

Visual Design



SWE 432, Fall 2016

Design and Implementation of Software for the Web

With at least 30 new things you won't believe!

#10 will shock you!

(actually we hope you believe it all)

Show and Tell: More Airplanes

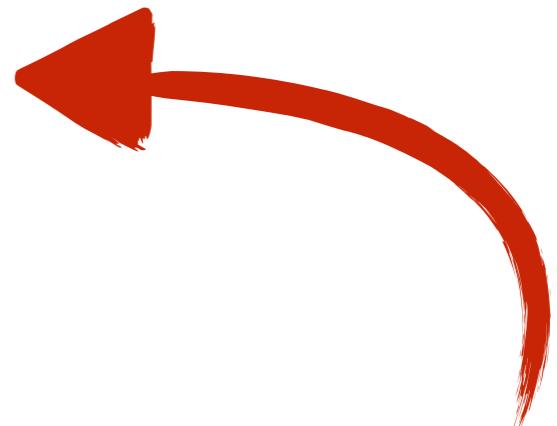
A DAY IN THE LIFE OF
AIR TRAFFIC OVER
THE CONTINENTAL U. S.

ANIMATION CREATED USING
FUTURE ATM CONCEPTS
EVALUATION TOOL
(FACET)

FOR
AVIATION SYSTEMS DIVISION
(AF)
NASA AMES RESEARCH CENTER

Today

- Importance of visual design: solving communication problems
- Some guidelines
- A lot of example and anti-examples



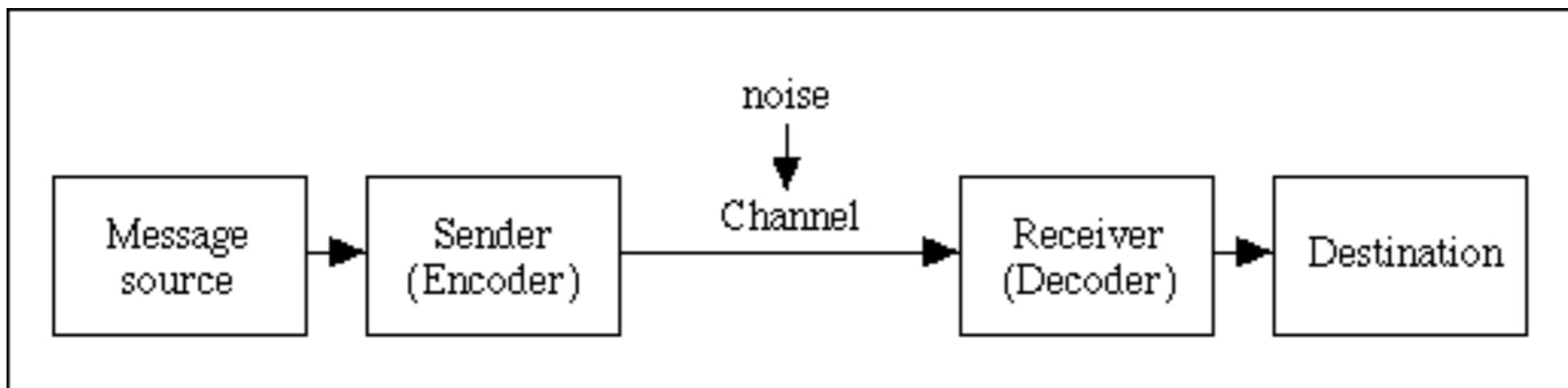
Plus a ton of practical visual guidelines!

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 variables—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 variables & organization encode information

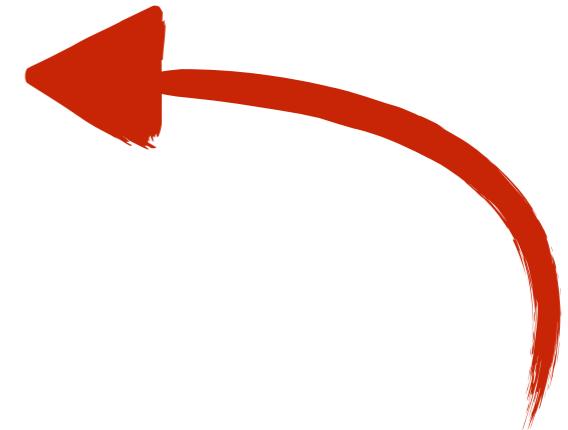


Goals for visual design

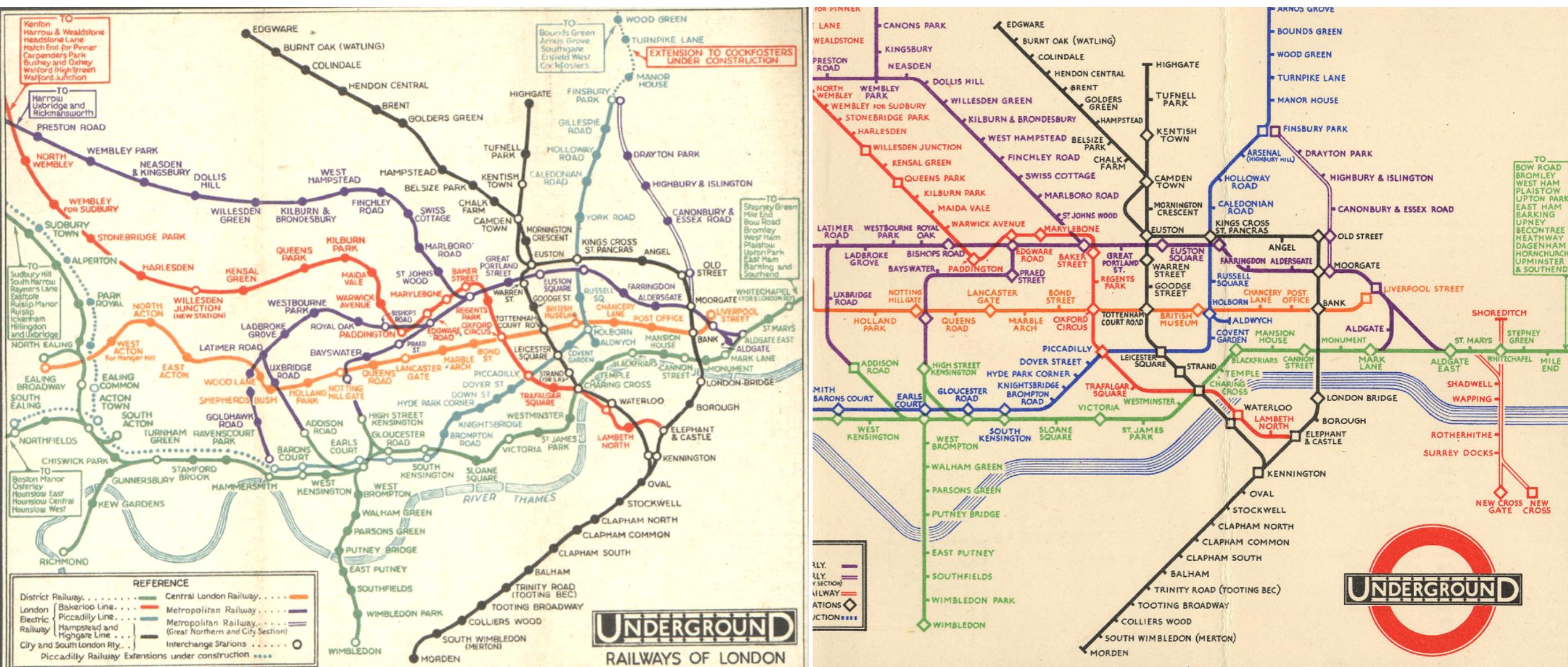
- Successfully **transmit** information
- Reduce visual **search** time through layout & organization
- Create desired **emotional** reactions through aesthetic choices
- Present coherent & consistent design that reduces ambiguity and potential confusion

Guidelines for Visual Design

Besides using “Marker Felt thin” for callouts!



