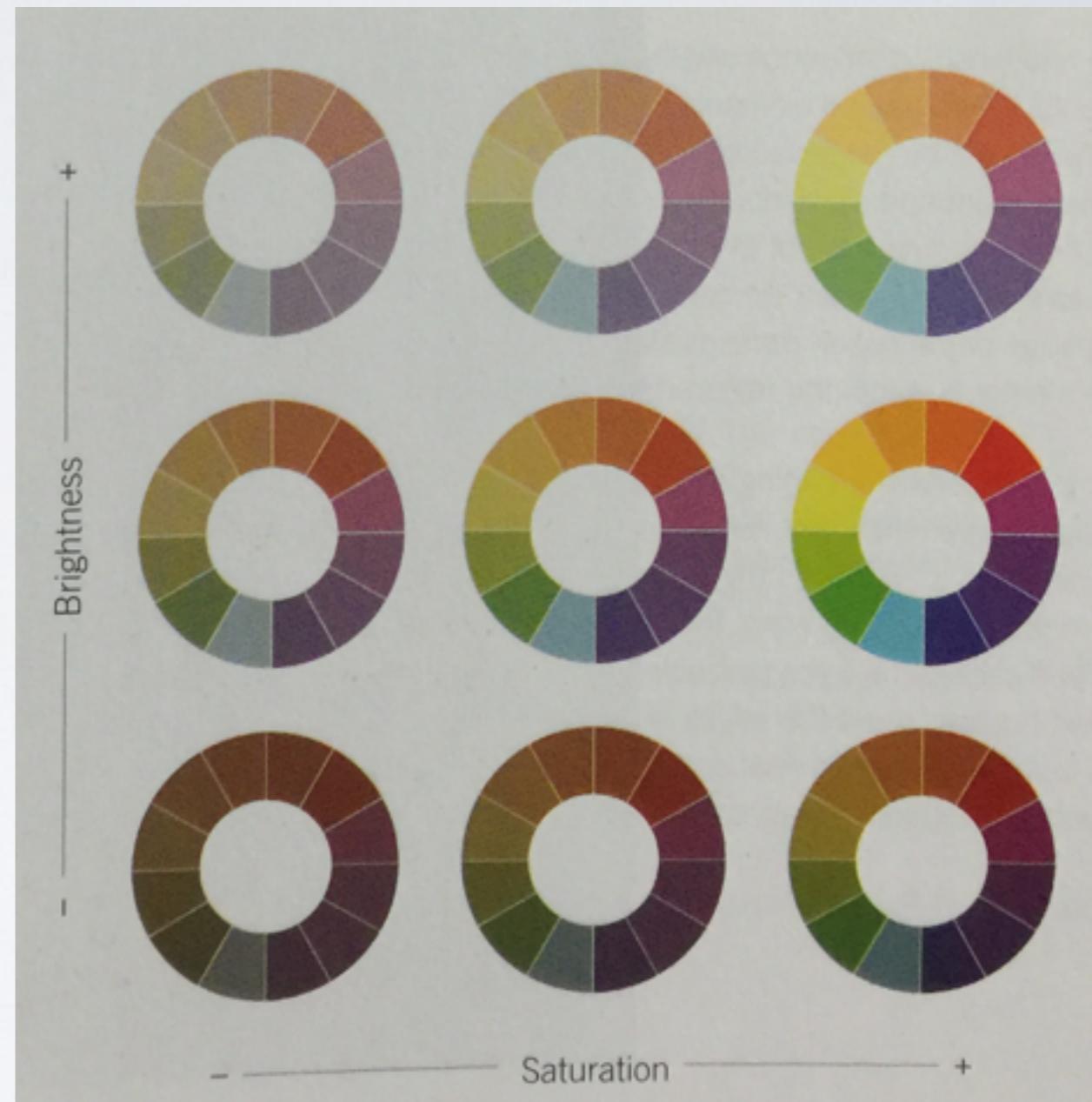
Selecting the right type of icon

- If concept is concrete, familiar, tangible, use similar or example icon
- If concept will be used repeatedly, consider using more symbolic or arbitrary icon based on convention
- If concept is abstract process or subtle, use textual label

Color

Color

- Hue: What we usually see as color
- Luminance: Amount of light entering eye
- Brightness: Perceived amount of light
 - (blue appears brighter than white)
- Saturation: Purity of color



Color combinations

The grid illustrates four types of color combinations using color wheels and examples from nature:

- Analogous:** Shows a color wheel with a triangle in the center. Below it is a color bar with three squares: light blue, dark purple, and medium purple. The text explains: "Analogous color combinations use colors that are next to each other on the color wheel." An example from nature is a brown ammonite shell.
- Triadic:** Shows a color wheel with a triangle in the center. Below it is a color bar with three squares: olive green, burnt orange, and dark purple. The text explains: "Triadic color combinations use colors at the corners of an equilateral triangle circumscribed in the color wheel." An example from nature is a purple and yellow pansy flower.
- Complementary:** Shows a color wheel with a large X in the center. Below it is a color bar with two squares: lime green and burnt orange. The text explains: "Complementary color combinations use two colors that are directly across from each other on the color wheel." An example from nature is a purple crocus flower.
- Quadratic:** Shows a color wheel with a square in the center. Below it is a color bar with eight squares arranged in two rows of four: dark purple, lime green, orange, and dark purple. The text explains: "Quadratic color combinations use colors at the corners of a square or rectangle circumscribed in the color wheel." An example from nature is a red-eyed tree frog.



Guidelines on color use

- Number of colors - use color conservatively, limiting to ~5 colors; redundantly encode info to support color-blind
- Use appropriate color combinations
- Use warmer colors for foreground & cooler colors for background
- Use saturated colors to draw attention & for excitement
- Use desaturated, dark colors for serious & professional

Guidelines on color use

- Avoid highly saturated opponent colors at the same time
- Older users need more brightness
- Do not require color discrimination in small areas
- Use color for relative differences, but not numeric information
- Use greater intensity for hues that indicate larger amounts