Visual Design

SWE 432, Fall 2018

Web Application Development

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

#10 will shock you!

(actually we hope you believe it all)

GEORGE MASON UNIVERSITY

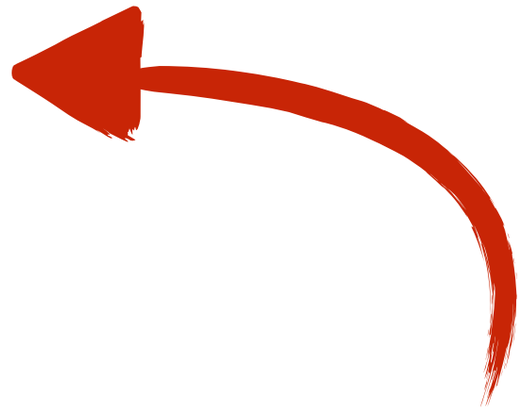
HW4 Discussion

Go to:
b.socrative.com, Click student login
Room name: SWE432
Student ID: Your G-number (Including the G)

Reminder: Survey can only be completed if you are in class. If you are not in class and do it you will be referred directly to the honor code board, no questions asked, no warning.

Today

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



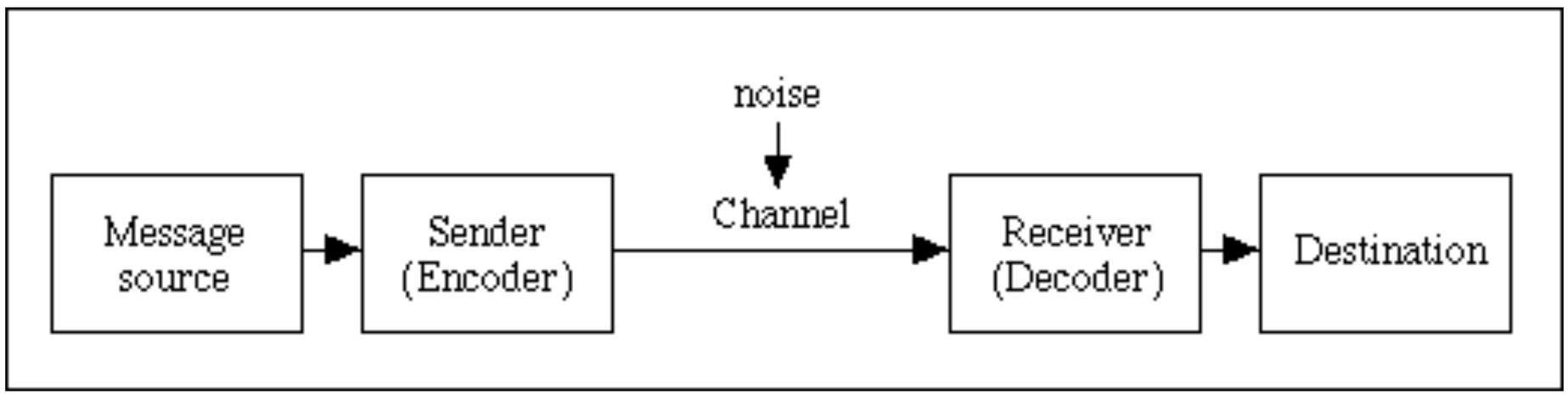
Plus a ton of practical visual guidelines!

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

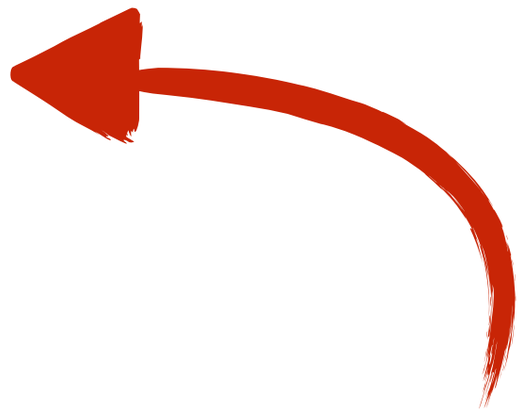
- Goal: **efficiently** & accurately transmit information from system to user
- Visual variables & organization encode information



Goals for visual design

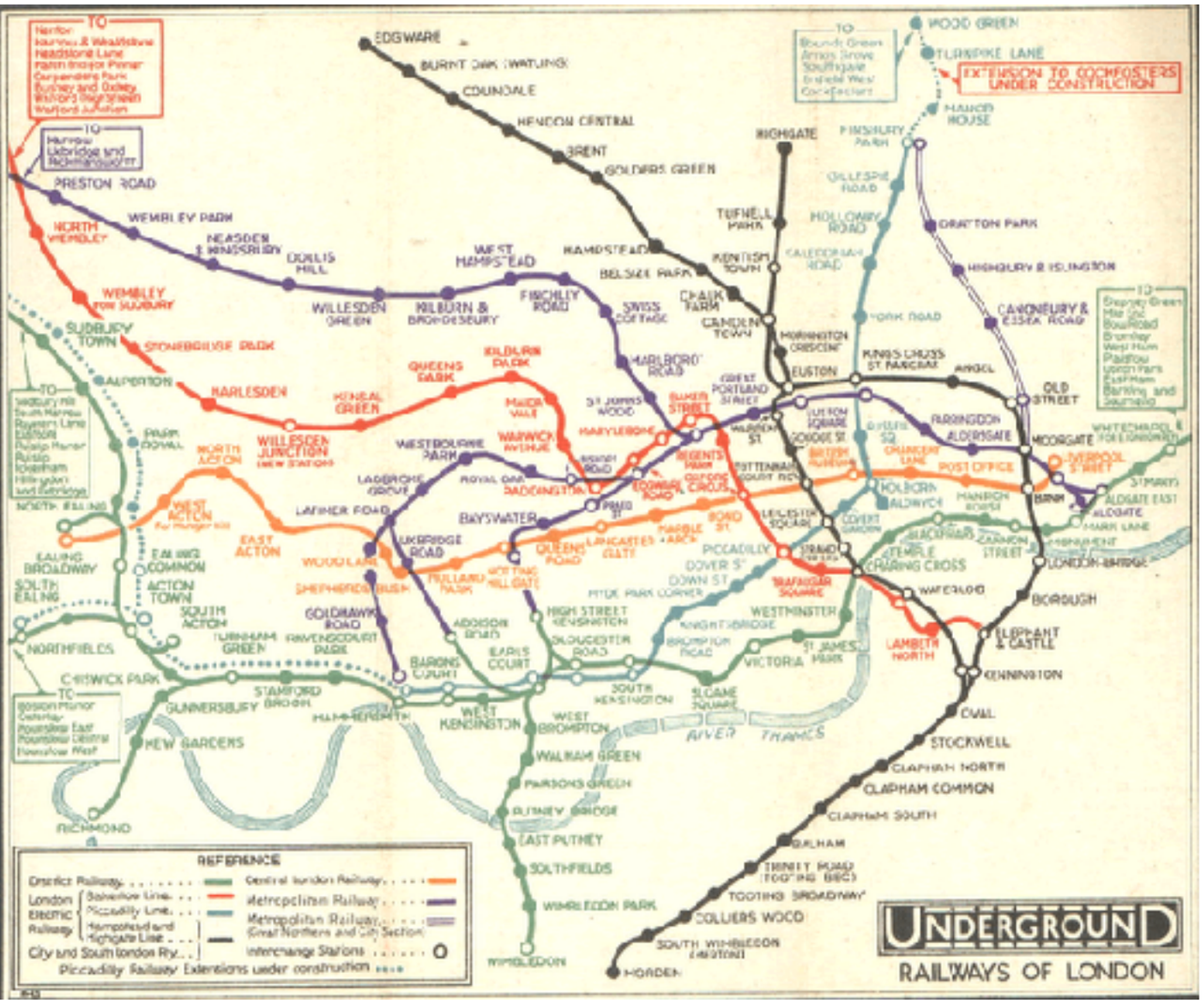
- Successfully **transmit** information
- Reduce visual **search** time through layout & organization
- Create desired **emotional** reactions through aesthetic choices
- Present coherent & consistent design that reduces ambiguity and potential confusion

Guidelines for Visual Design



Besides using "Marker Felt thin" for callouts!

Guidelines for Visual Design



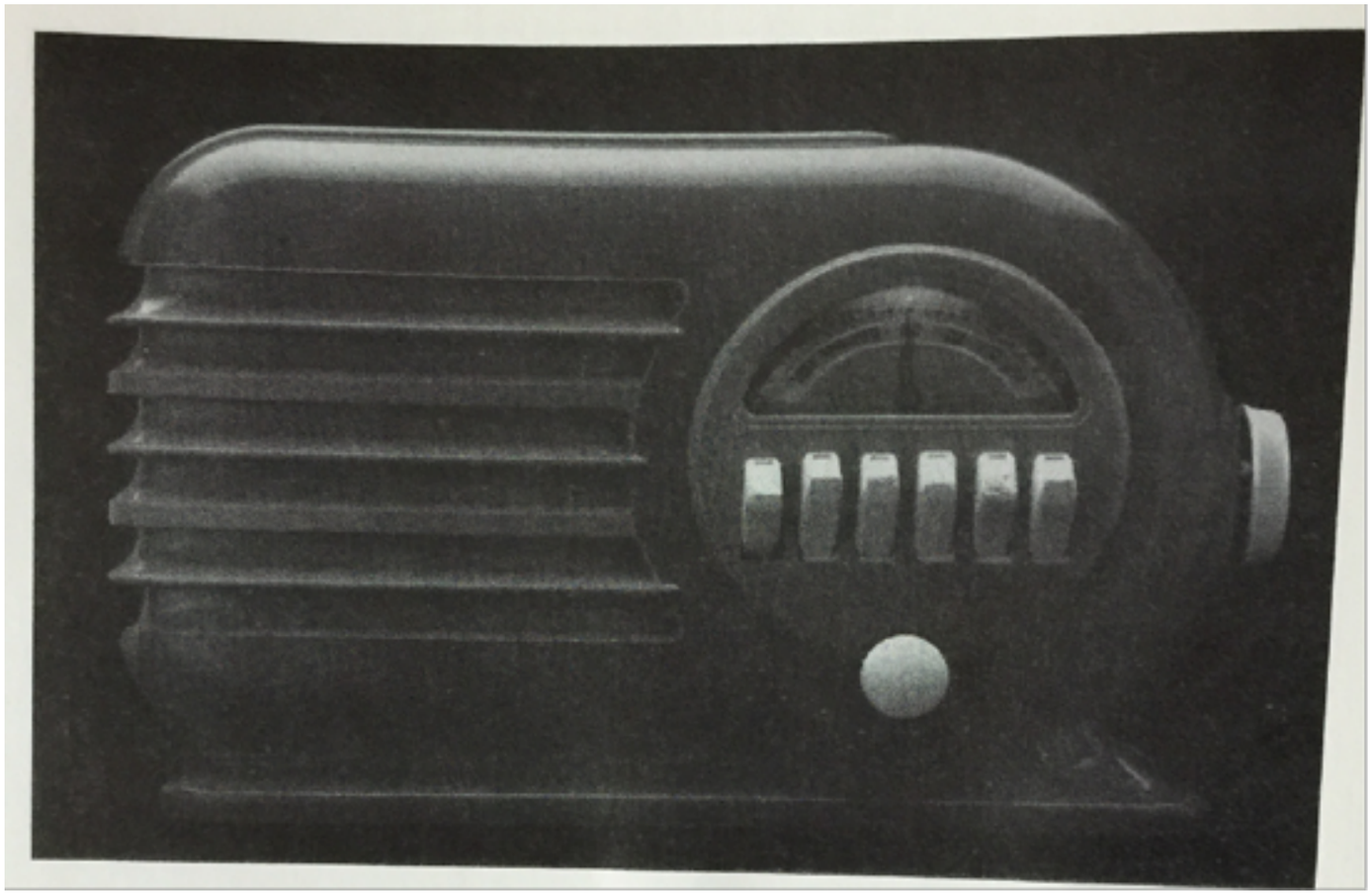
Consider: Two Subway Maps

Elegance & simplicity

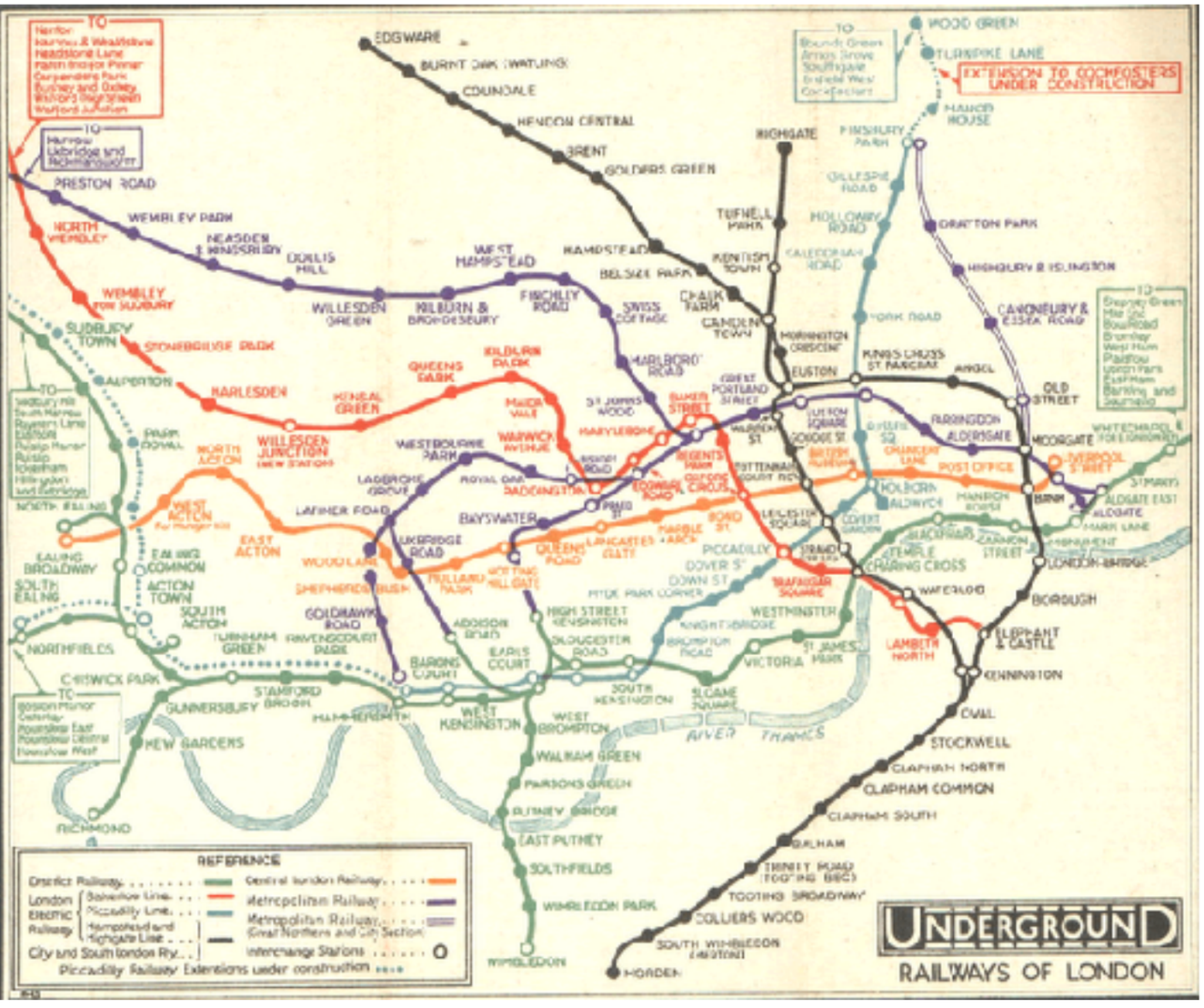
- *Elegance*—derives from Latin eligere, to "select carefully"
- **Judicious** selection of elements and economy of expression revealing an intimate understanding of problem
- Removing & combining superfluous elements until only the necessary remains