Guidelines for Visual Design



Consider: Two Subway Maps

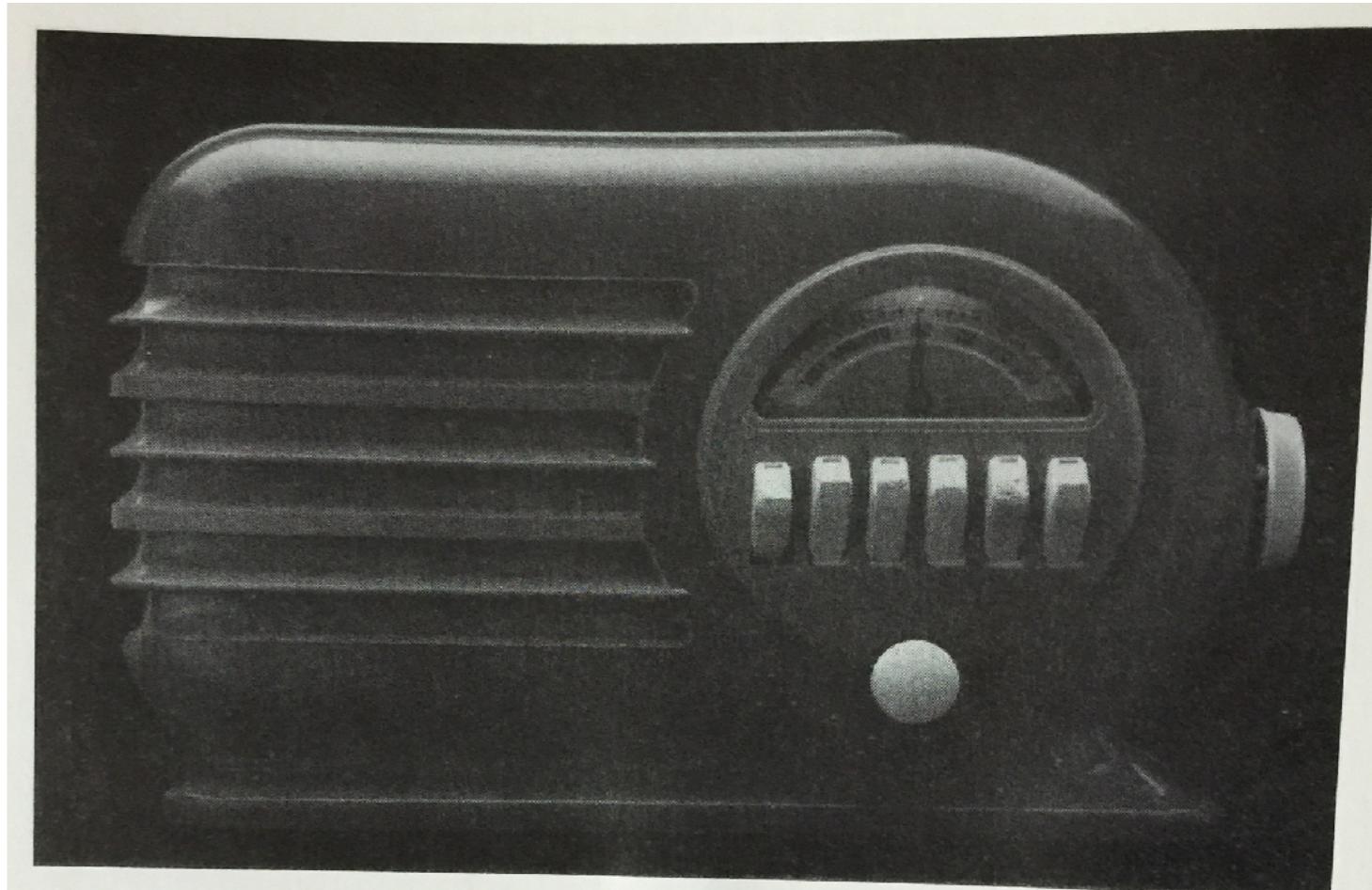
Elegance & simplicity

- *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

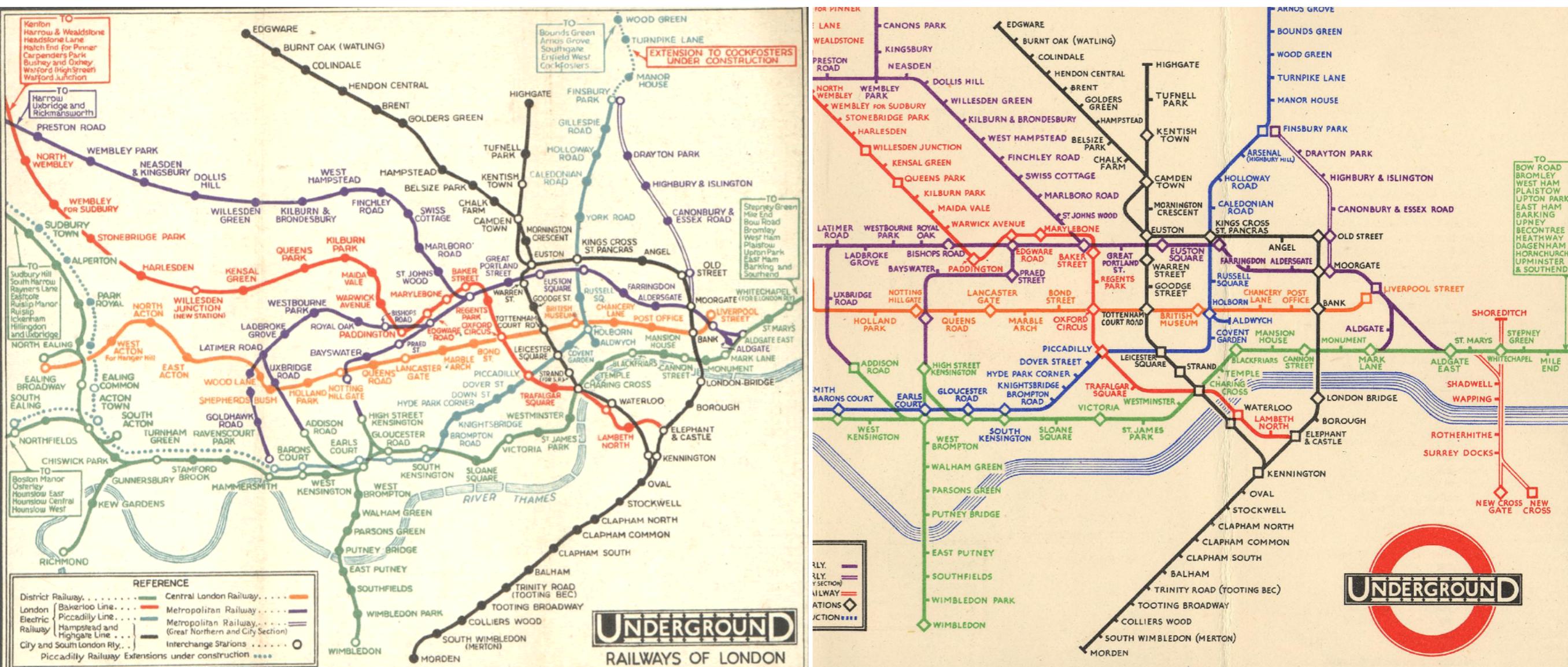


Benefits of simplicity

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



Guidelines for Visual Design



Simplicity in new map: Abstract Geographic Details

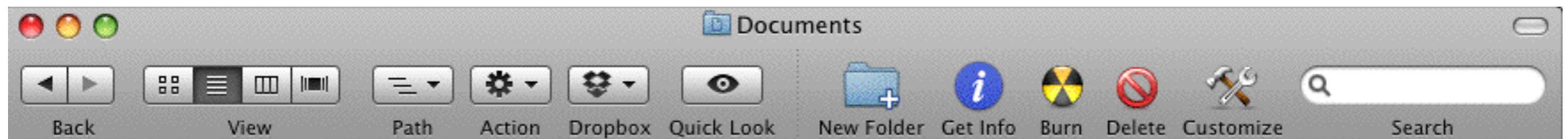
Reducing a design to its essence

- Make design simple, bold direct by removing inessential details & elements
 - Even essential elements may be suggested

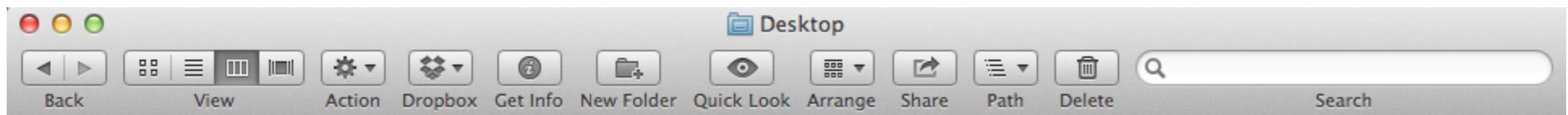
1. Determine essential qualities & information to be conveyed
2. Critically examine each element & ask how design would suffer without it.
3. Try removing elements. What happens?



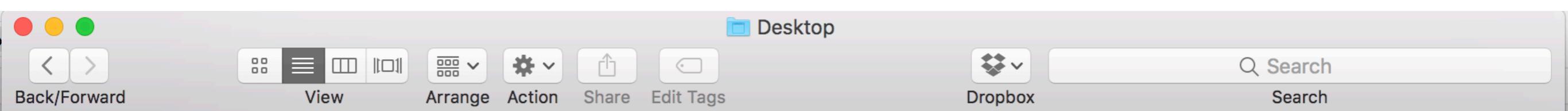
Trade-offs in Simplicity



OSX c.2010

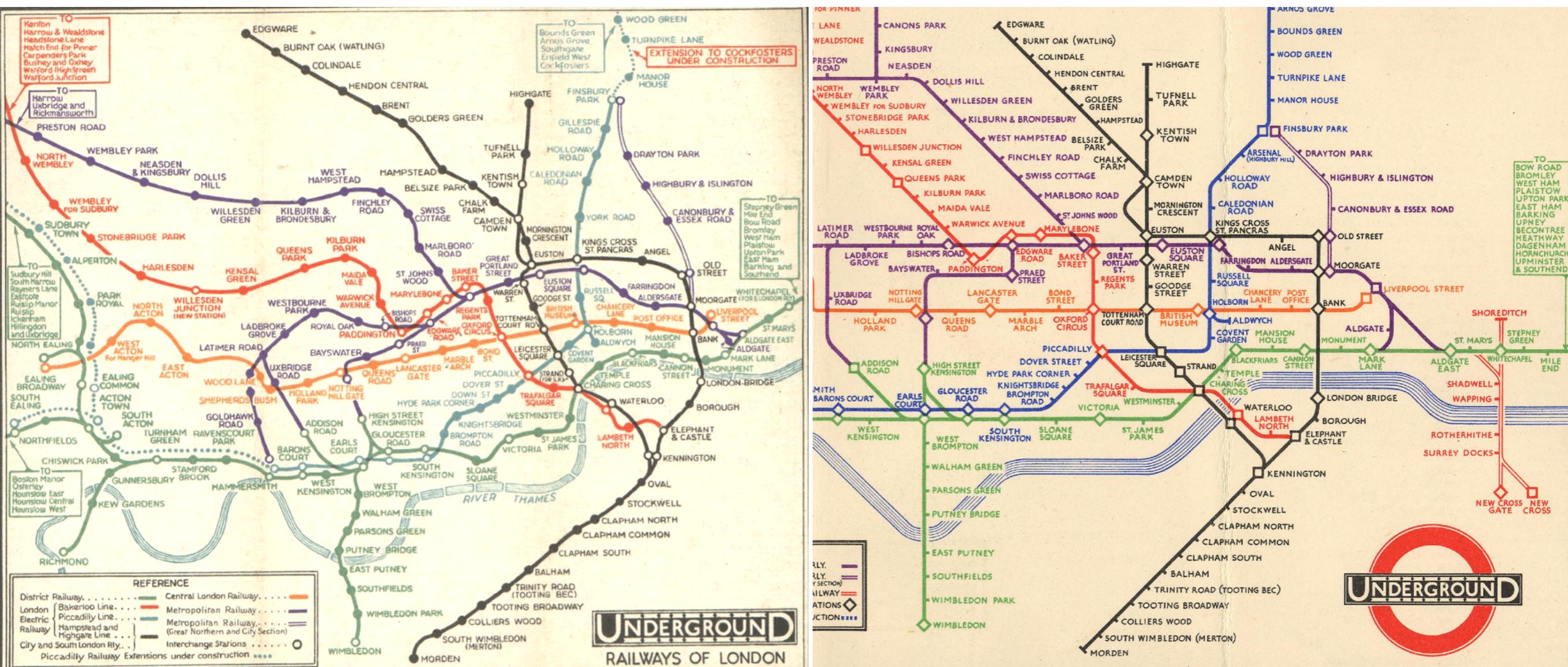


OSX c.2011



OSX c.2016

Guidelines for Visual Design



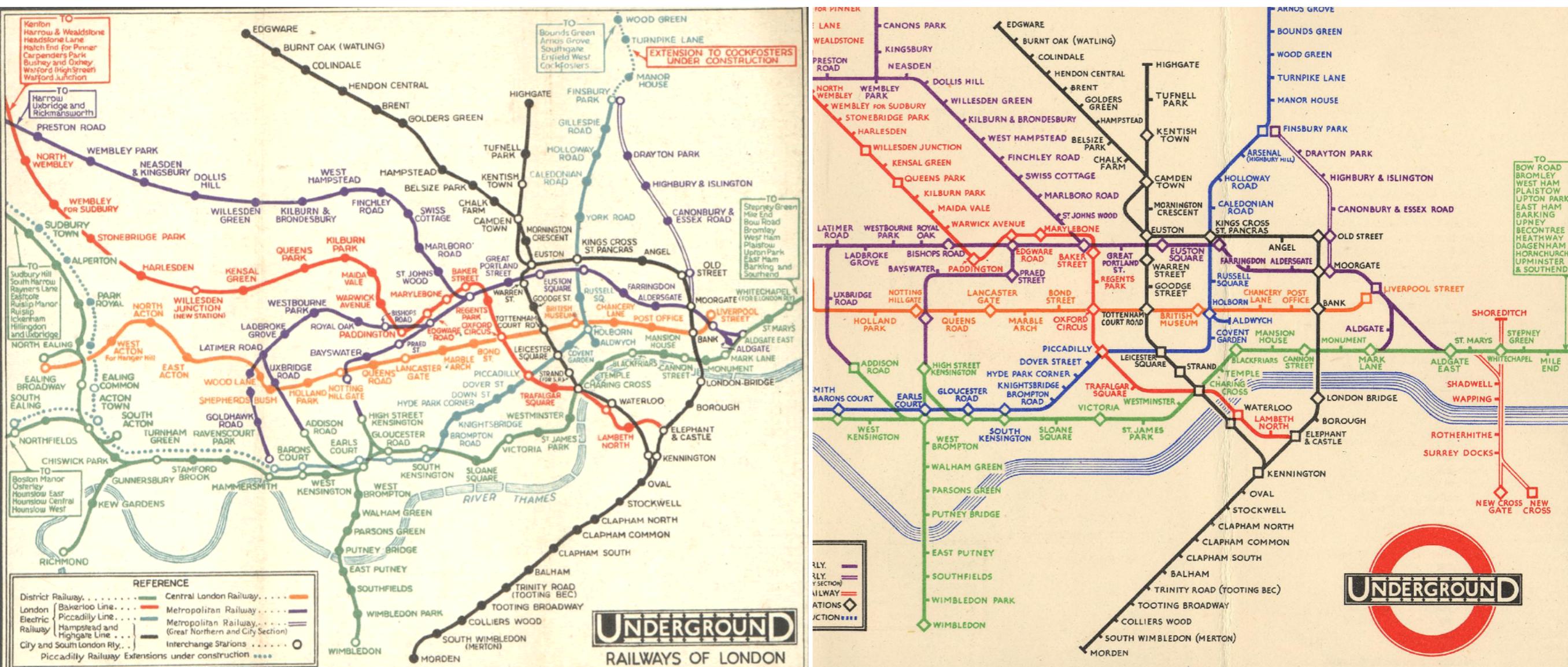
Reduction in new map: relative distances don't matter

Regularizing the elements of a design

- Reduce information by repeating elements according to a rule, principle or rhythm
- Enable user to scan ahead
- Use irregularity where needed to clarify that something is irregular!

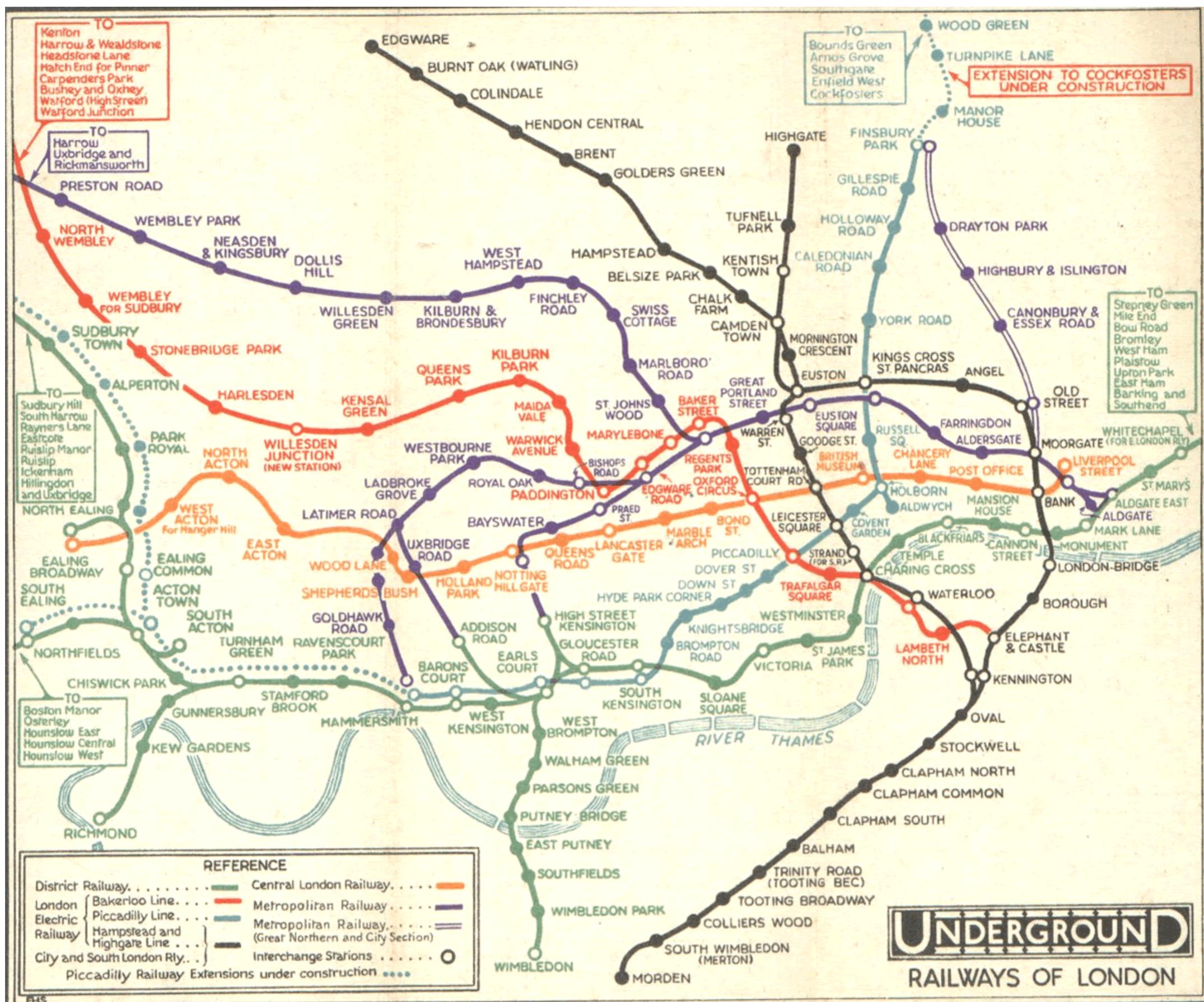
1. Use **regular** geometric forms, simplified controls, muted colors where possible
2. If multiple similar forms required, make them identical as much as possible in size, shape, color, texture, spacing, alignment
3. Limit variation in typography to a few sizes
4. Make sure critical elements intended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

Guidelines for Visual Design



Regularization in new map: Straight lines result in station names laid out in a line, rather than bouncing around

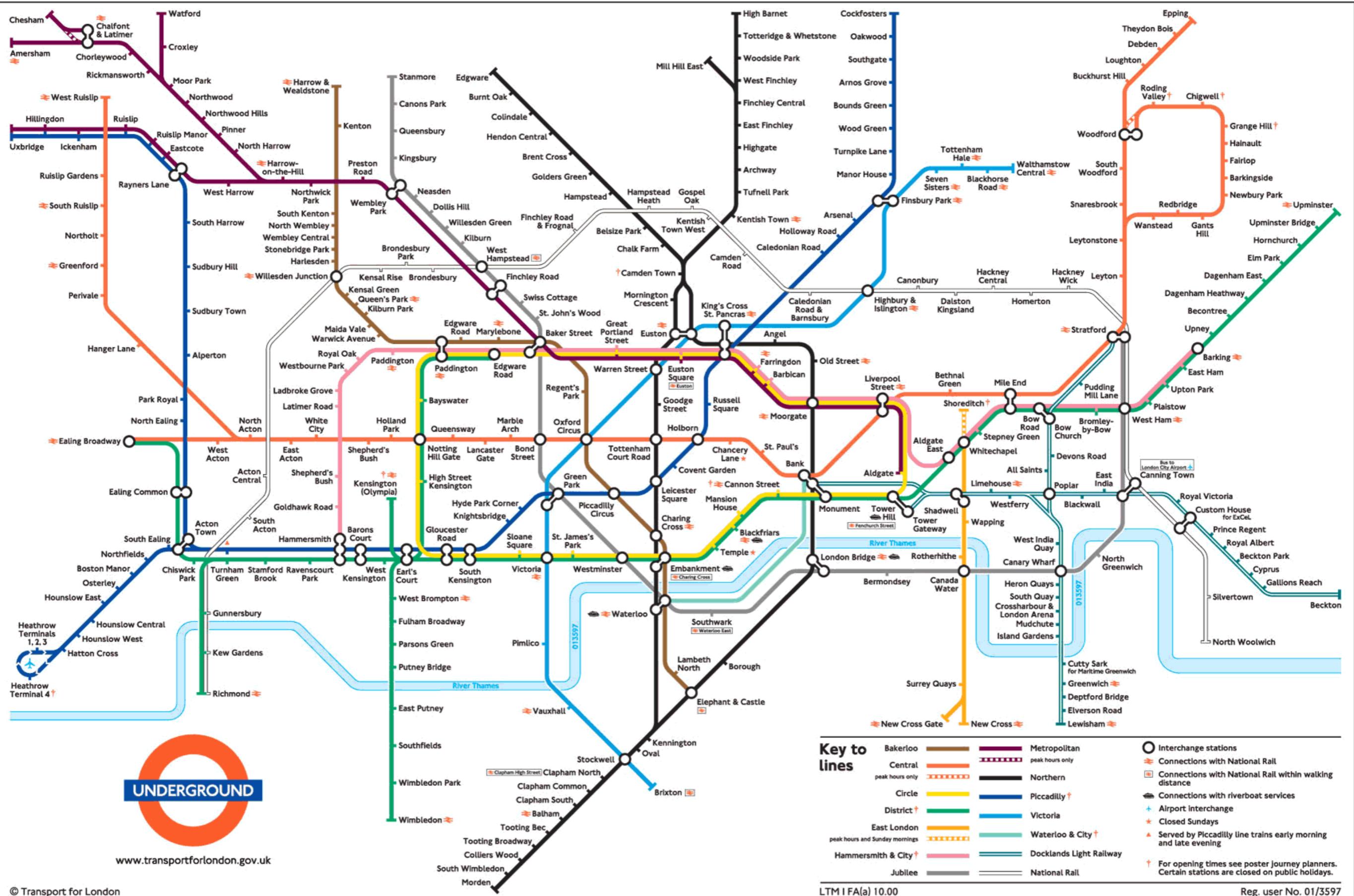
Original (1920's?) Underground Map



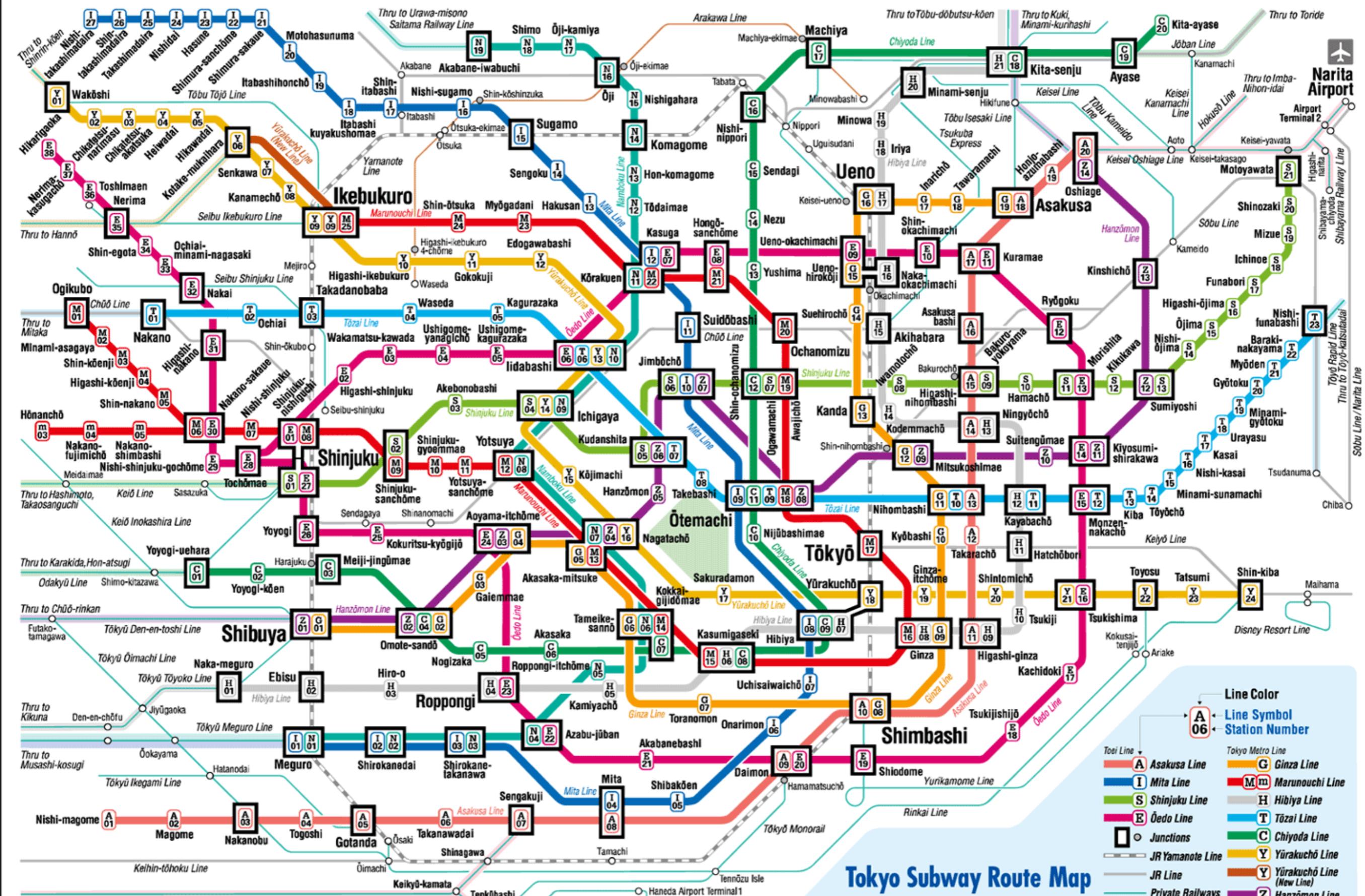
Beck's 1933 Underground Map



Today's Underground Map

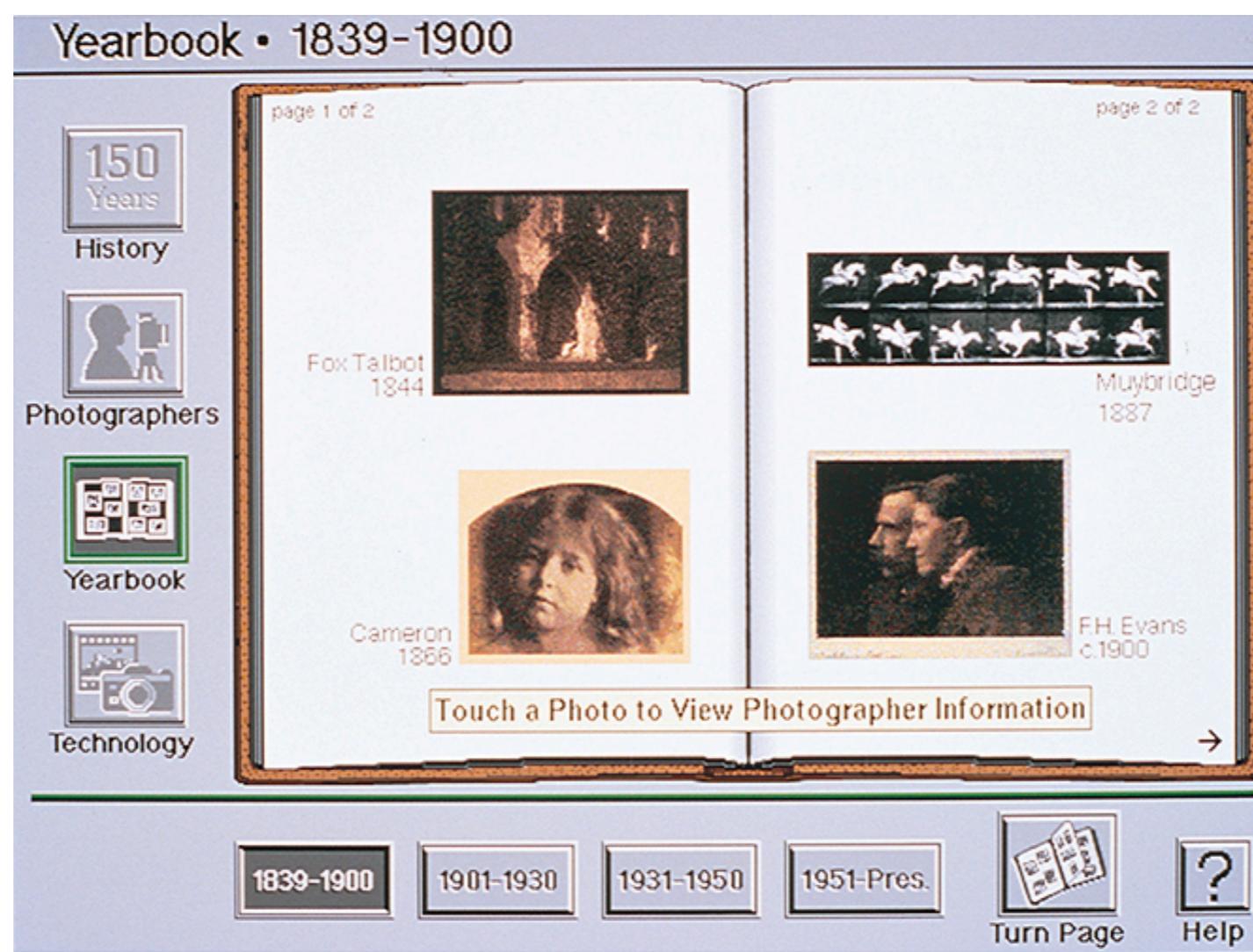


Tokyo Metro Map



Error - excessive skeuomorphism

- Skeuomorphism - making visual design resemble reality (like metaphors)
- Excessive skeuomorphism is distracting and wastes potential visual bandwidth that could encode meaningful information



6 Notes

Search

<ahref="http://ww... Saturday

It's the City Journal... Saturday

<ahref="http://www... Jun 7

MAY INVOICES May 31

CAPSULES May 31

APRIL INVOICES Apr 30

It's the City Journal Books Podcast: 21st century conversatio...