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



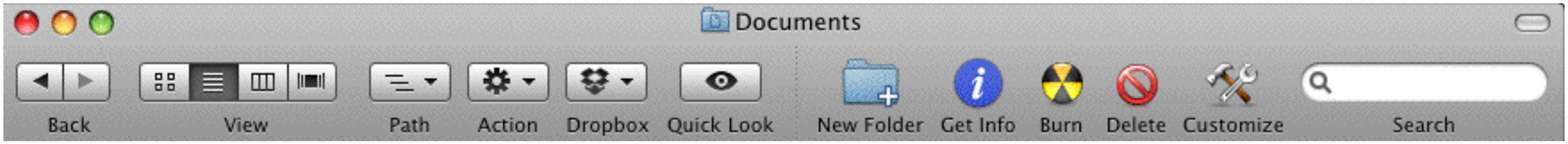
Simplicity in new map: Abstract Geographic Details

Reducing a design to its essence

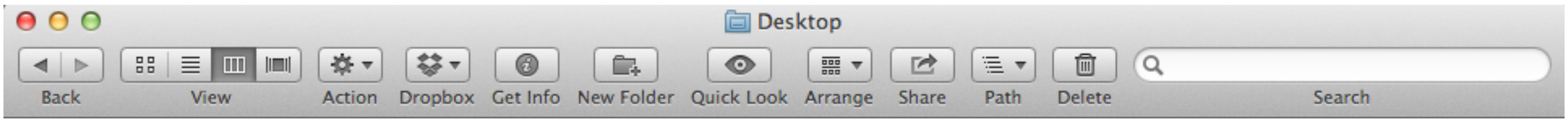
- Make design simple, bold direct by removing inessential details & elements
  - Even essential elements may be suggested

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?

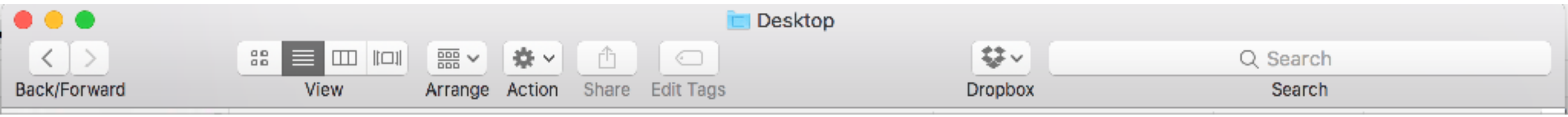
Trade-offs in Simplicity



OSX c.2010

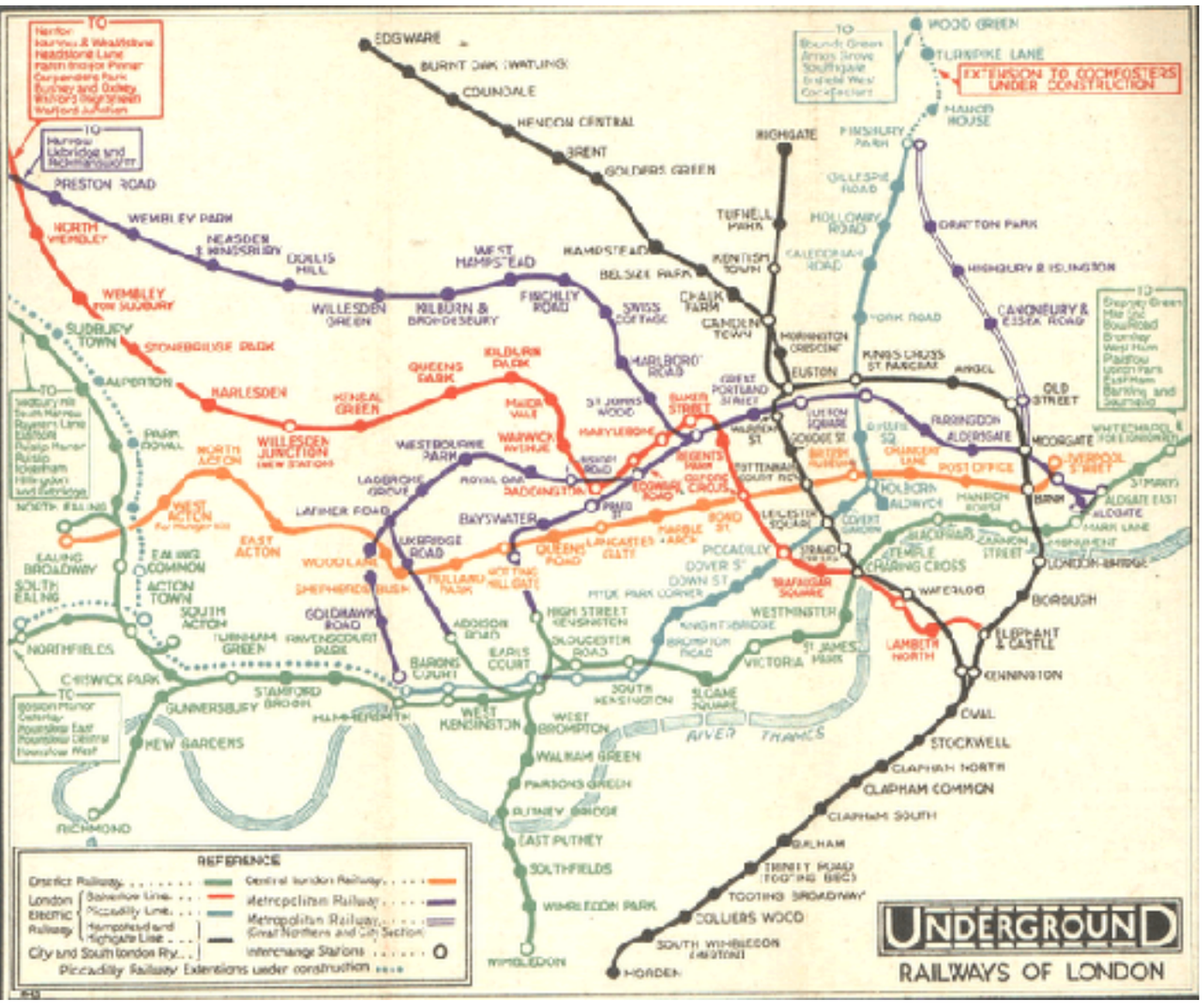


OSX c.2011



OSX c.2016

Guidelines for Visual Design



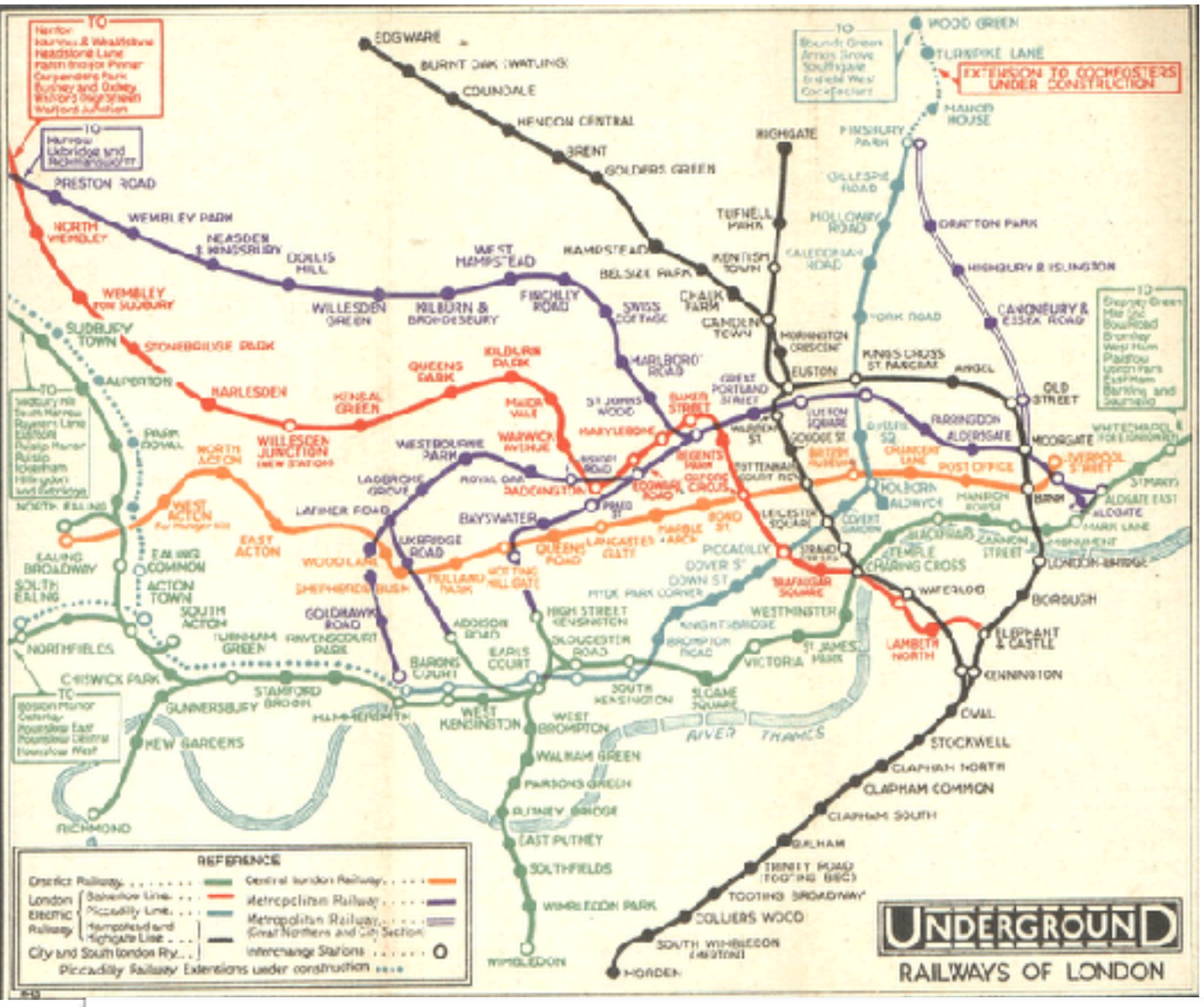
Reduction in new map: relative distances don't matter

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!

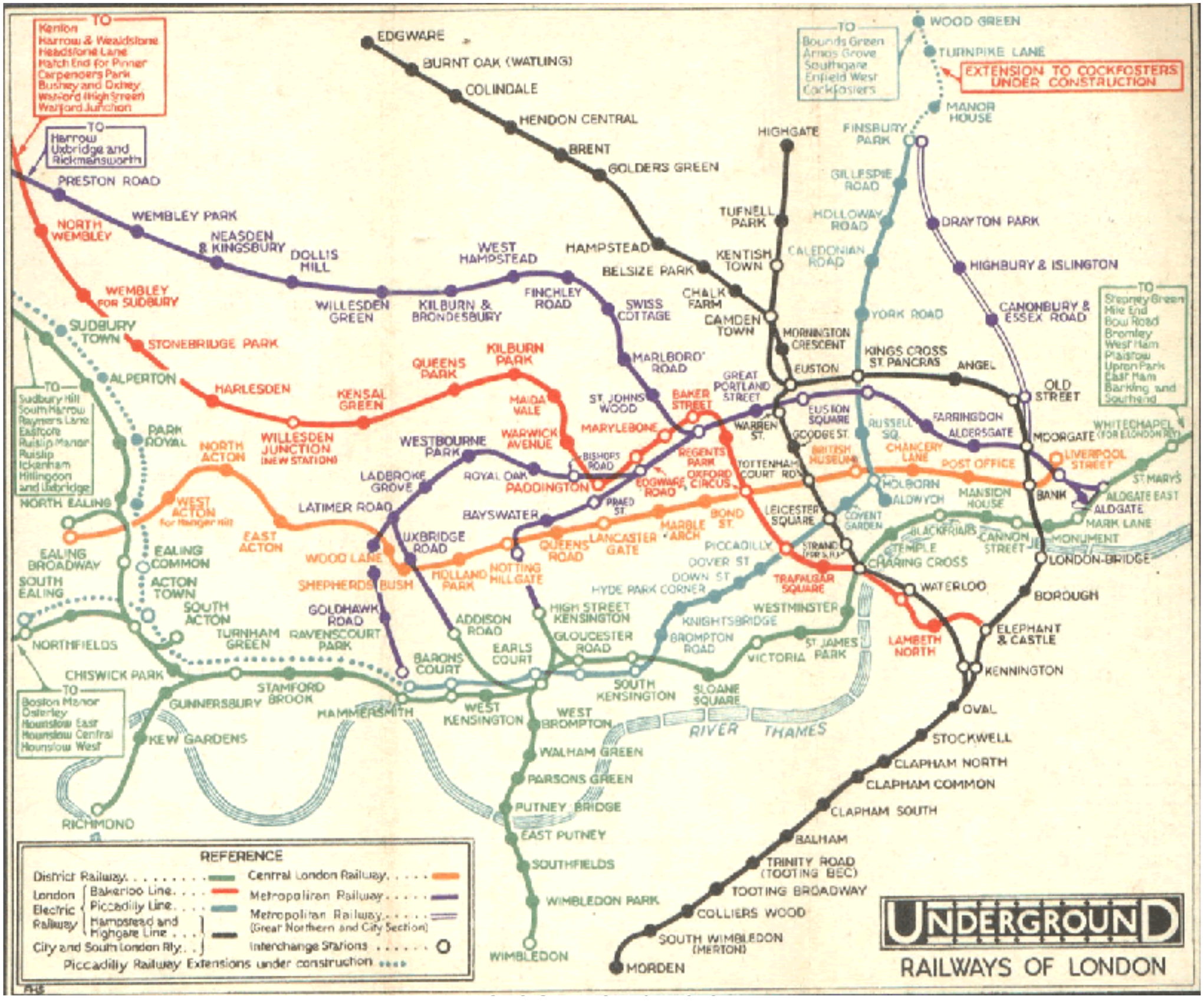
1. Use **regular** geometric forms, simplified controls, muted colors where possible
2. If multiple similar forms required, make them identical as much as possible in size, shape, color, texture, spacing, alignment
3. Limit variation in typography to a few sizes
4. Make sure critical elements intended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

Guidelines for Visual Design



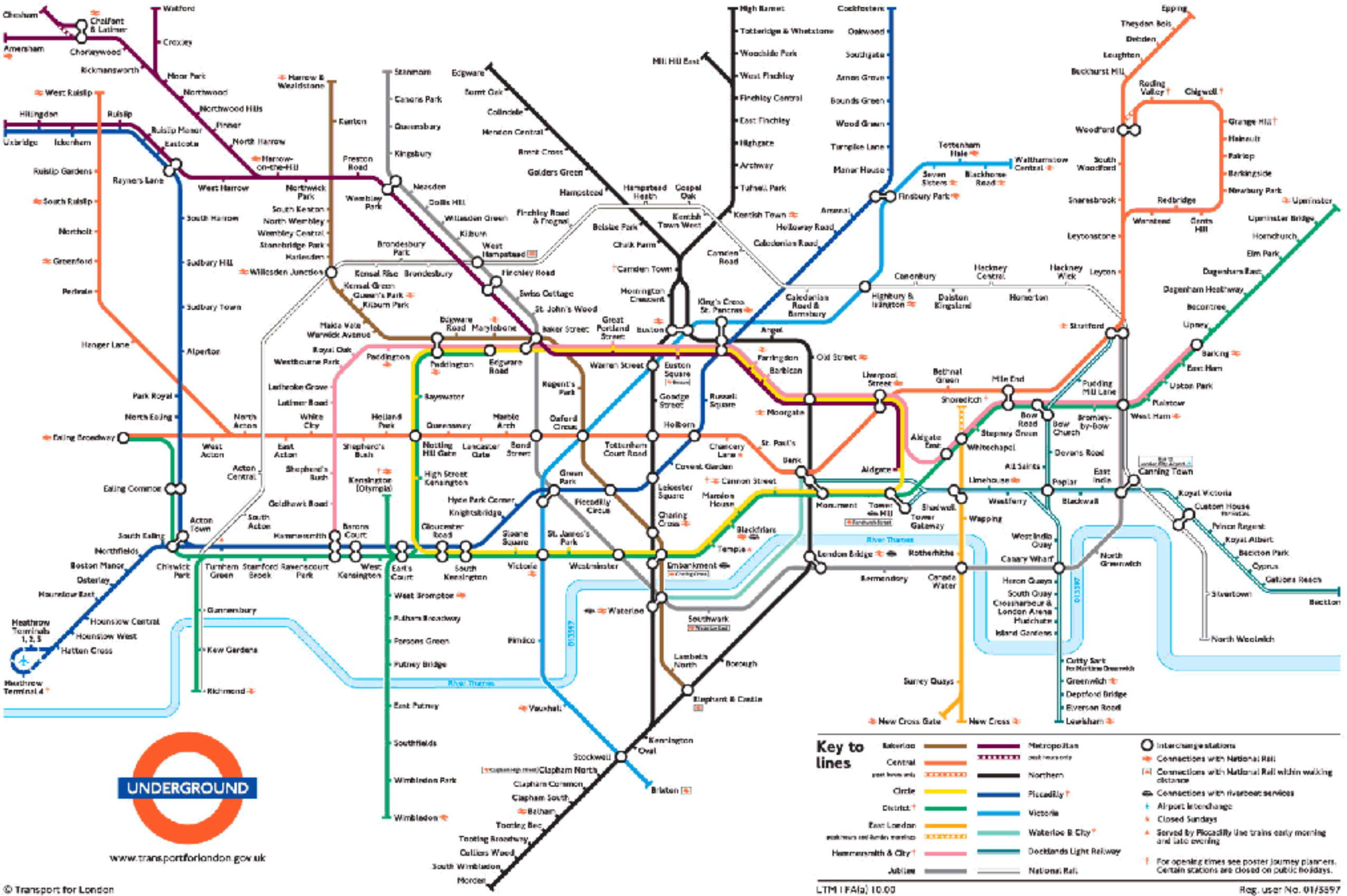
Regularization in new map: Straight lines result in station names laid out in a line, rather than bouncing around

Original (1920's?) Underground Map

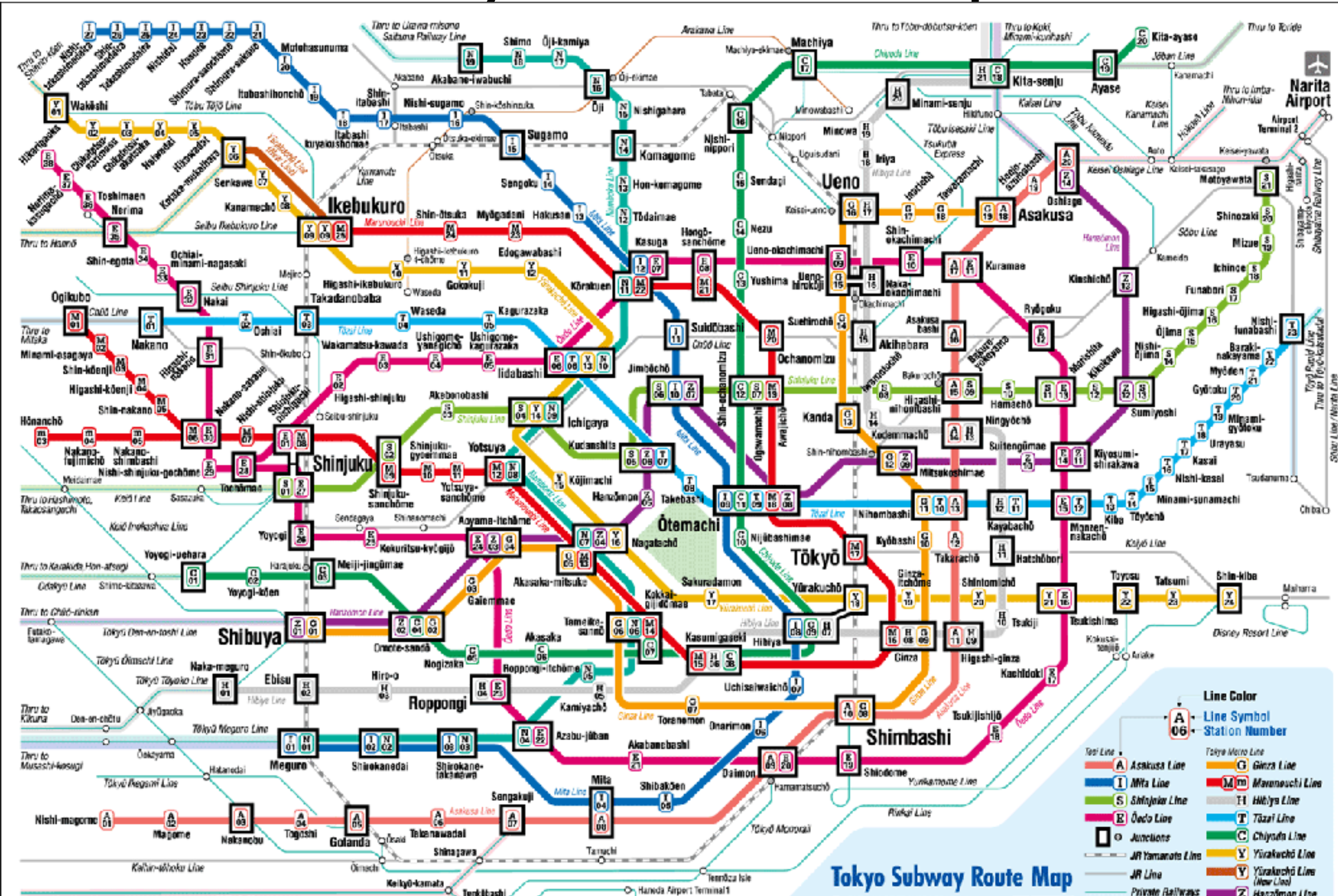


Beck's 1933 Underground Map

Today's Underground Map

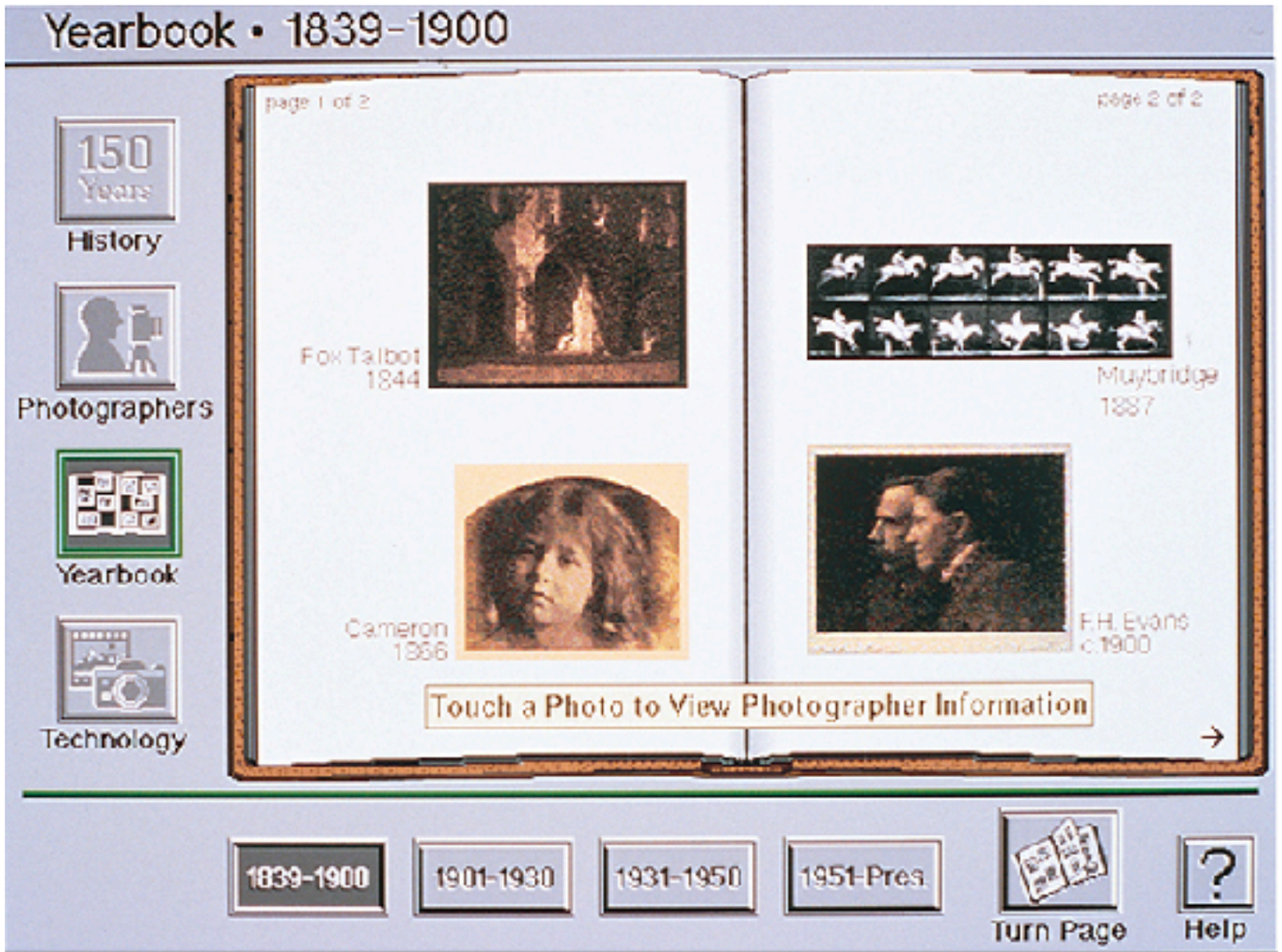


Tokyo Metro Map



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

<a href="http://ww... Saturday

It's the City Journal... Saturday

<a href="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?

In fact, kind of the underlying thesis is that the quote-unquote "TEXAS MODEL" works, "incontrovertibly" you say at the end of the book. So a two-part question: What exactly is the Texas Model? It's not quite simply unfettered free enterprise is it?