2 days ago

Jun 15 11:41 AM

It's the City Journal Books Podcast: 21st century conversations for 19th century attention spans.

I'm Joel Mathis, contributing editor to Philadelphia Magazine online.

(Ben)

AND we're joined today by Erica GREEDER. She's a senior editor at Texas Monthly—formerly, she was the southwest correspondent for The Economist. Her work has also appeared in the *New York Times*, the *New York Sun*, *The Spectator* (UK), and *More Intelligent Life*. And she is currently the author of **BIG HOT CHEAP AND RIGHT: WHAT AMERICA CAN LEARN FROM THE STRANGE GENIUS OF TEXAS**. Welcome to the podcast

What CAN America learn from the strange genius of Texas?

“Oh, that’s what our TodoApp was doing wrong! It didn’t have enough leather!”

wo-

you're familiar with the "Texas on the Brink" booklet put out by the state's Democrats in 2011, but let me kind of go through the quick litany here: Texas ranks 50th among the states in the percentage of its population 25 or older



Calendars

Invitations (0)

Day

Week

Month

Year

List

Search

July 2013

Wednesday

July 3

Ted Faszer's Birthday

all-day

Mike Yutzy's Birthday

all-day

Thursday

July 4

Cherie Yvette's Birthday

all-day

Monday

July 15

Allie Johnson's Birthday

all-day

Dr Stoll

8:45 AM to 9:45 AM

Thursday

July 18

Richard Gintowt's Birthday

all-day

Jacks birthday

11 AM to Noon

Monday

July 22

Alisha Campbell's Birthday

all-day

Saturday

July 27

Ted Faszer's Birthday

Wednesday, July 3, 2013

Details

all-day events

Mike Yutzy's Birthday **Ted Faszer's Birthday**

2 PM

3 PM

4 PM

5 PM

6 PM

7 PM

8 PM

9 PM

November 2016

Day

Week

Month

Year



Sun	Mon	Tue	Wed	Thu	Fri	Sat
		• SWE 432 Noon				
20	21 • SWE meeting 11 AM	22 • Office Hours • SWE 432 10:30 AM Noon	23	24 • SWE 432 Noon	25	26
27	28 • Office Hours • SWE 432 10:30 AM Noon	29	30			
				Dec 1 • SWE 432 Noon	2	3
4	5 • Office Hours • SWE 432 10:30 AM Noon	6	7	8 • SWE 432 Noon	9	10
11	12 • Office Hours 10:30 AM	13	14	15	16	17

Scale, Contrast, & Proportion

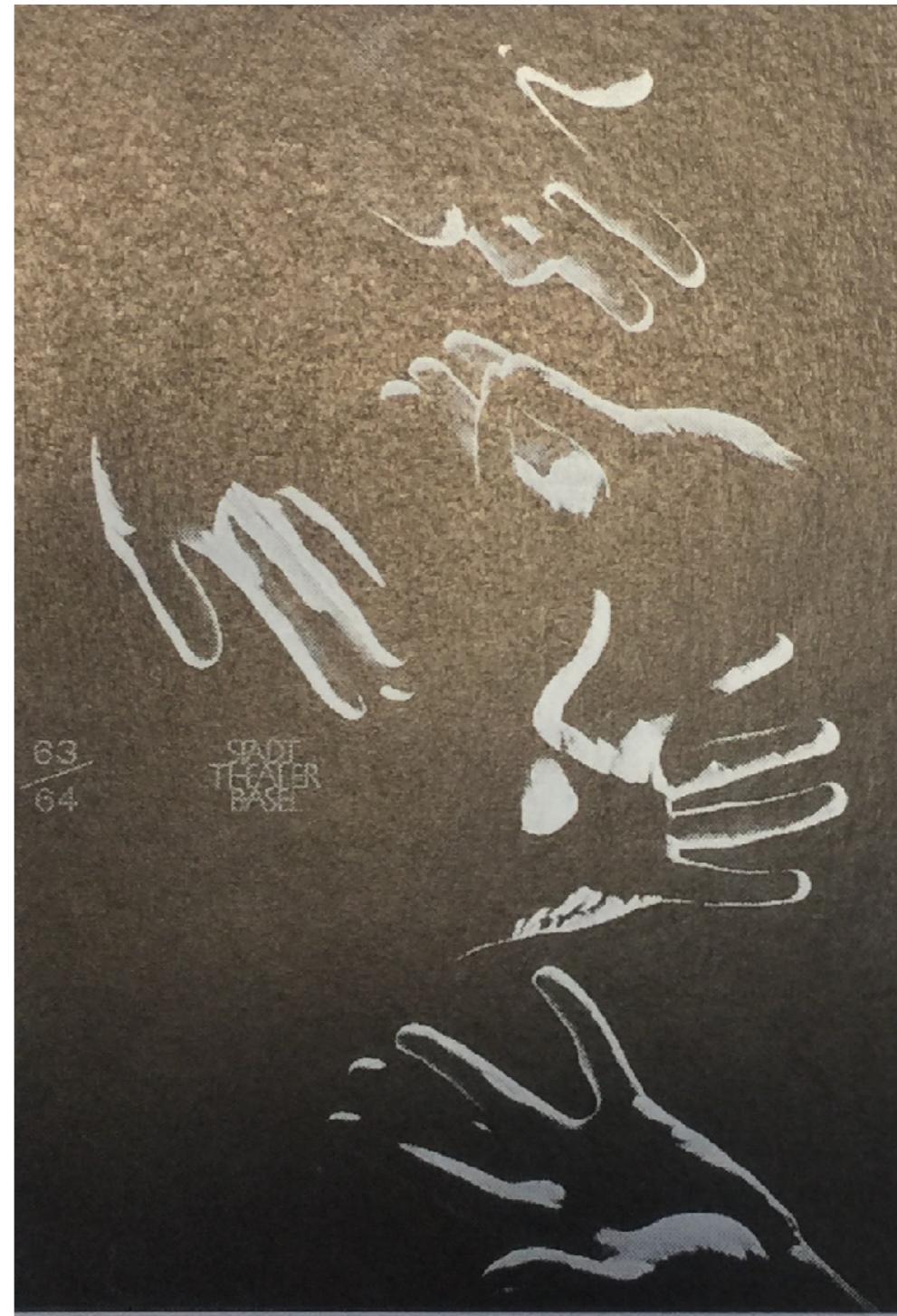
Scale, contrast, & proportion

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

Individual visual variables 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



Train Tables: Which is Better?

Train No.	3701	3301	3801	A	3	3	A3	3	3	3	A3	3	A3	3	3	3	3	3205	3815	3817	3819	3207	3821	3823	3825	3209	3827	3829	3831		
New York, N.Y.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.			
	12.10	12.40	1.30	3.52	4.50	6.10	6.25	6.35	6.50	7.10	7.30	7.33	7.45	7.50	8.05	8.25	8.40	8.50	9.10	9.40	10.10	10.25	10.40	11.10	11.40	11.50	12.10	12.40	1.10		
Newark, N.J. P	12.24	12.55	1.44	4.07	5.04	6.24	6.38	6.49	7.04	7.24	7.45	7.47	7.59	8.04	8.19	8.39	8.54	9.04	9.24	9.54	10.24	10.39	10.54	11.24	11.54	12.04	12.24	12.54	1.24		
North Elizabeth										7.30				8.10																	
Elizabeth	12.31	1.03	1.51			5.11	6.31			6.56	7.11	7.32		7.54		8.13	8.26	8.46	9.01	9.11	9.31	10.01	10.31	10.46	11.01	11.31	12.01	12.11	12.31	1.01	1.31
Linden	12.36			1.56		5.16	6.36			7.01	7.15	7.37		7.59		8.18	8.31	8.51	9.06		9.36	10.06	10.36		11.06	11.36	12.06		12.36	1.06	1.36
North Rahway										7.03		7.39				8.20	8.33	8.54													
Rahway	12.40	1.11	2.00			5.20	6.40			7.06	7.20	7.42		8.03		8.24	8.36	8.57	9.10	9.18	9.40	10.10	10.40	10.53	11.10	11.40	12.10	12.18	12.40	1.10	1.40
Metro Park (Iselin)	12.44		2.04	4.26	5.24		6.56	7.10	7.25		8.04	8.07	8.15		8.40		9.14		9.44	10.14	10.44		11.14	11.44	12.14		12.44	1.14	1.44		
Metuchen	12.48		2.08		5.28					7.14	7.29			8.11		8.44		9.18		9.48	10.18	10.48		11.18	11.48	12.18		12.48	1.18	1.48	
Edison	12.51		2.11							7.17	7.32			8.14		8.47		9.21			10.21				11.21		12.21			1.21	
New Brunswick	12.55		2.15		5.35		7.05	7.21	7.35					8.18	8.25		8.50		9.25		9.54	10.25	10.54		11.25	11.54	12.25		12.54	1.25	1.54
Jersey Avenue	1.02		2.18							7.28				8.21				9.28			10.28				11.28		12.28			1.28	
Princeton Jct. S			2.31		5.50		7.19		7.50			8.34	8.41		9.05		9.41		10.09	10.41	11.09		11.41	12.09	12.41		1.09	1.41	2.09		
Trenton, N.J.			2.42	4.58	6.03		7.28		8.01		8.31	8.44	8.52		9.16		9.52		10.15	10.52	11.19		11.52	12.19	12.52		1.22	1.52	2.20		

Principles

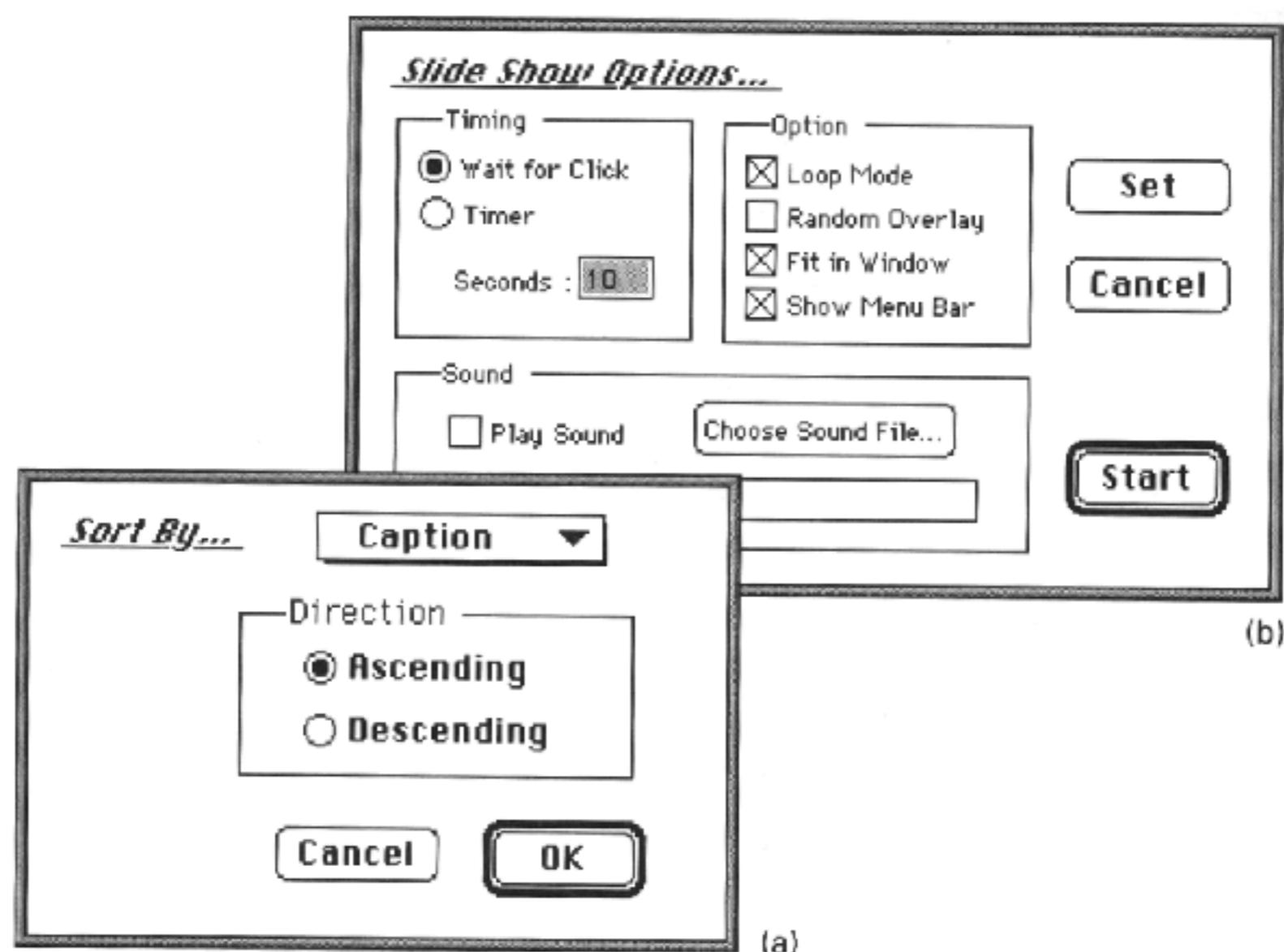
- Clarity - contrasts should be clear and easily differentiated, not slight and subtle
- Harmony - proportions and ratios should be harmonious
- Activity - use contrasts to maintain orientation & context within design
- Restraint - contrasts should be conscious, strong, few in number, and never overwhelming