The second part of the question is: Who is the model working for? I know 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

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

Details

Wednesday, July 3, 2013

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

iPad 2:01 PM 92%

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 10:30 AM • SWE 432 Noon	23	24 • SWE 432 Noon	25	26
27	28	29 • Office Hours 10:30 AM • SWE 432 Noon	30			
				Dec 1 • SWE 432 Noon	2	3
4	5	6 • Office Hours 10:30 AM • SWE 432 Noon	7	8 • SWE 432 Noon	9	10
11	12	13 • Office Hours 10:30 AM	14	15	16	17

Today Calendars Inbox

Scale, Contrast, & Proportion

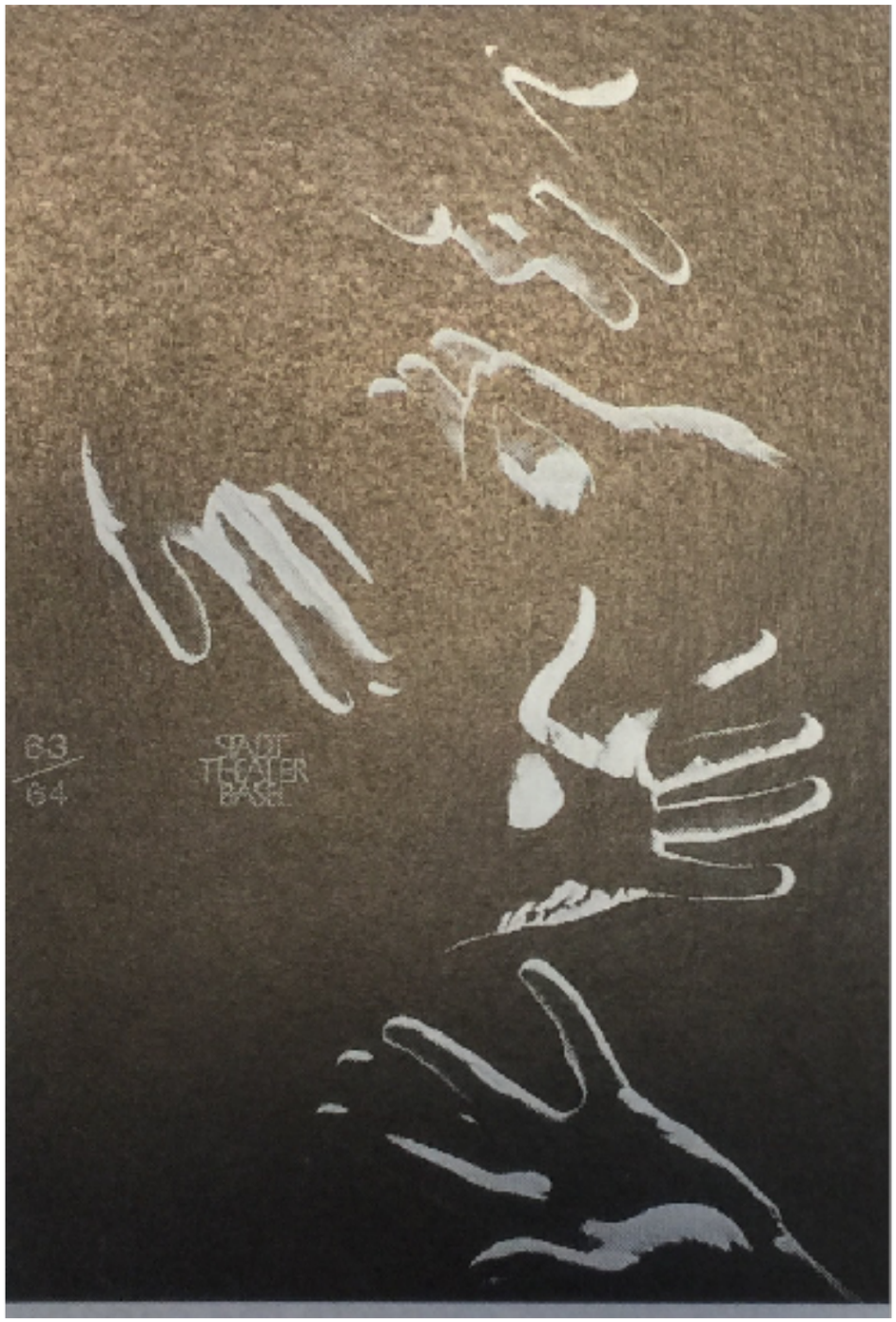
Scale, contrast, & proportion

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?

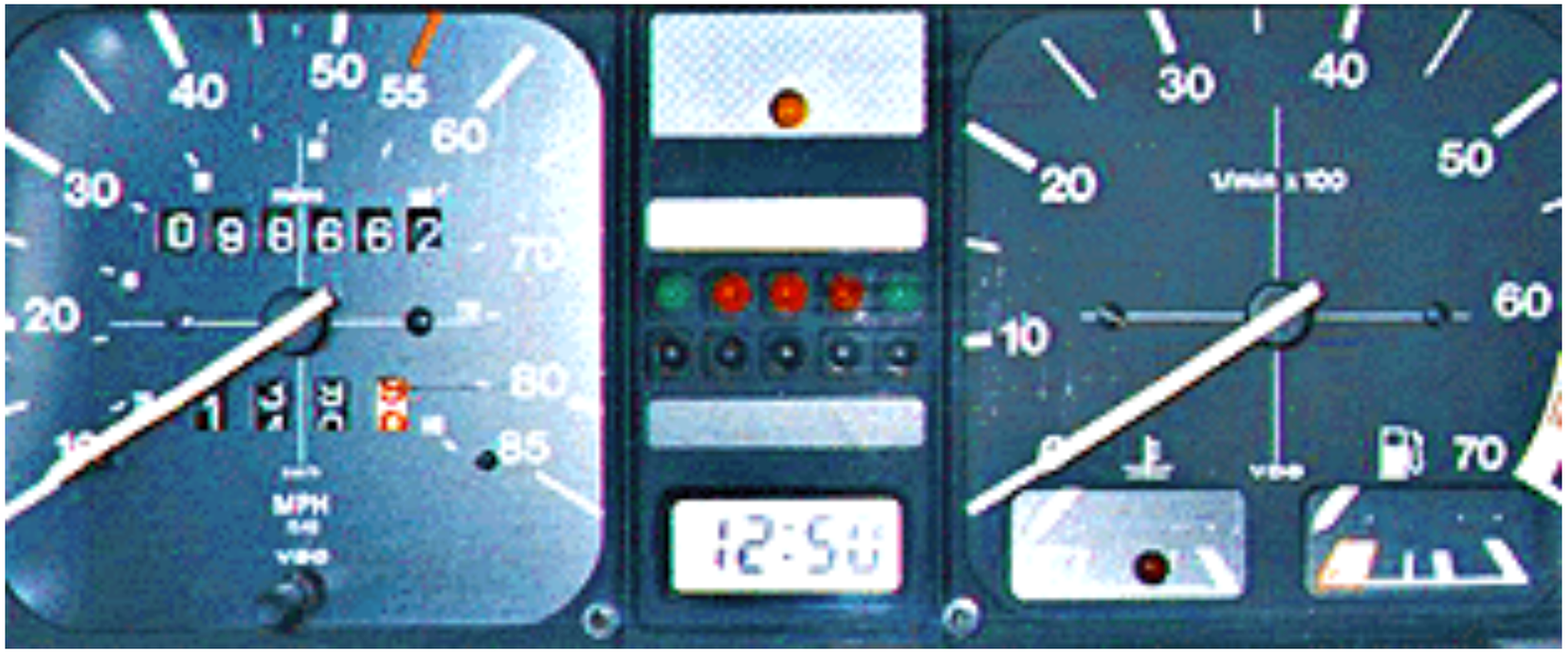
Train No.	3701	XM 3301	3801	A 67	3 3803	3 3201	A3 51	3 3703	3 3807	3 3203	A3 61	3 3809	A3 47	3 3901	3 3811	3 3903	3 3813	3205	3815	3817	3819	3207	3821	3823	3825	3209	3827	3829	3831
New York, N.Y.	A.M. 12.10	A.M. 12.40	A.M. 1.30	A.M. 3.52	A.M. 4.50	A.M. 6.10	A.M. 6.25	A.M. 6.35	A.M. 6.50	A.M. 7.10	A.M. 7.30	A.M. 7.33	A.M. 7.45	A.M. 7.50	A.M. 8.05	A.M. 8.25	A.M. 8.40	A.M. 8.50	A.M. 9.10	A.M. 9.40	A.M. 10.10	A.M. 10.25	A.M. 10.40	A.M. 11.10	A.M. 11.40	A.M. 11.50	P.M. 12.10	P.M. 12.40	P.M. 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	....	10.19	10.52	11.19	....	11.52	**12.19**	**12.52**	....	**1.22**	**1.52**	2.20

	am ◗																												
New York, NY	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				
Newark, NJ[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				
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				
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				
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				
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				
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				
Edison	12.51		2.11	. .	. .		. .	7.17	7.32		. .	8.14	. .		8.47		9.21		. .	10.21	. .		11.21	. .	12.21				
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				
Jersey Avenue	1.02		2.18	. .	. .		. .	7.28	. .		. .	8.21	. .		. .		9.28		. .	10.28	. .		11.28	. .	12.28				
Princeton Junction[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				
Trenton, NJ			2.42	4.58	6.03		7.28		8.01		8.31	8.44	8.52		9.16		9.52		10.19	10.52	11.19		11.52	12.19	12.52				
TRAIN NUMBER	3701	3301	3801	67	3803	3201	51	3703	3807	3203	61	3809	47	3901	3811	3903	3813	3205	3815	3817	3819	3207	3821	3823	3825				
NOTES		XM		⟵	3	3	⟵3	3	3	3	⟵3	3	⟵3	3	3	3	3												

Principles

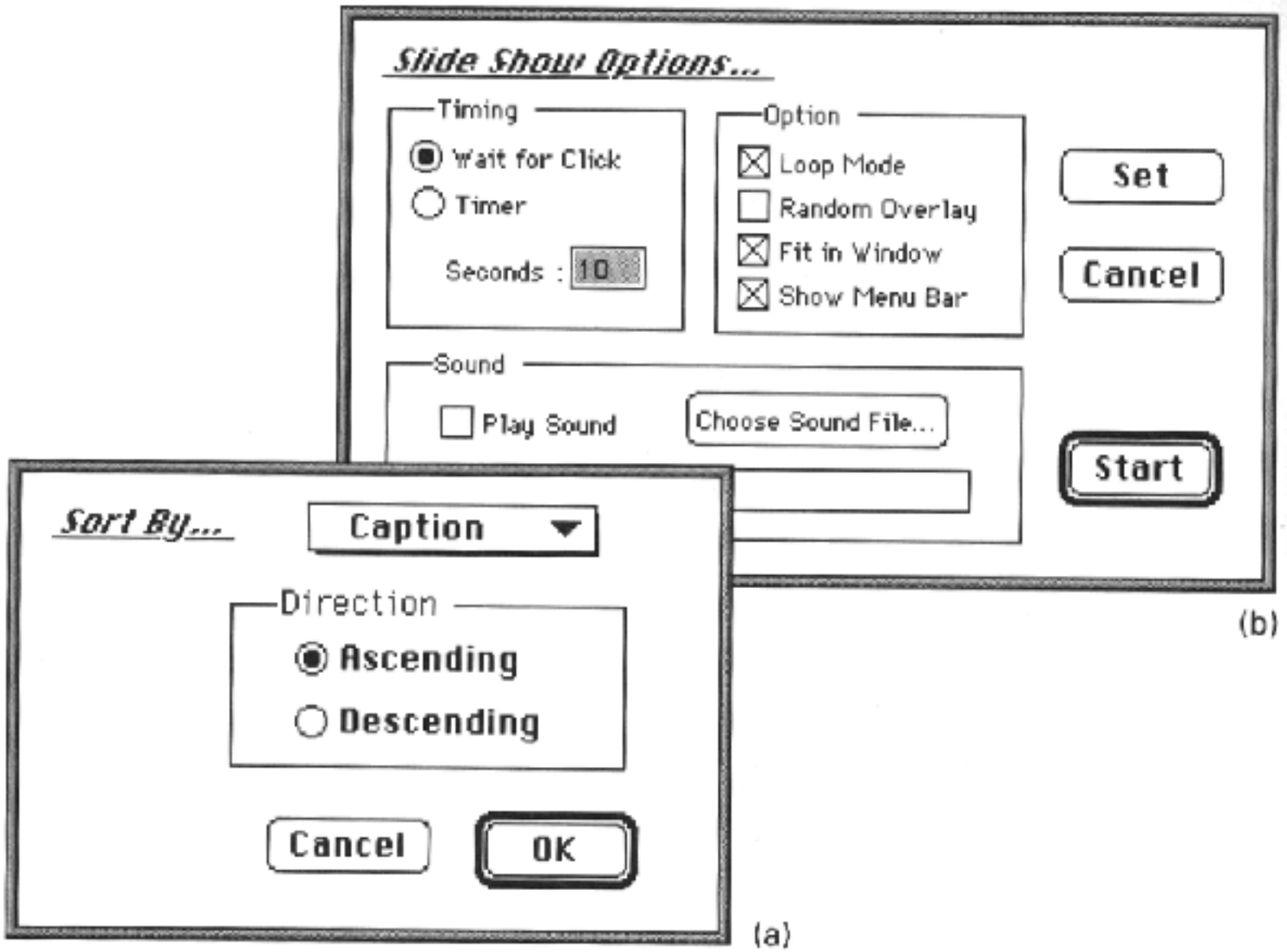
- Clarity - contrasts should be clear and easily differentiated, not slight and subtle
- Harmony - proportions and ratios should be harmonious
- Activity - use contrasts to maintain orientation & context within design
- Restraint - contrasts should be conscious, strong, few in number, and never overwhelming

Error: Lack of Clarity

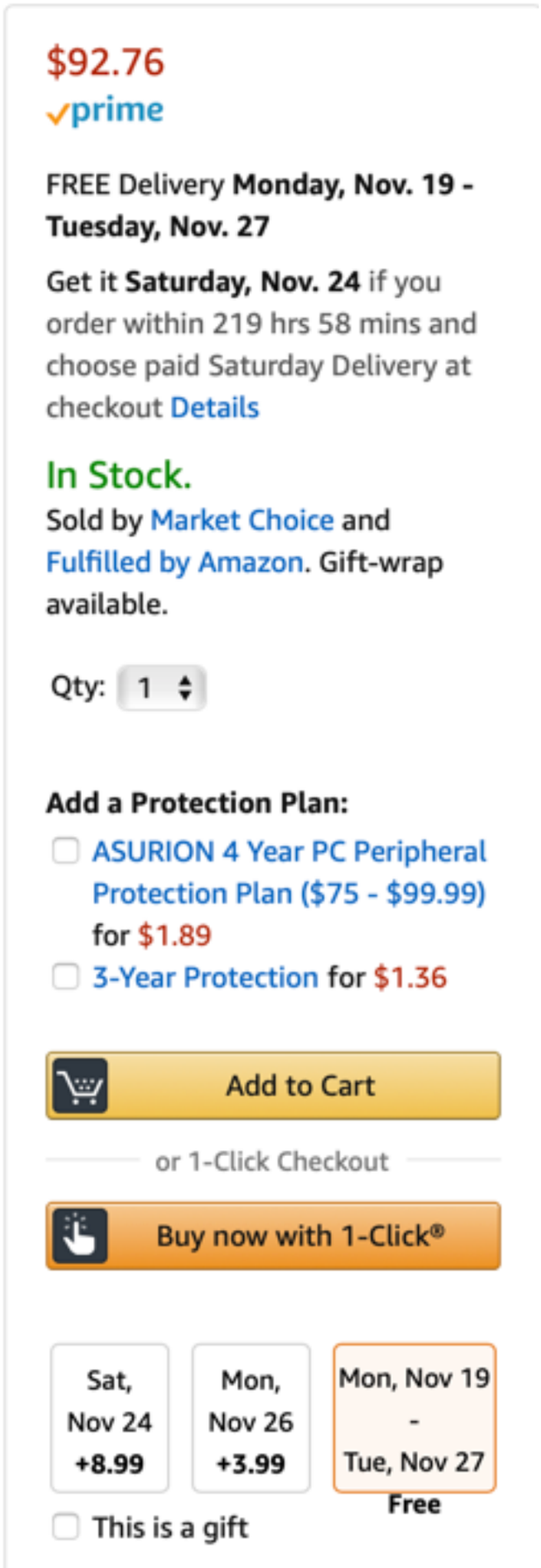


Error - excessive typographic contrasts

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



Show and tell - highlighting visual features



What is (or not) important to the customer and is (or not) visually highlighted?

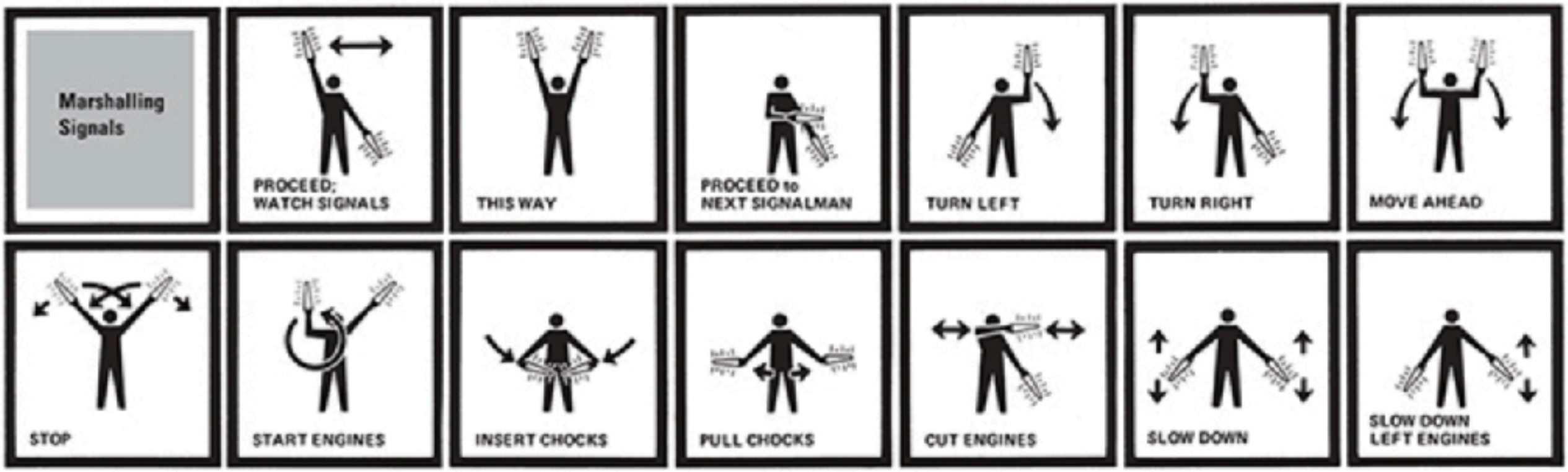
Good: add to cart/buy buttons; prime logo

Bad: Screencap taken on Weds Nov 14 ("free prime option" is >7 days!)

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**

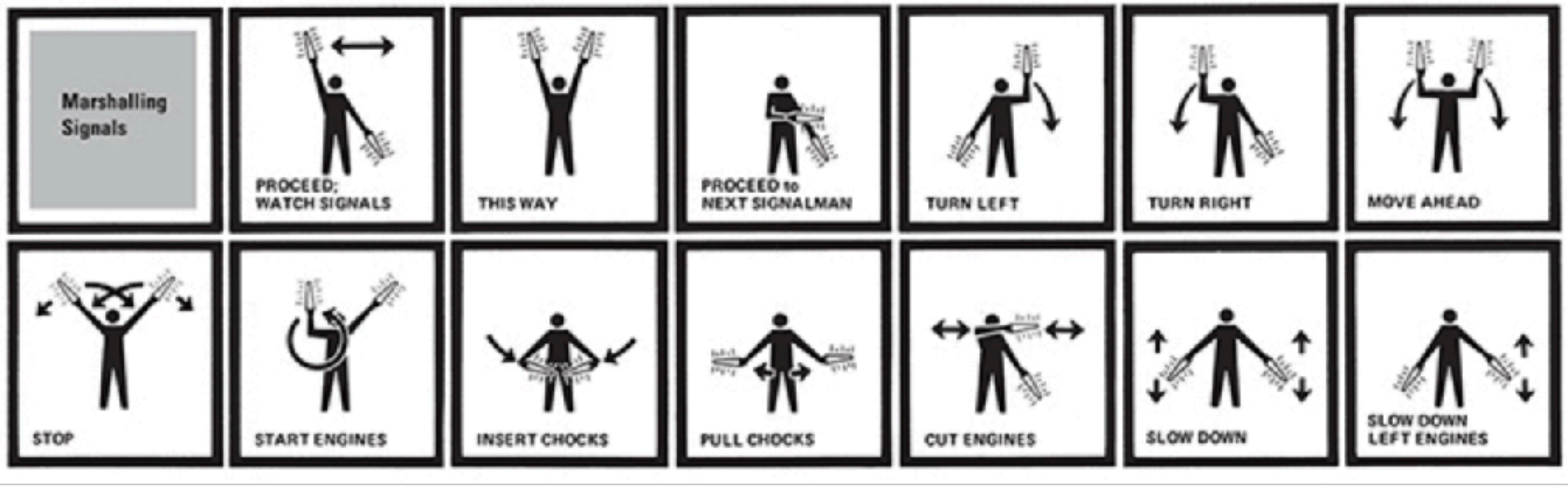
No Layers, Confusing

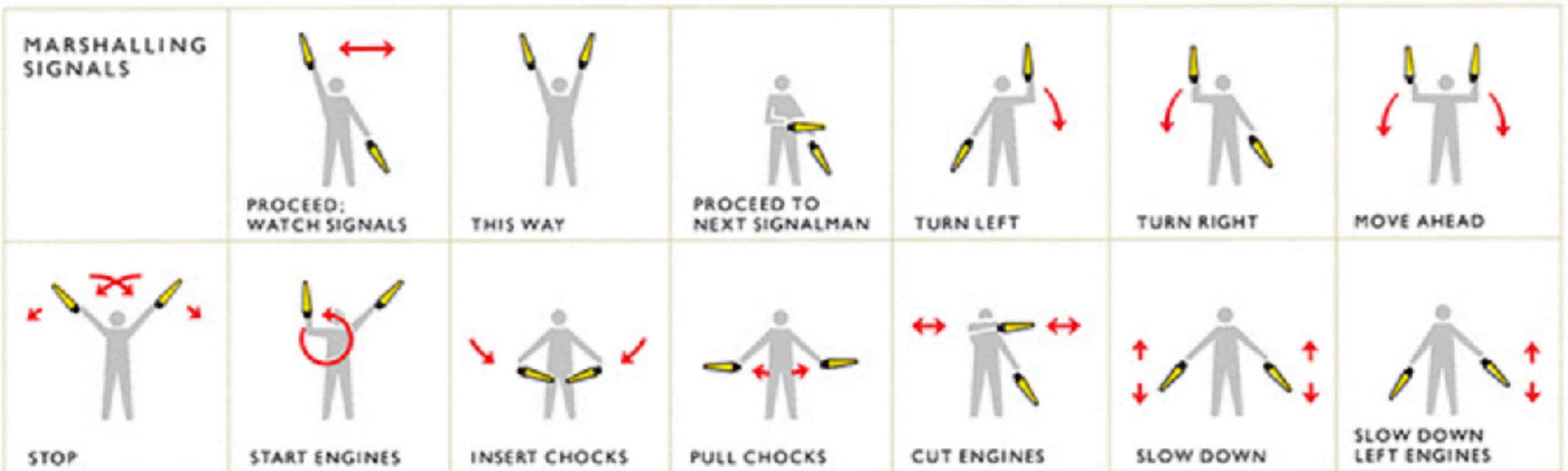


Creating layers

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


Marshalling Signals
PROCEED; WATCH SIGNALS
THIS WAY
PROCEED to NEXT SIGNALMAN
TURN LEFT
TURN RIGHT
MOVE AHEAD
STOP
START ENGINES
INSERT CHOCKS
PULL CHOCKS
CUT ENGINES
SLOW DOWN
SLOW DOWN LEFT ENGINES


MARSHALLING SIGNALS
PROCEED; WATCH SIGNALS
THIS WAY
PROCEED TO NEXT SIGNALMAN
TURN LEFT
TURN RIGHT
MOVE AHEAD
STOP
START ENGINES
INSERT CHOCKS
PULL CHOCKS
CUT ENGINES
SLOW DOWN
SLOW DOWN LEFT ENGINES