Error: Lack of Clarity



Error - excessive typographic contrasts

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

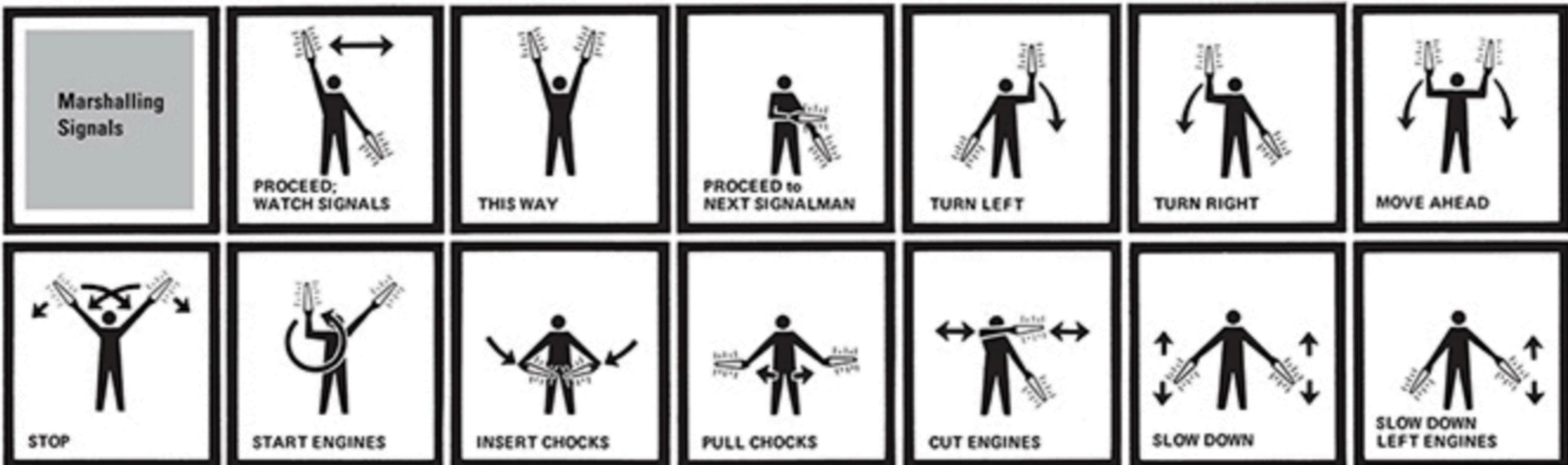


Layers

- 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**



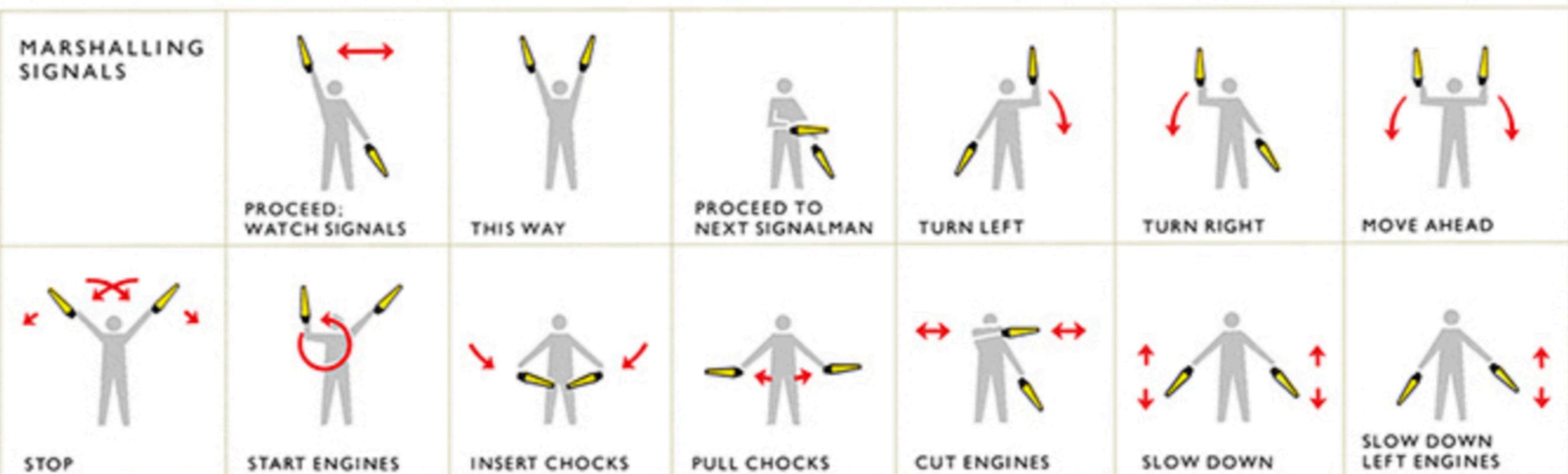
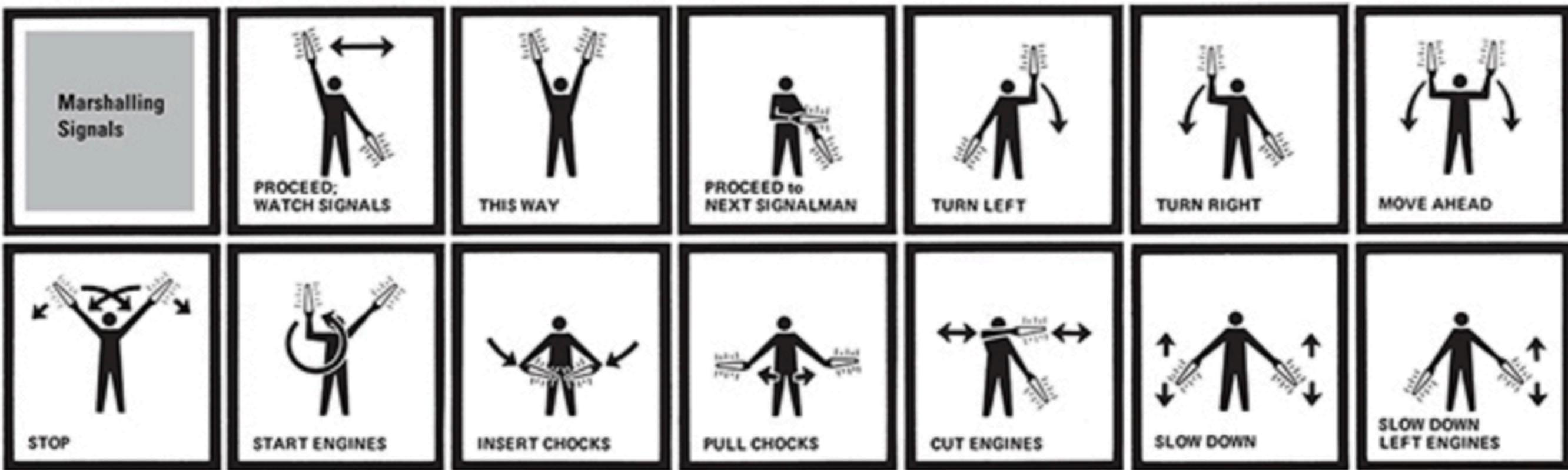
No Layers, Confusing



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

Layers



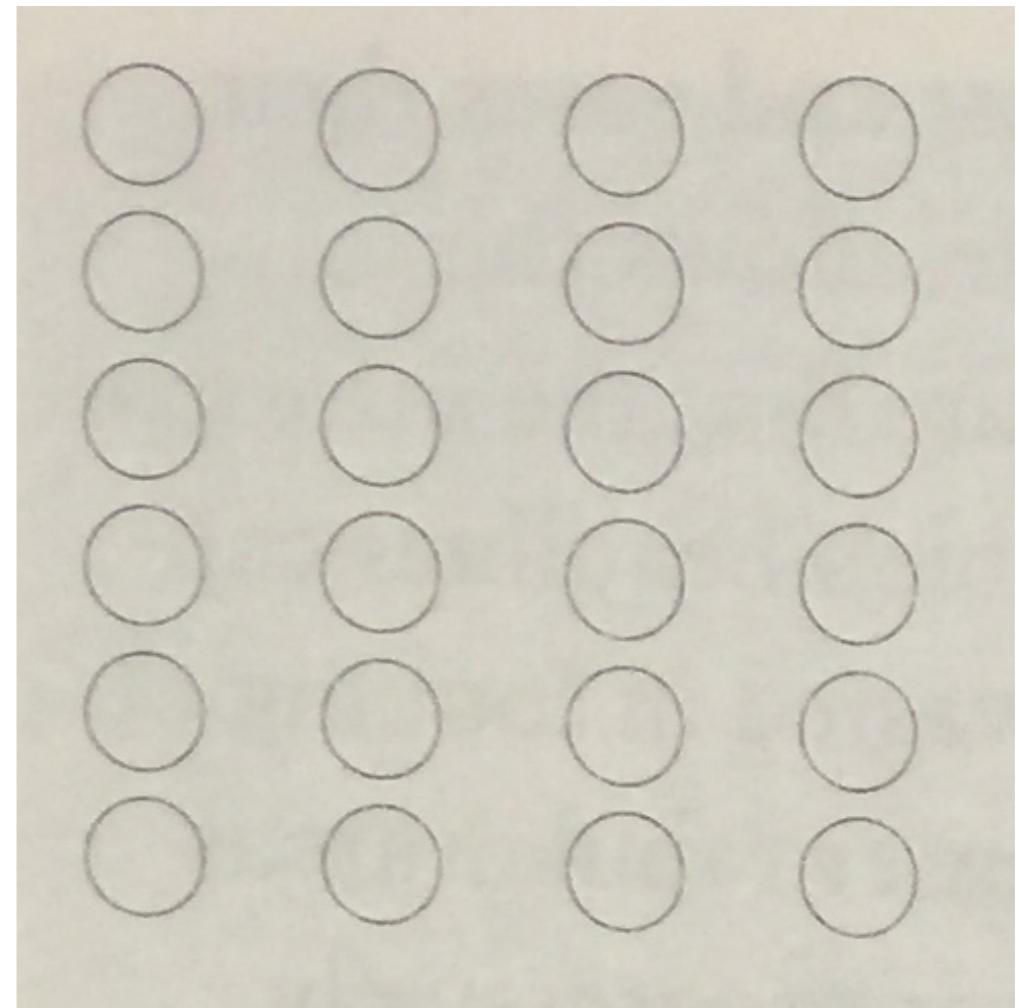
Organization & Structure

Organization & structure

- Organization needs to be **designed**
- 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 -> psychology of perception