Organization & Structure

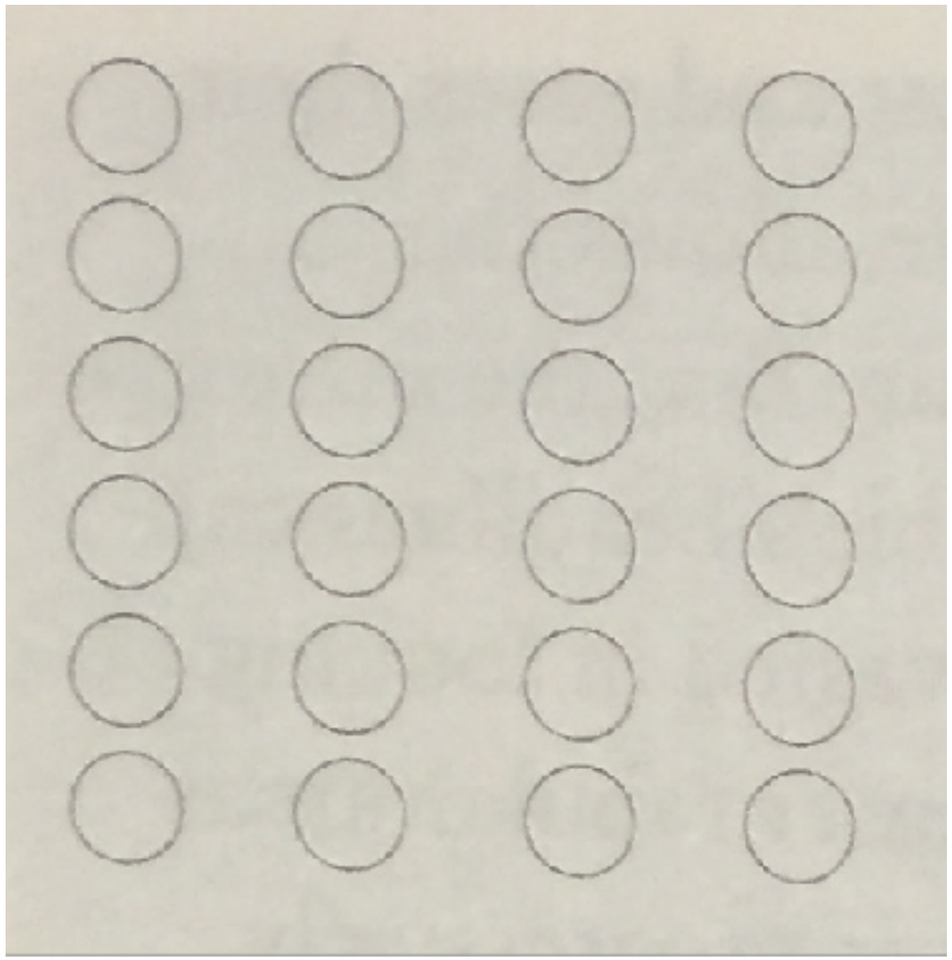
Organization & structure

- 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

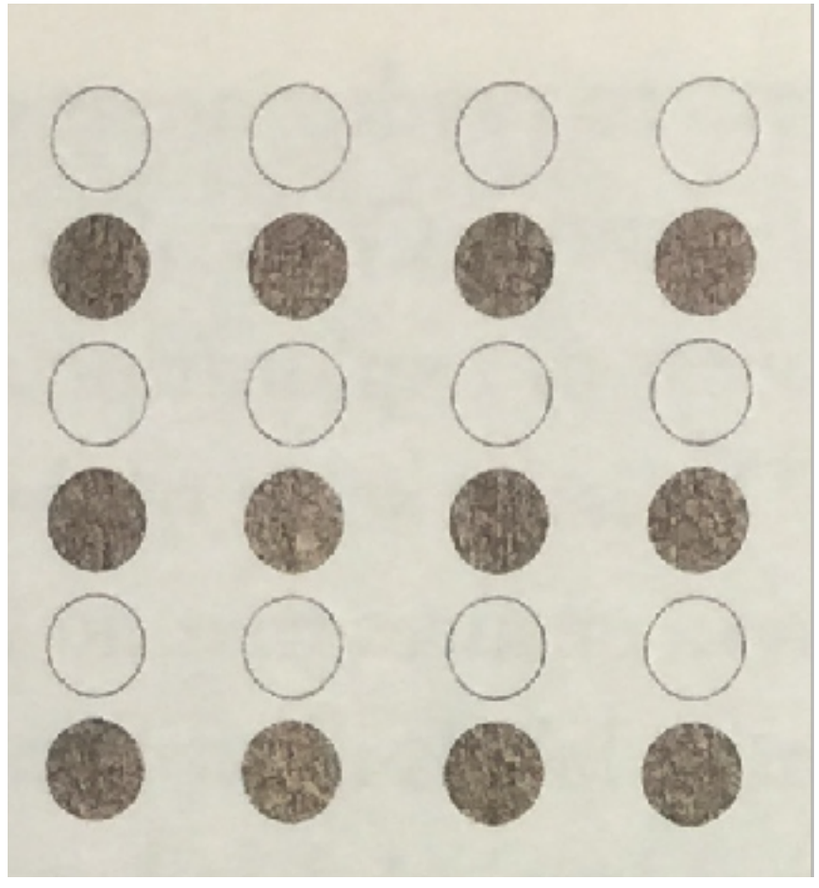
- parsed as 4 columns based on close vertical spacing
- then parsed as two sets of two columns based on spacing



Gestalt principle - Similarity

- Elements associated more strongly when share common visual attributes than when they differ

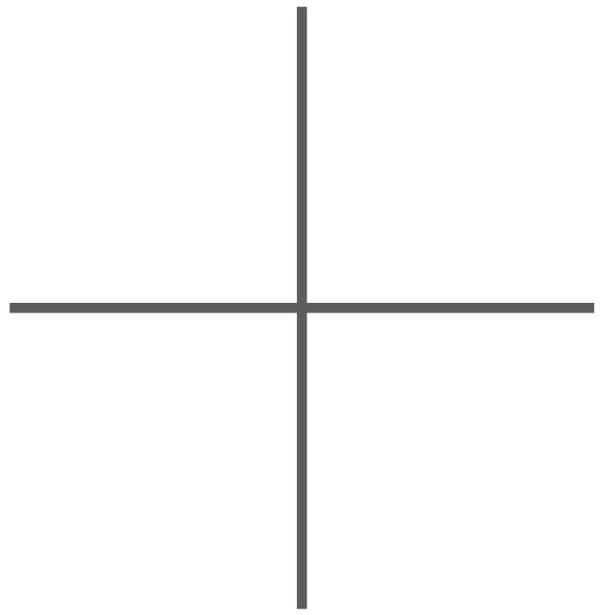
- parsed as rows based on fill similarity, despite closer column spacing



Gestalt principle - Continuity

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

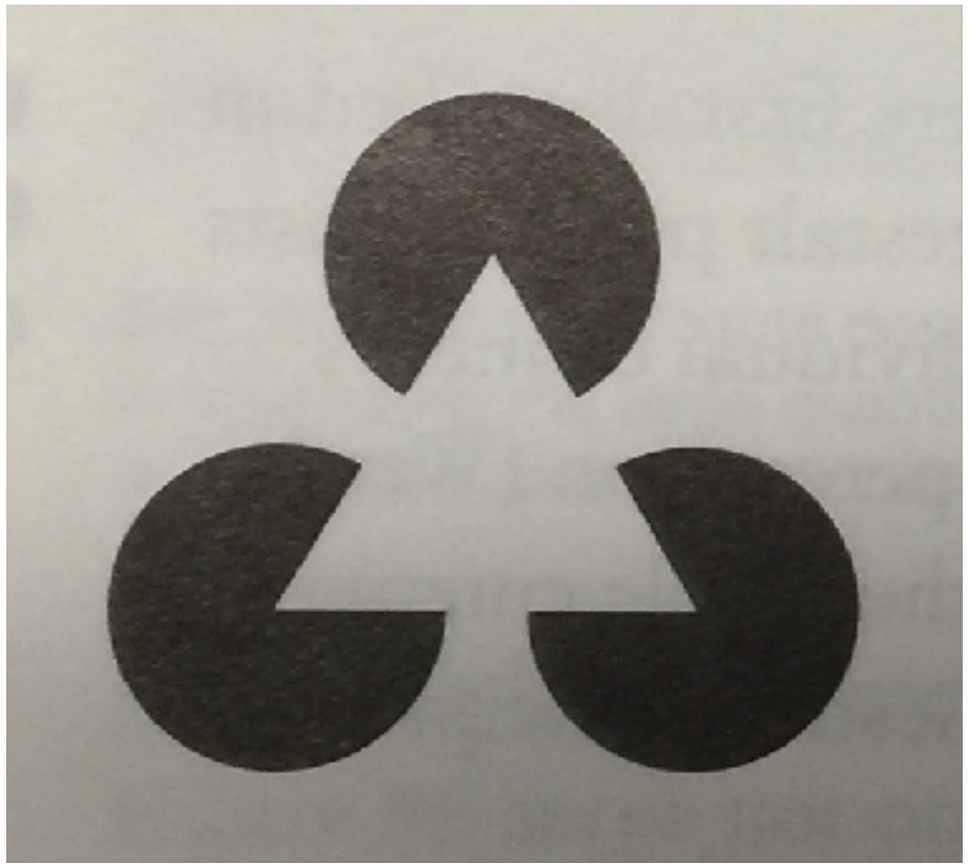
parsed as two lines, rather than 4 separate lines or 4 opposing angles



Gestalt principle - Closure

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

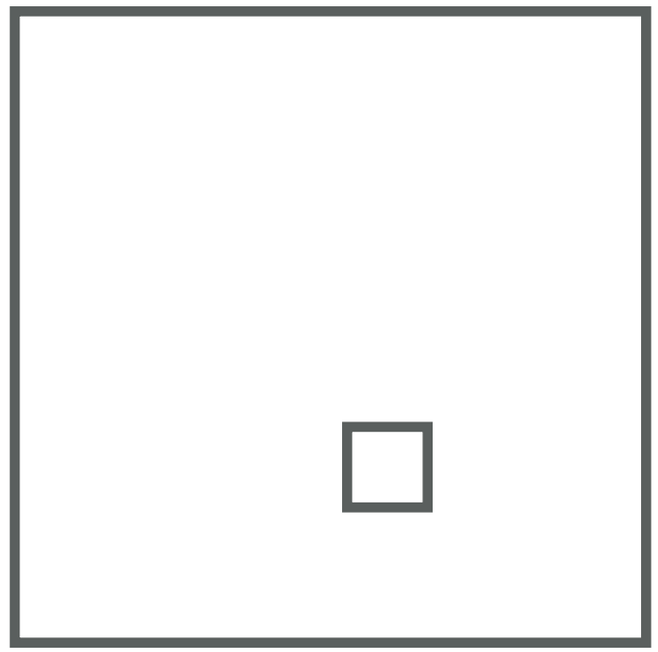
Parsed as triangle superimposed on 3 complete circles, even though none of these is actually present



Gestalt principle - Area

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

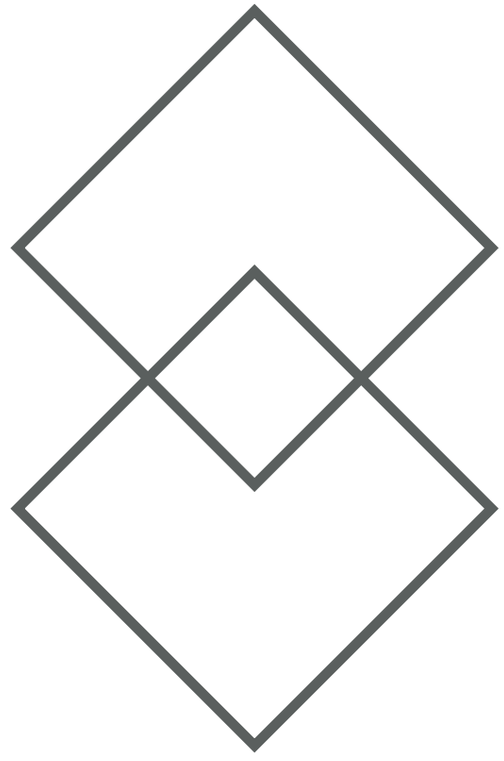
Small rectangle parsed as small rectangle on top of larger, rather than hole



Gestalt principle - Symmetry

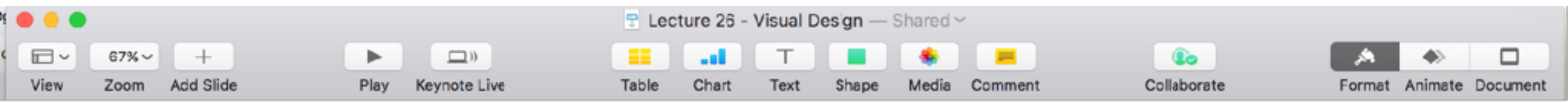
- Preference to interpret ambiguous form as multiple symmetric elements

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



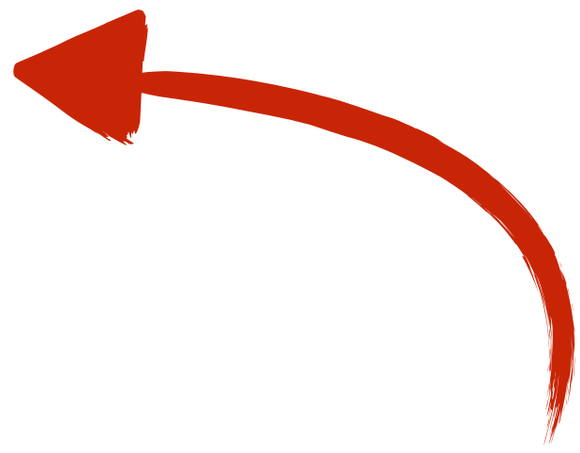
Hierarchy

Order groups based on perceptual prominence corresponding to intended reading sequence

Can help solve “skimming” problems

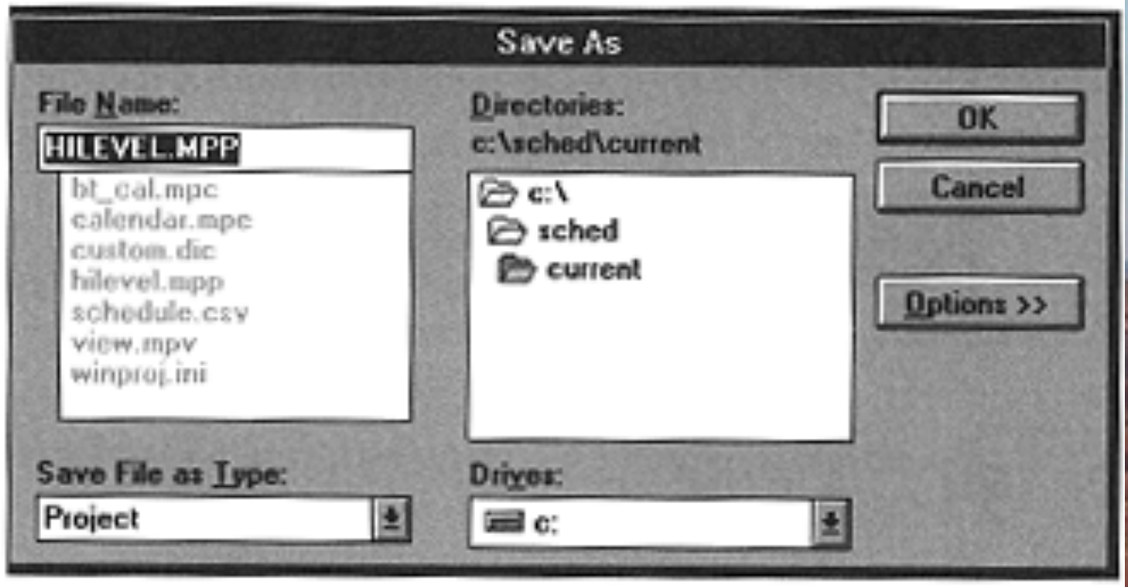
Structure can help people focus attention on key parts

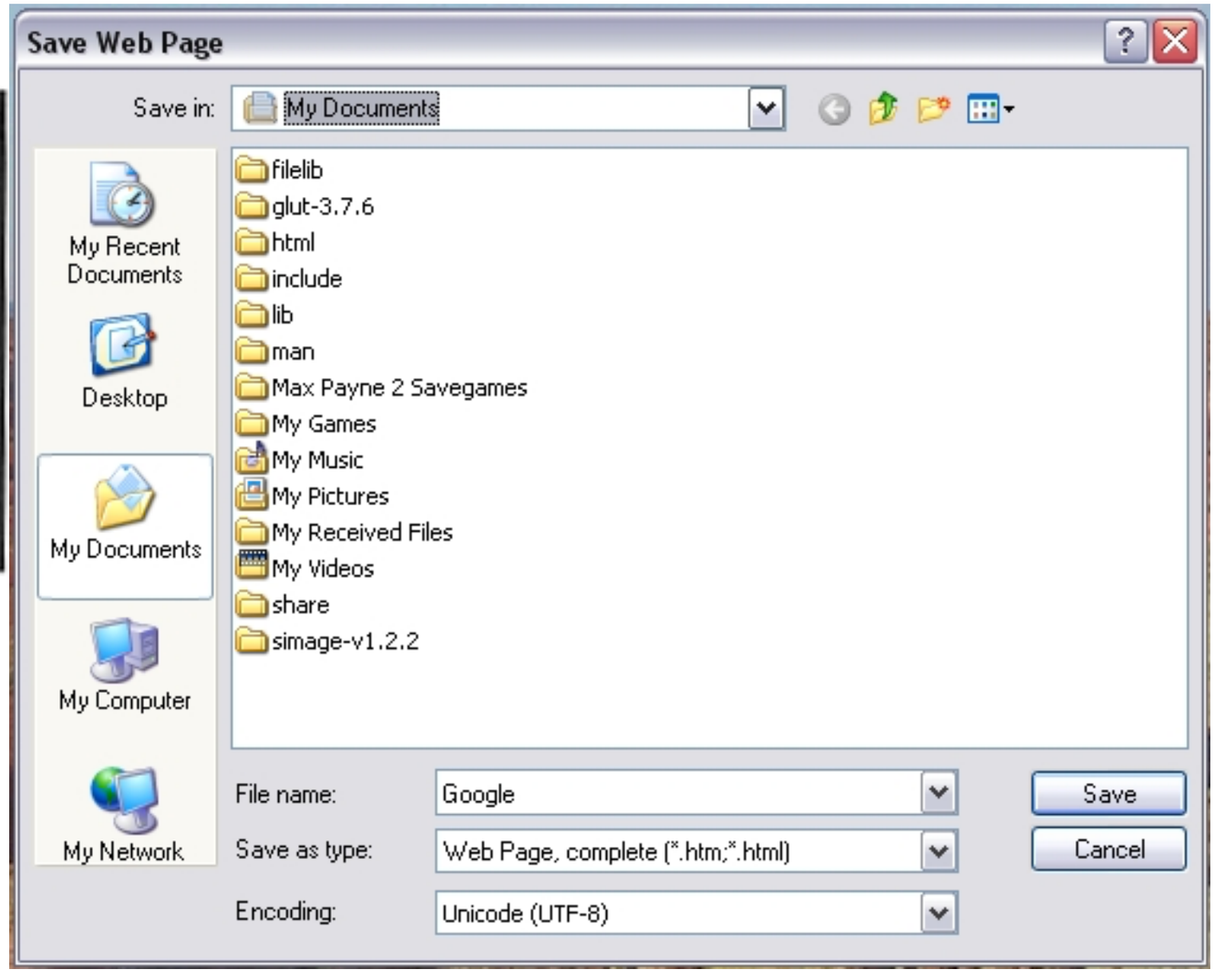
Key points might **get lost though.**



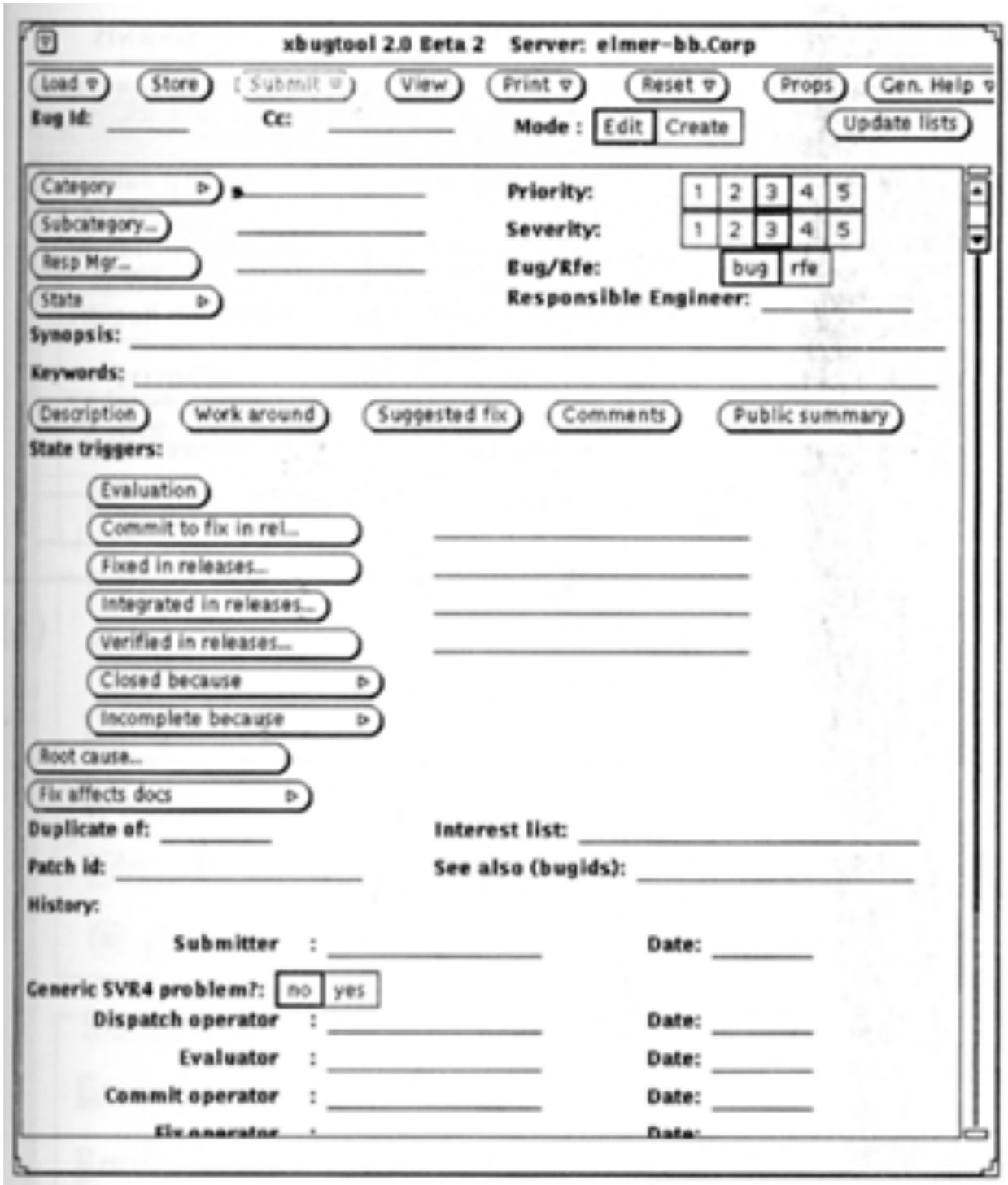
But bolding helps! Plus this obnoxious red arrow and text in a totally different font!

Hierarchy in UIs





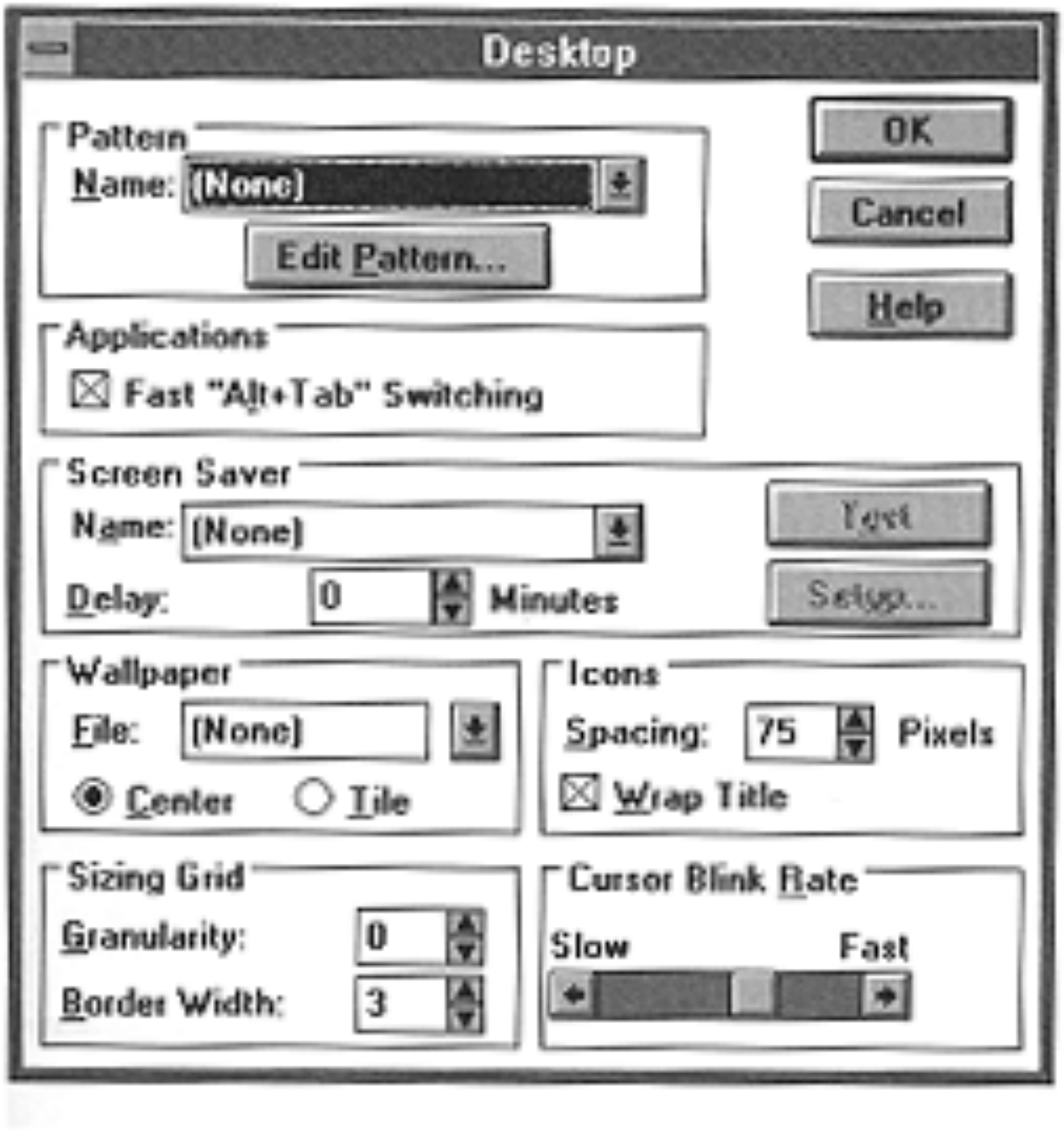
Error - Haphazard layout



(a)

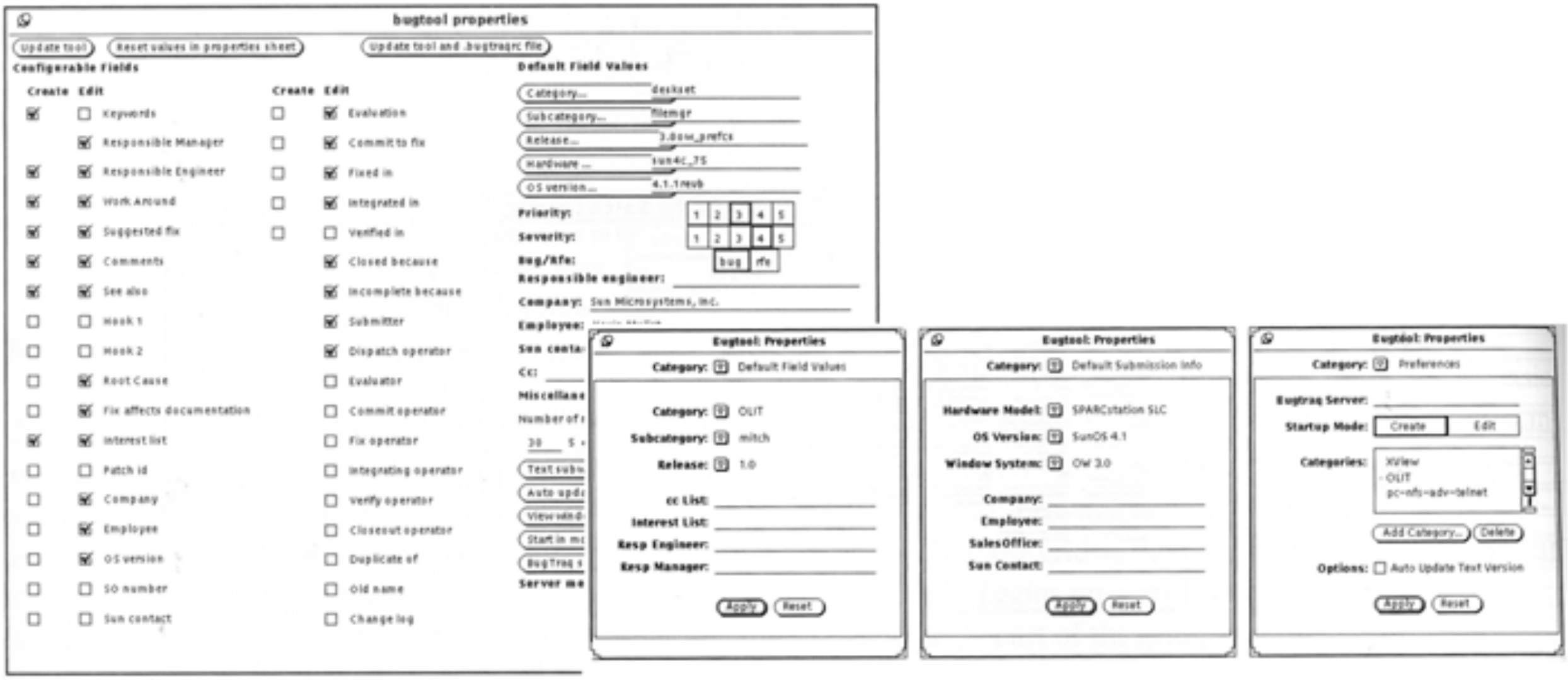
(b)