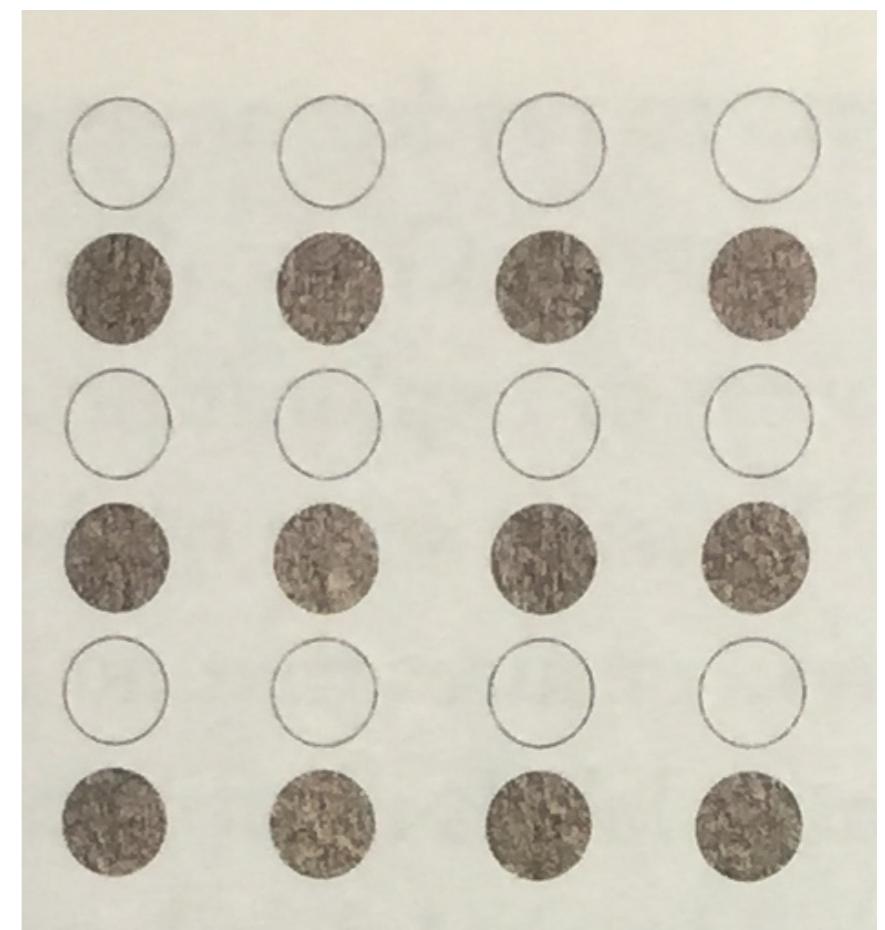
Gestalt principle - Proximity

- Elements associated MOST 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

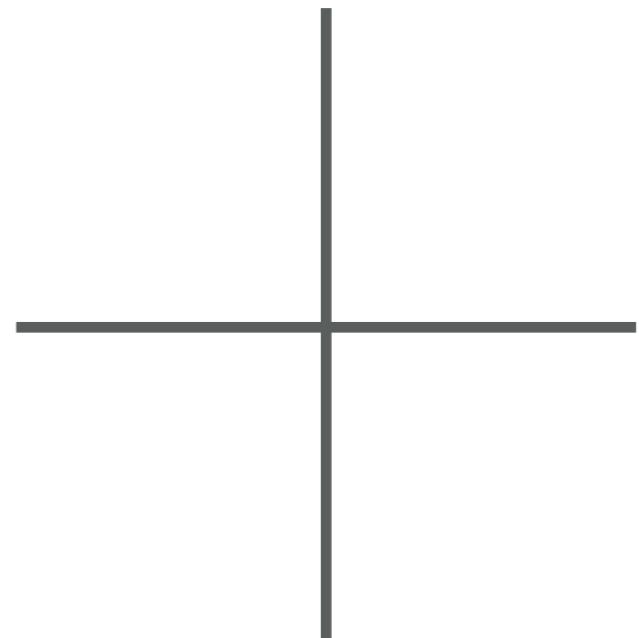
- Elements associated more strongly when share common visual attributes than when they differ
- parsed as rows based on fill similarity, despite closer column spacing



Gestalt principle - Continuity

- Preference for **simplest** physical explanation of complex figure

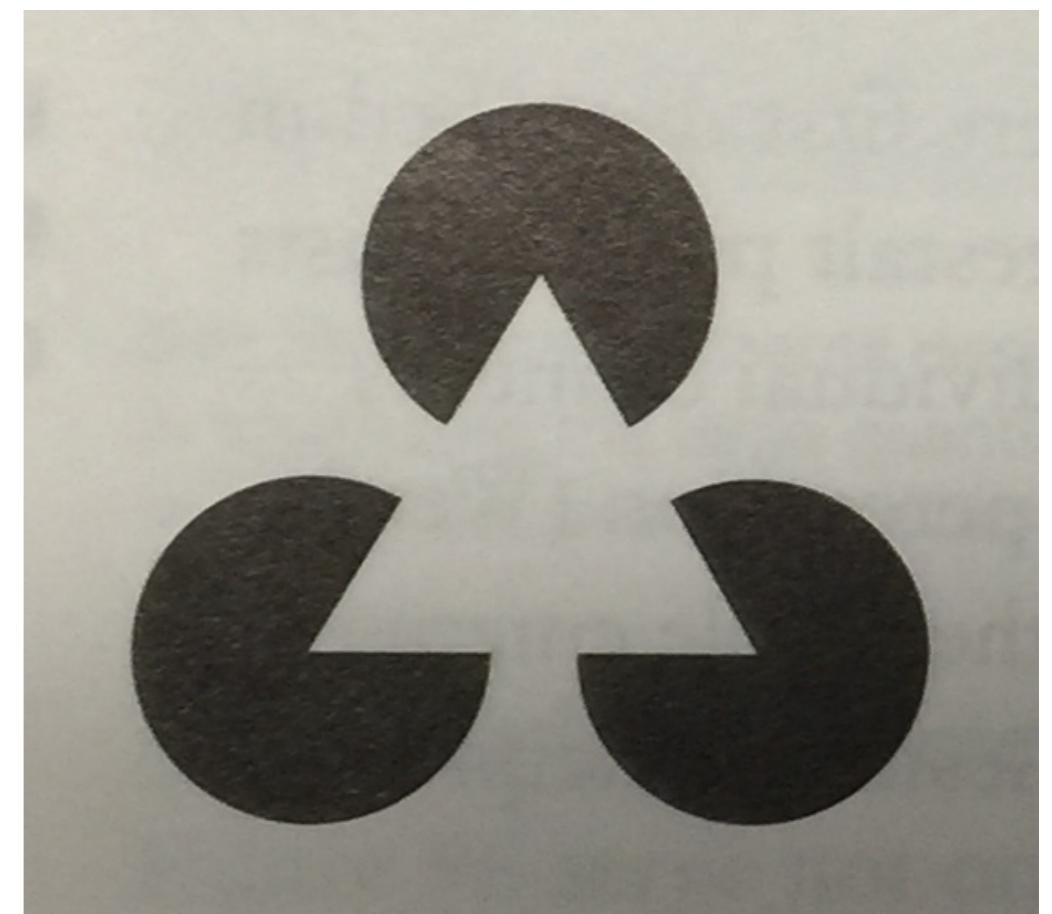
parsed as two lines, rather than
4 separate lines or 4 opposing
angles



Gestalt principle - Closure

- Preference to interpret figures as complete, even when missing information

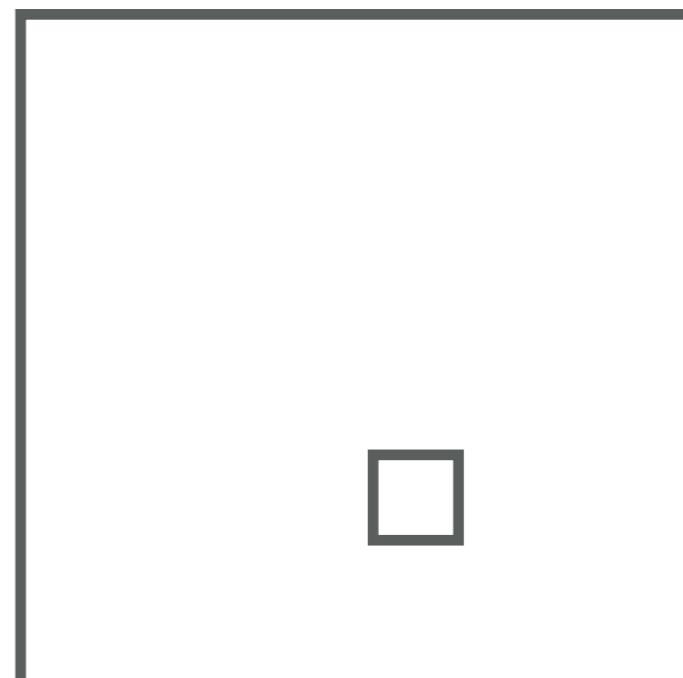
Parsed as triangle
superimposed on 3 complete
circles, even though none of
these is actually present



Gestalt principle - Area

- Preference to interpret smaller overlapping elements as figure, larger as ground

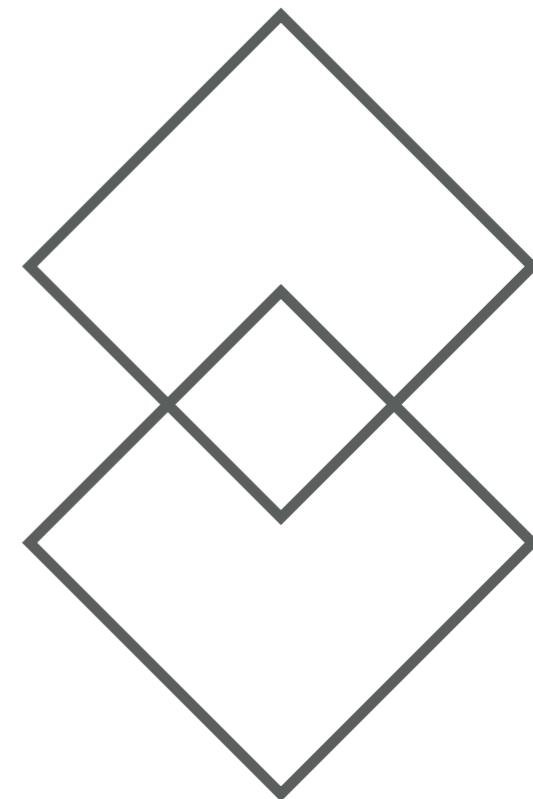
Small rectangle parsed
as small rectangle on top
of larger, rather than hole



Gestalt principle - Symmetry

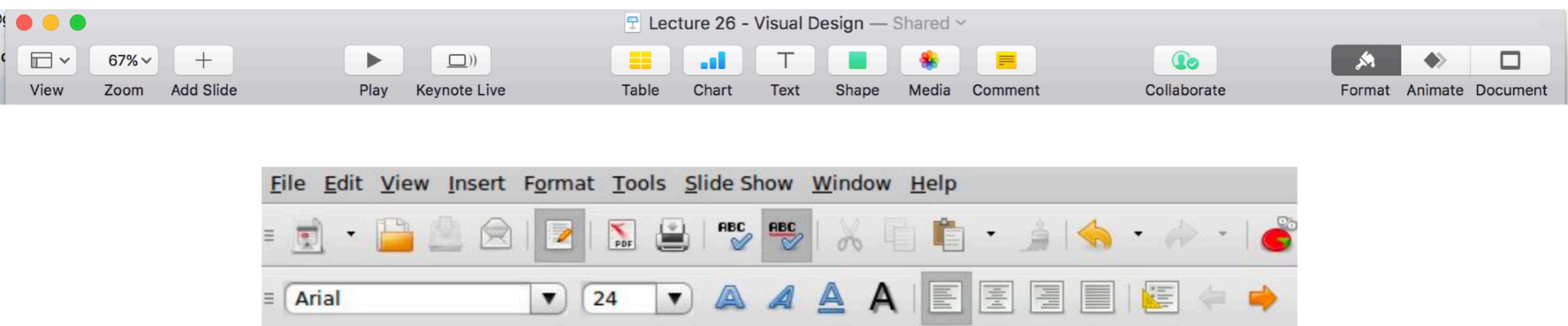
- Preference to interpret ambiguous form as multiple symmetric elements

Parsed as two overlapping objects rather than 3 separate shapes



Grouping

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



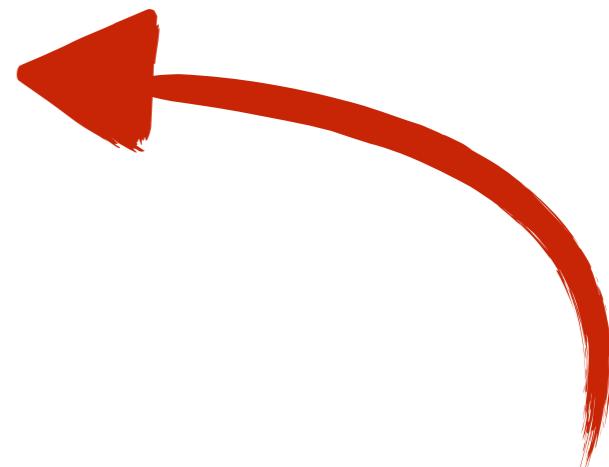
Hierarchy

Order groups based on perceptual prominence corresponding to intended reading sequence

Can help solve “skimming” problems

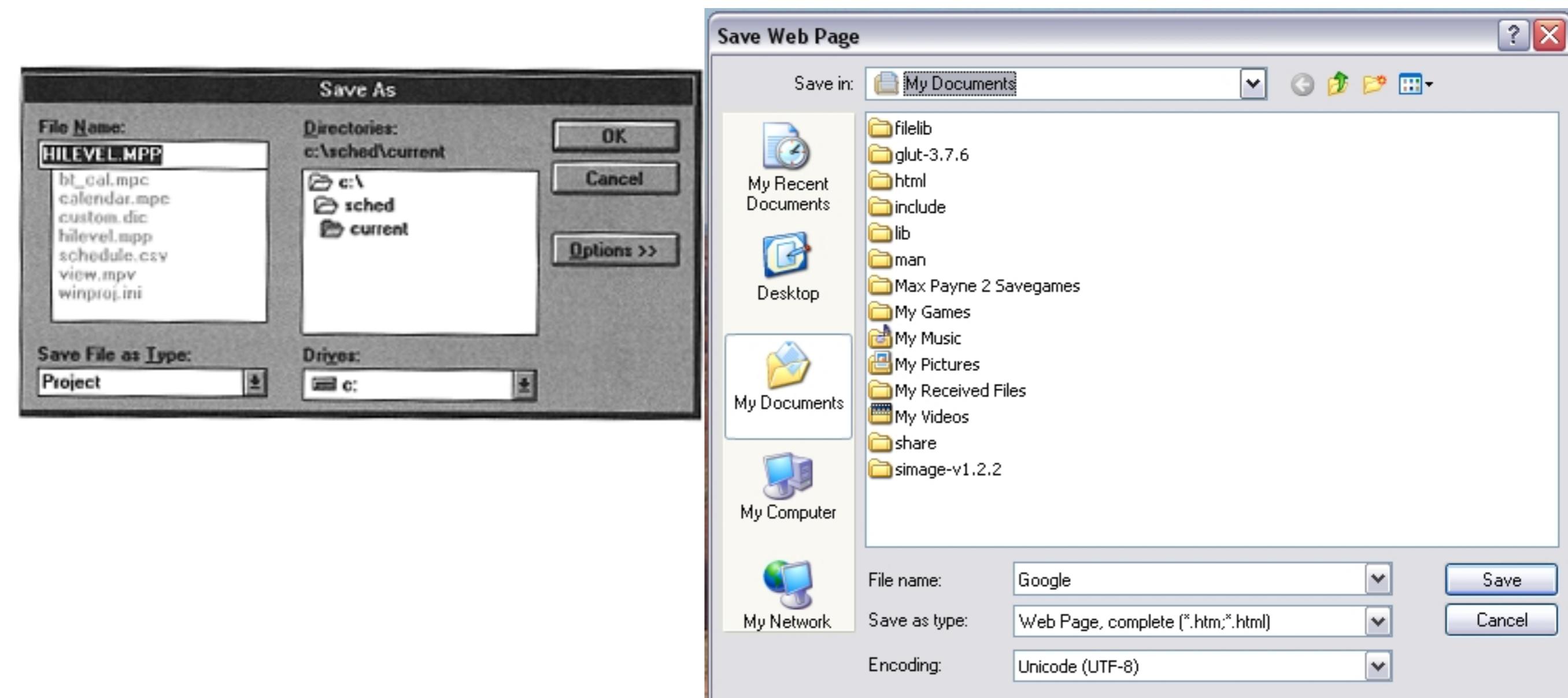
Structure can help people focus attention on key parts

Key points might **get lost though.**



But bolding helps! Plus this obnoxious red arrow and text in a totally different font!

Hierarchy in UIs



Error - Haphazard layout

xbugtool 2.0 Beta 2 Server: elmer-bb.Corp

Load Store Submit View Print Reset Props Gen. Help

Mode: Edit Create Update lists

Bug ID: _____ Cc: _____

Category: _____ Priority:

1	2	3	4	5
---	---	---	---	---

Subcategory: _____ Severity:

1	2	3	4	5
---	---	---	---	---

Resp Mgr.: _____ Bug/Rfe:

bug	rfe
-----	-----

State: _____ Responsible Engineer: _____

Synopsis: _____

Keywords: _____

Description Work around Suggested fix Comments Public summary

State triggers:

Evaluation
Commit to fix in rel...
Fixed in releases...
Integrated in releases...
Verified in releases...
Closed because
Incomplete because
Root cause...
Fix affects docs

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: _____
Reviewer: _____	Date: _____

(a)

Bugtool

Report View Props Help Mode: Create Edit

Bug ID: _____ Type: Bug RFE

Category: XView Severity:

1	2	3	4	5
---	---	---	---	---

Subcategory: library

Release: 1.0 Severity:

1	2	3	4	5
---	---	---	---	---

Status: Submitted

Synopsis: _____

Keywords: _____

Pub Summary: _____

See also: _____

Interest List: _____

Description Work Around Suggested Fix Comments Evaluation

Root Cause: documentation-confusing

Same as: _____

Resp Mgr: none

Resp Engr: none

Hook 1: _____

Hook 2: _____

Flags: Fix Affects Documentation
 Generic SVR4 Problem

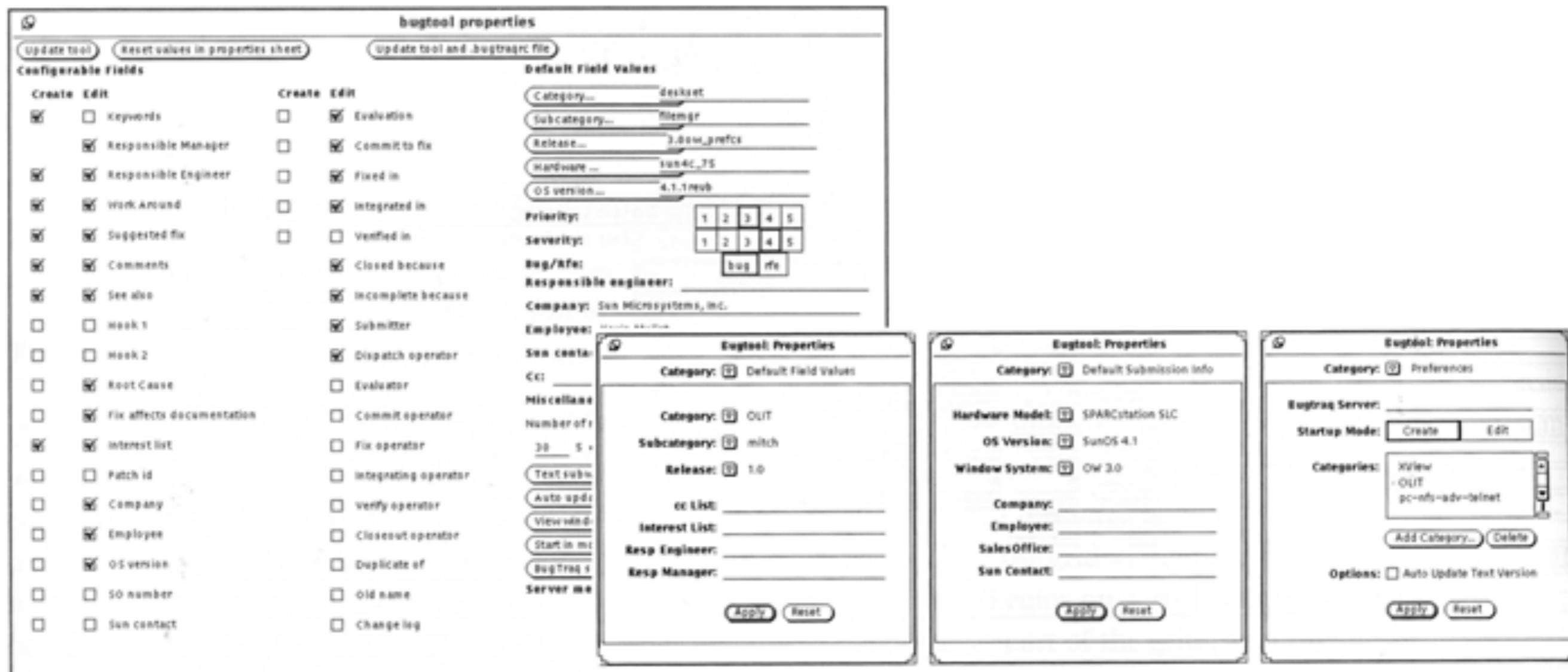
(b)

Error - Ambiguous internal relationships



Groups are aligned, contents are not

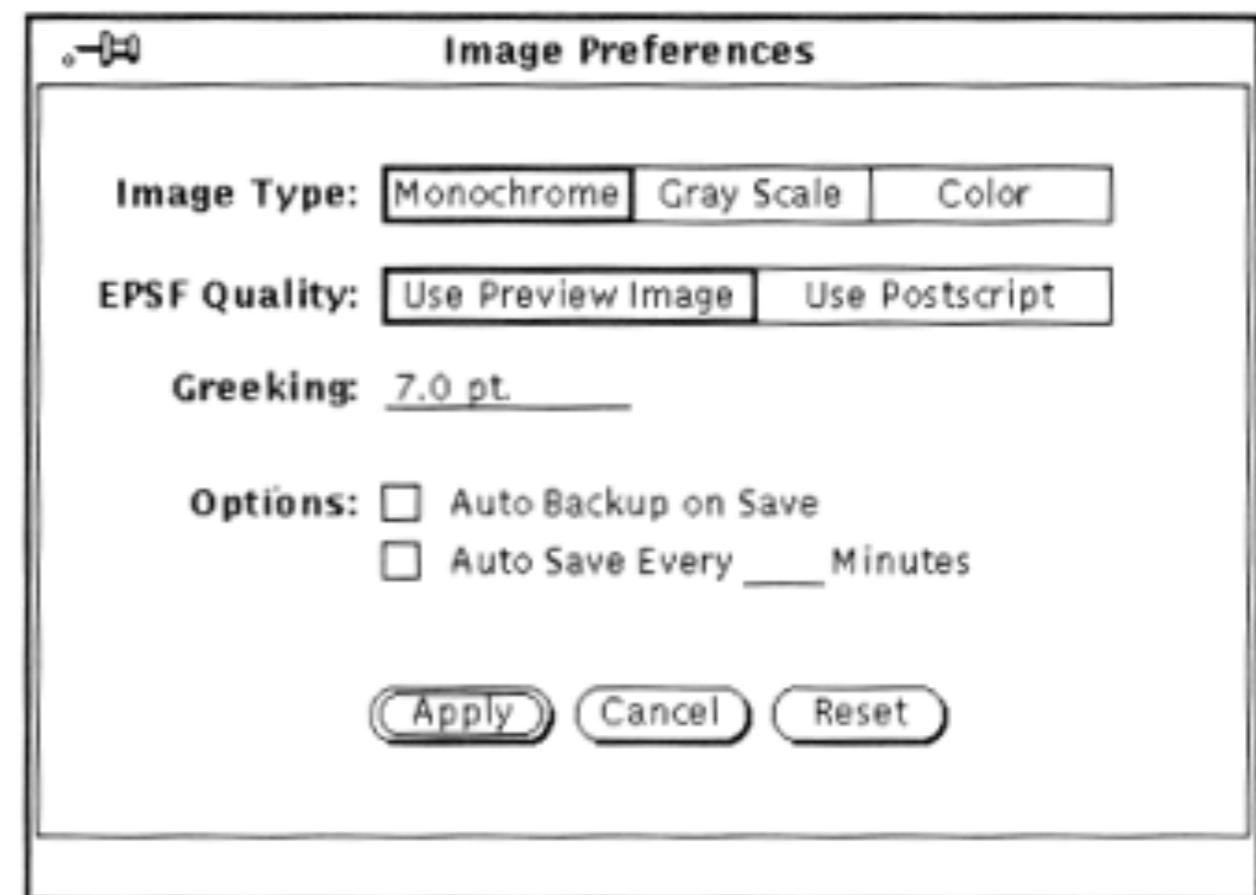
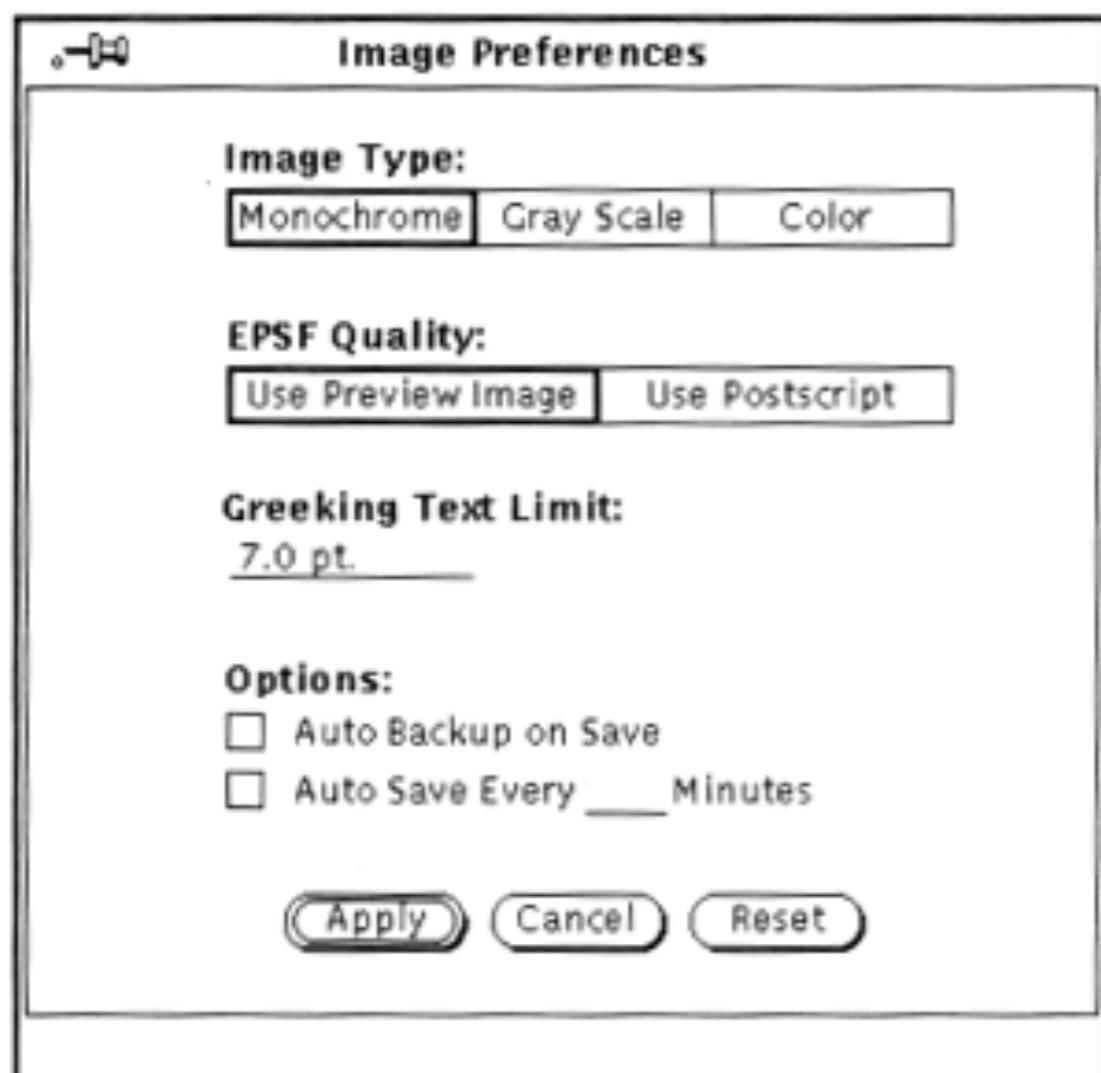
Error - Excessive display density



tiny font, tons of dead space.
fixed by breaking into separate panes

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



Images & Icons

Images & Icons

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

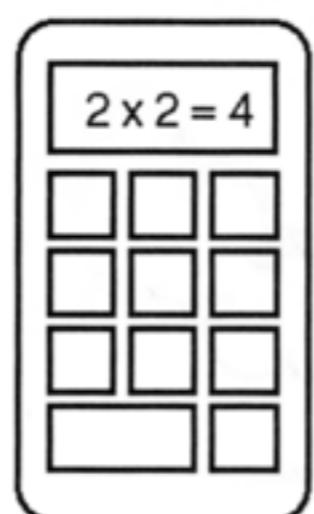
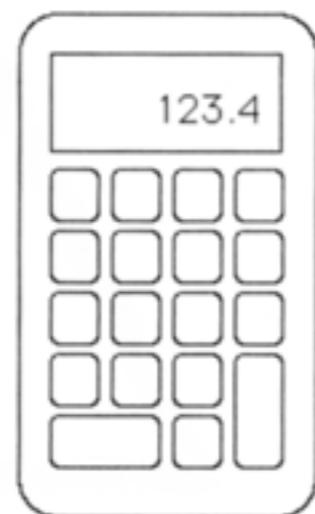
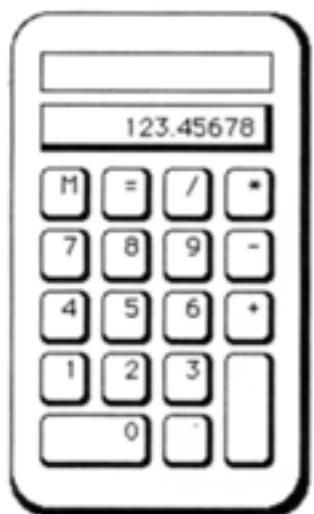
Types of iconic representation

- 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**



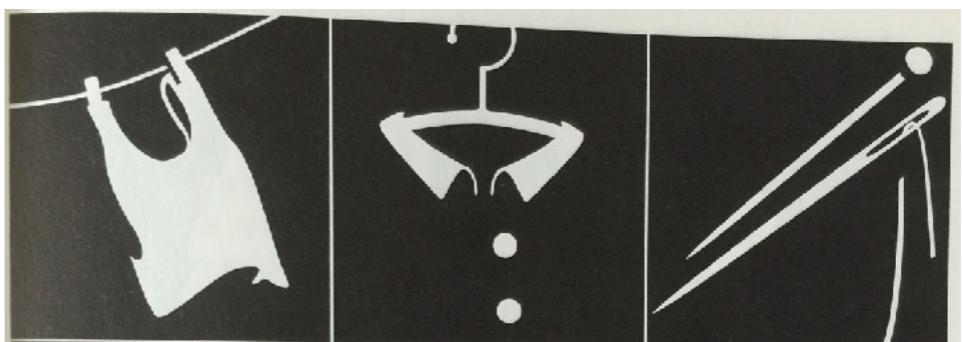
Use of abstraction

- 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

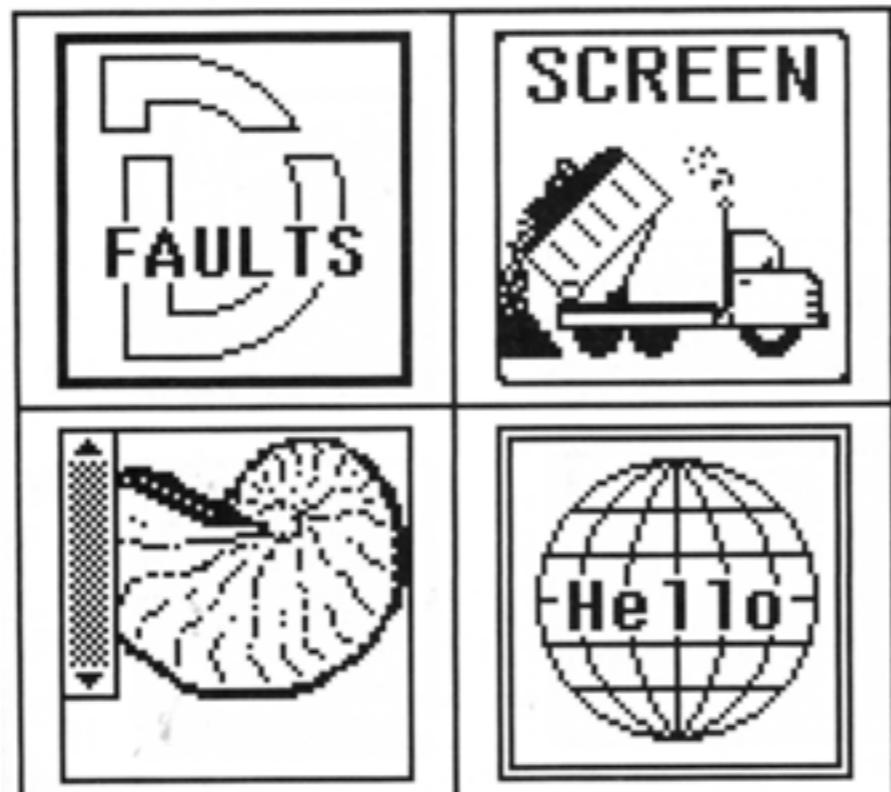
- Immediacy - can be perceived effortlessly & involuntarily by being **bold**, clear, balanced
- Generality - represents a **class** of items, rather than an individual element, by removing details that may vary
- Cohesiveness - set of icons that function **together** by sharing visual variables
- Characterization - call to mind one or more **distinctive** features



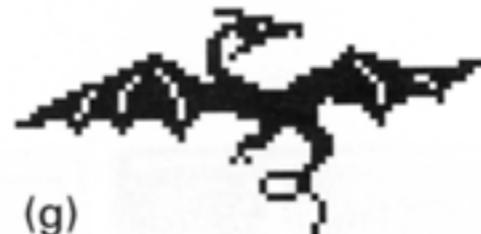
Selecting the right type of icon

- 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

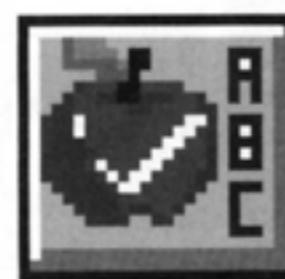
Error - Cultural or language dependence



(a)



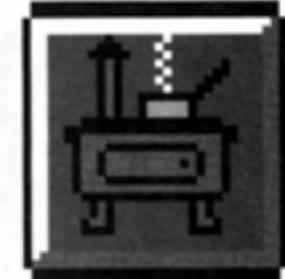
(g)



(d)



(e)



(f)

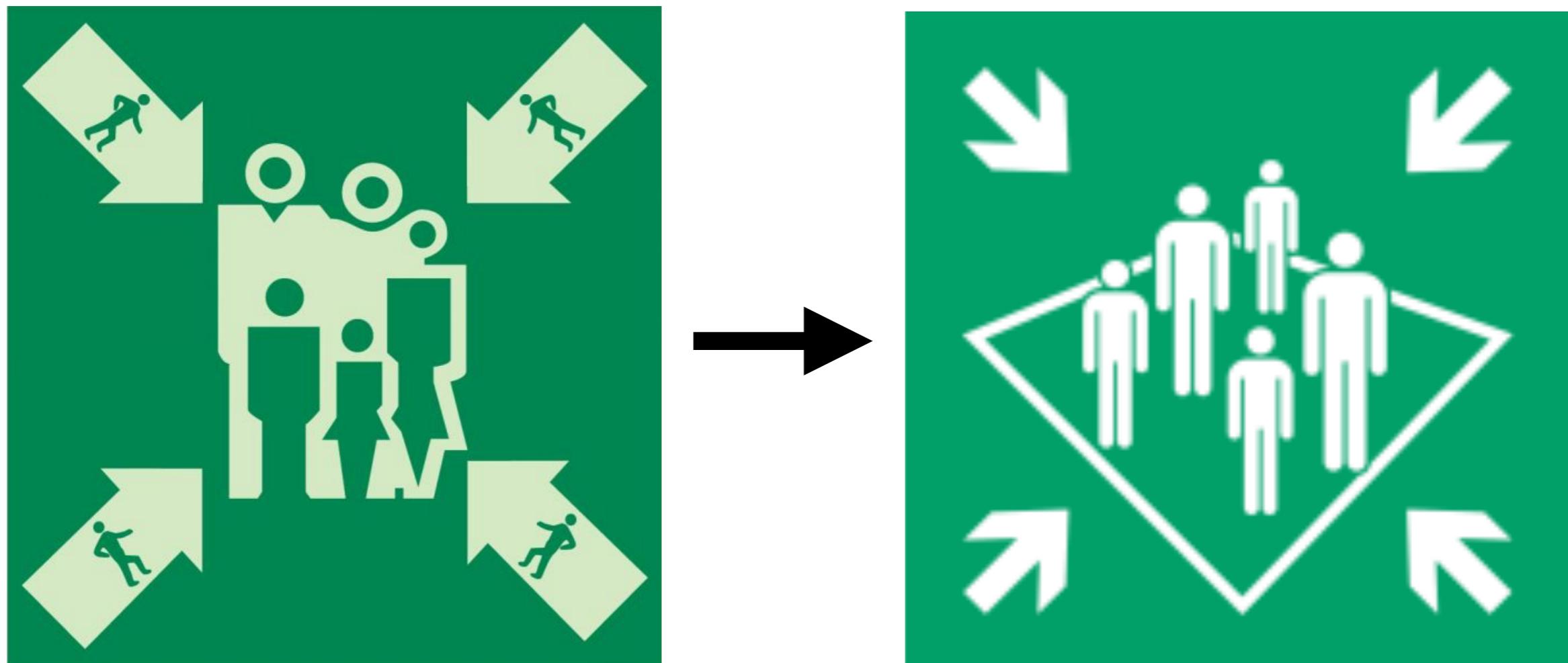


(b)



(c)

Misleading Syntax



Cultural Errors: Airplane Exit Signs

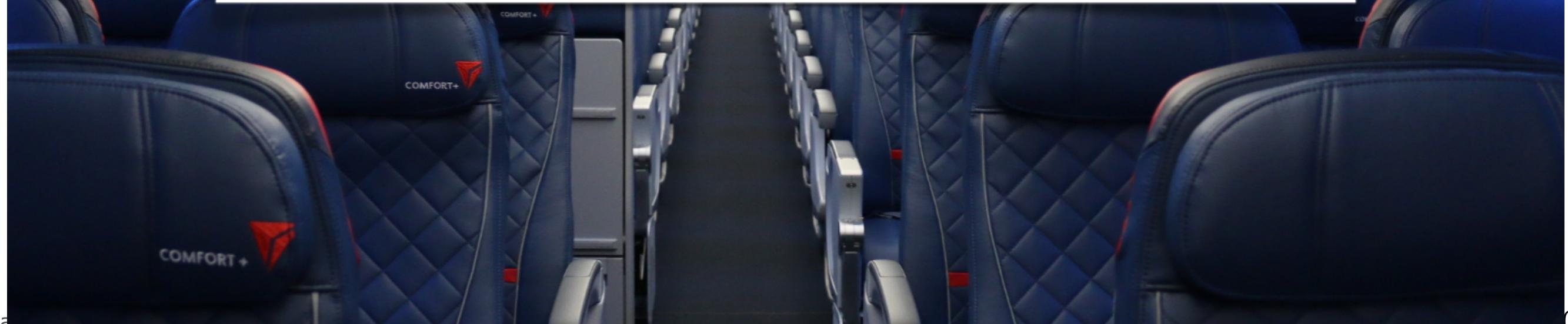


“Please be aware that the nearest exit may be located behind you.”

New Airbus Exit Sign



“Please be aware that the nearest exit may be located behind you. Exit signs are marked in green, with arrows”



Activity: OS 10.2 Preferences Icons



Best 3, worst 3 and why? Then: How to make worst 3 better?