Error - Ambiguous internal relationships



Groups are aligned, contents are not

Error - Excessive display density

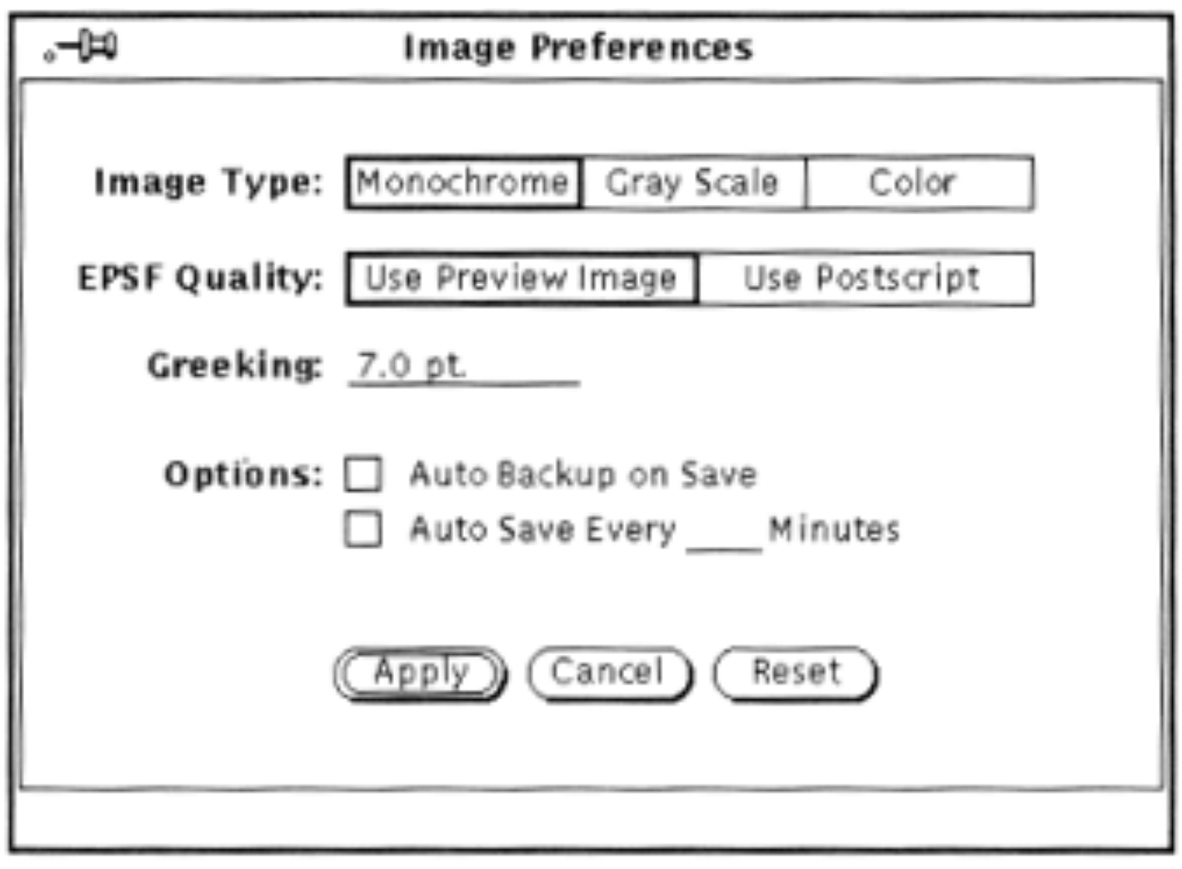


tiny font, tons of dead space.
fixed by breaking into separate panes

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

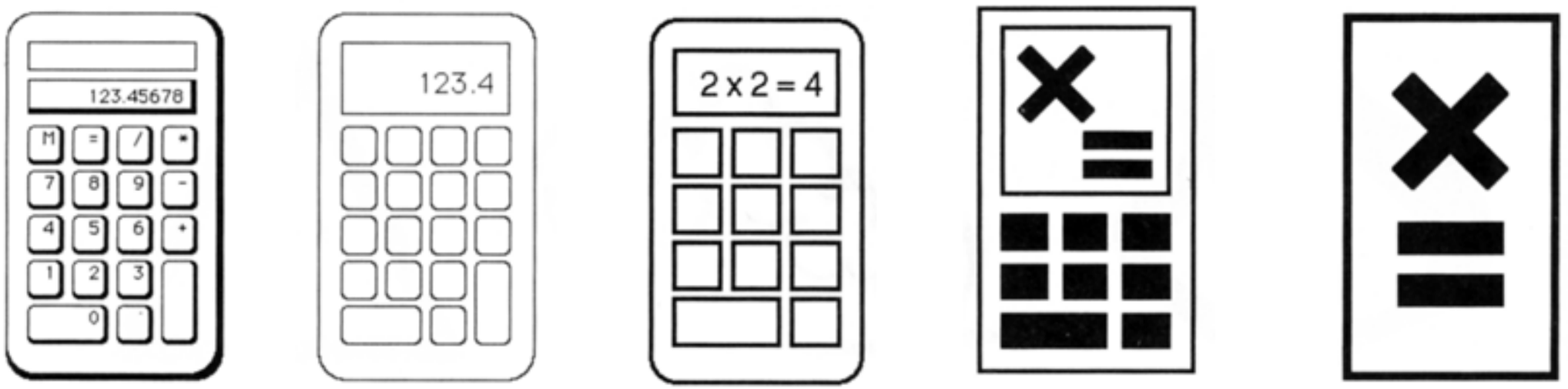
- Benefits
  - Identification - images are easy to recognize
  - Expression - breadth of artistic expression that can make design more engaging & enjoyable

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**

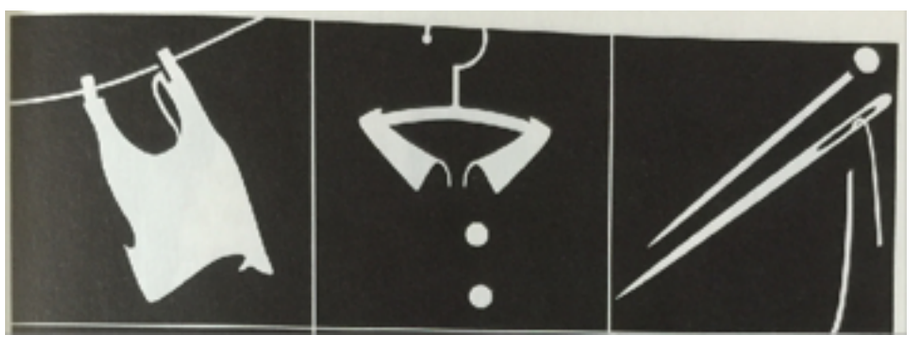
Use of abstraction

- 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

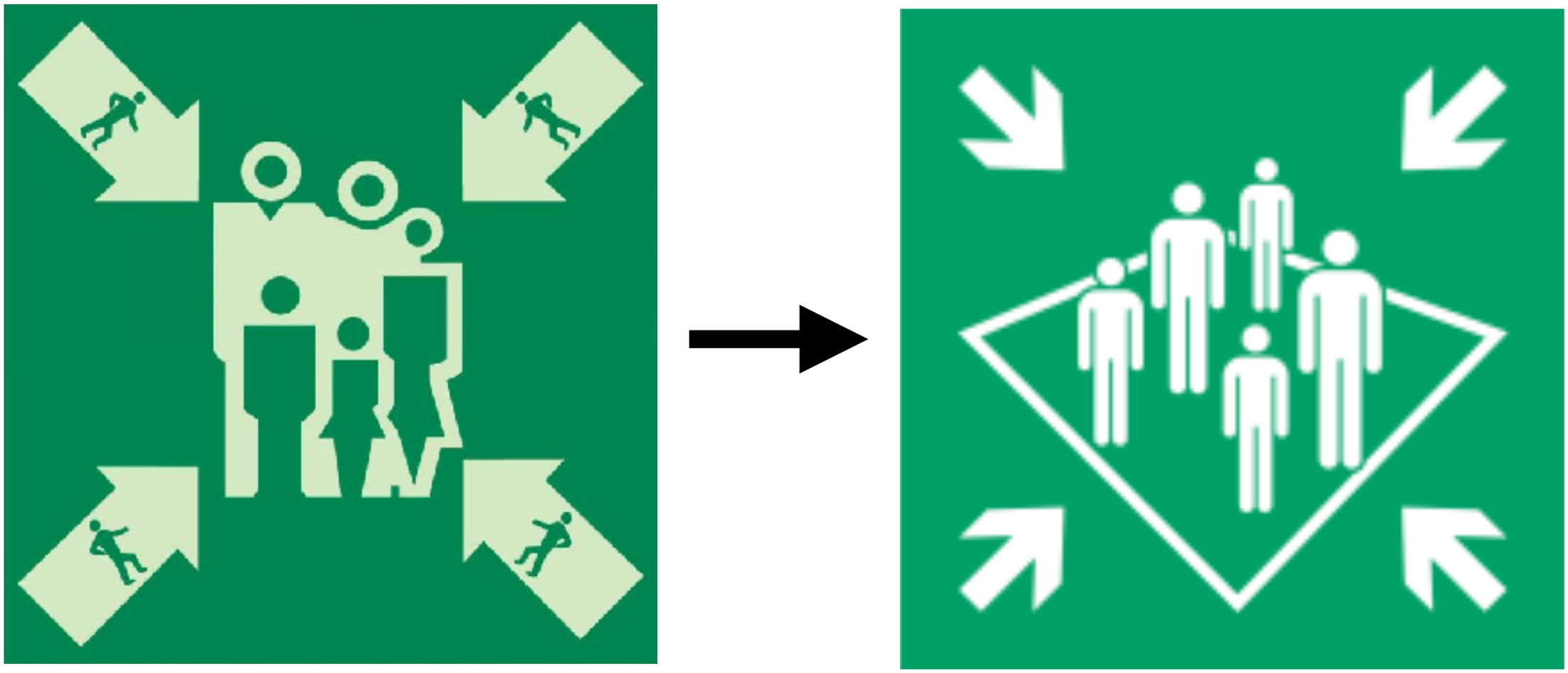
- Immediacy - can be perceived effortlessly & involuntarily by being **bold**, clear, balanced
- Generality - represents a **class** of items, rather than an individual element, by removing details that may vary
- Cohesiveness - set of icons that function **together** by sharing visual variables
- Characterization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

Misleading Syntax



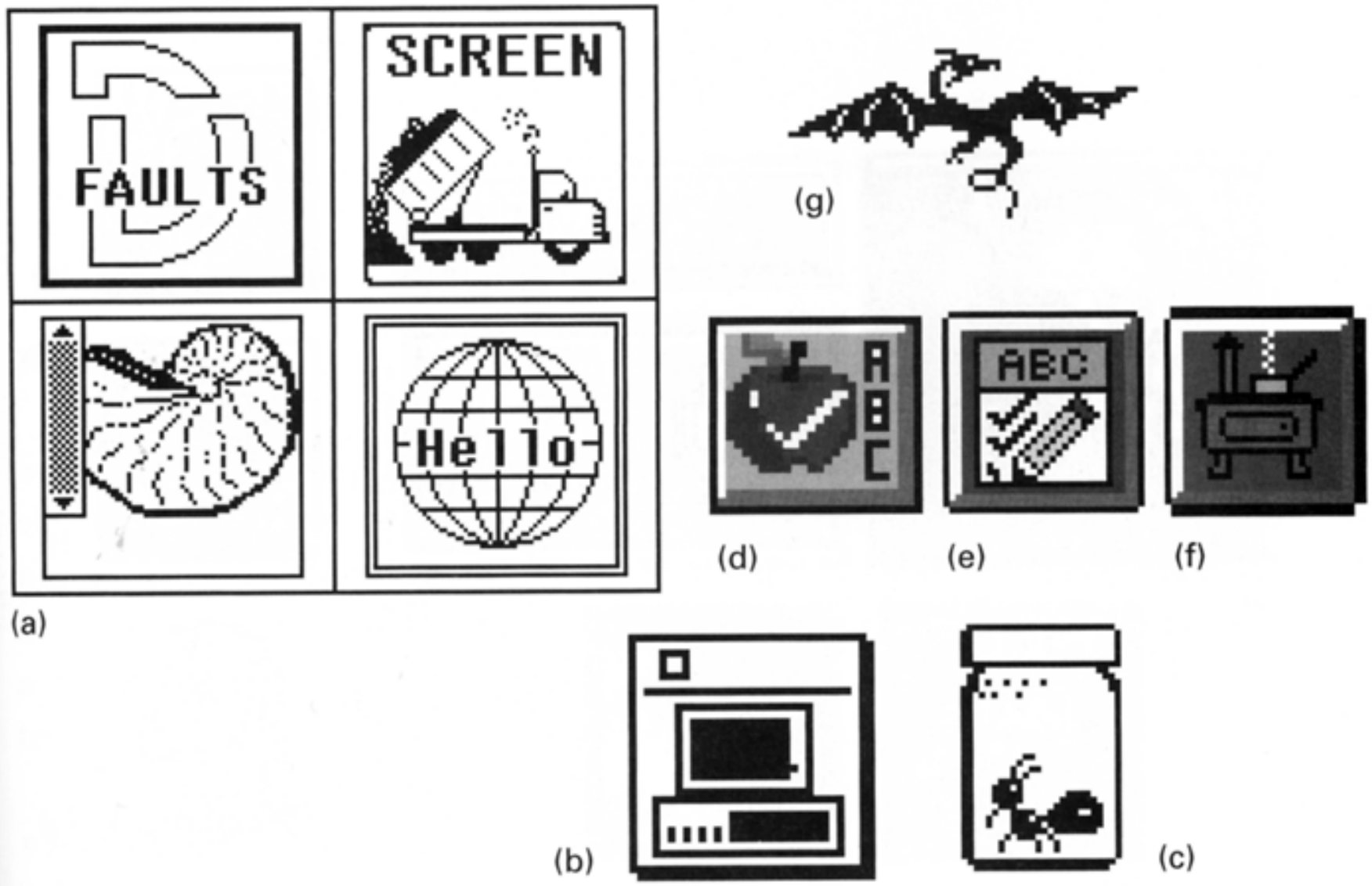
Cultural Errors: Airplane Exit Signs

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

New Airbus Exit Sign

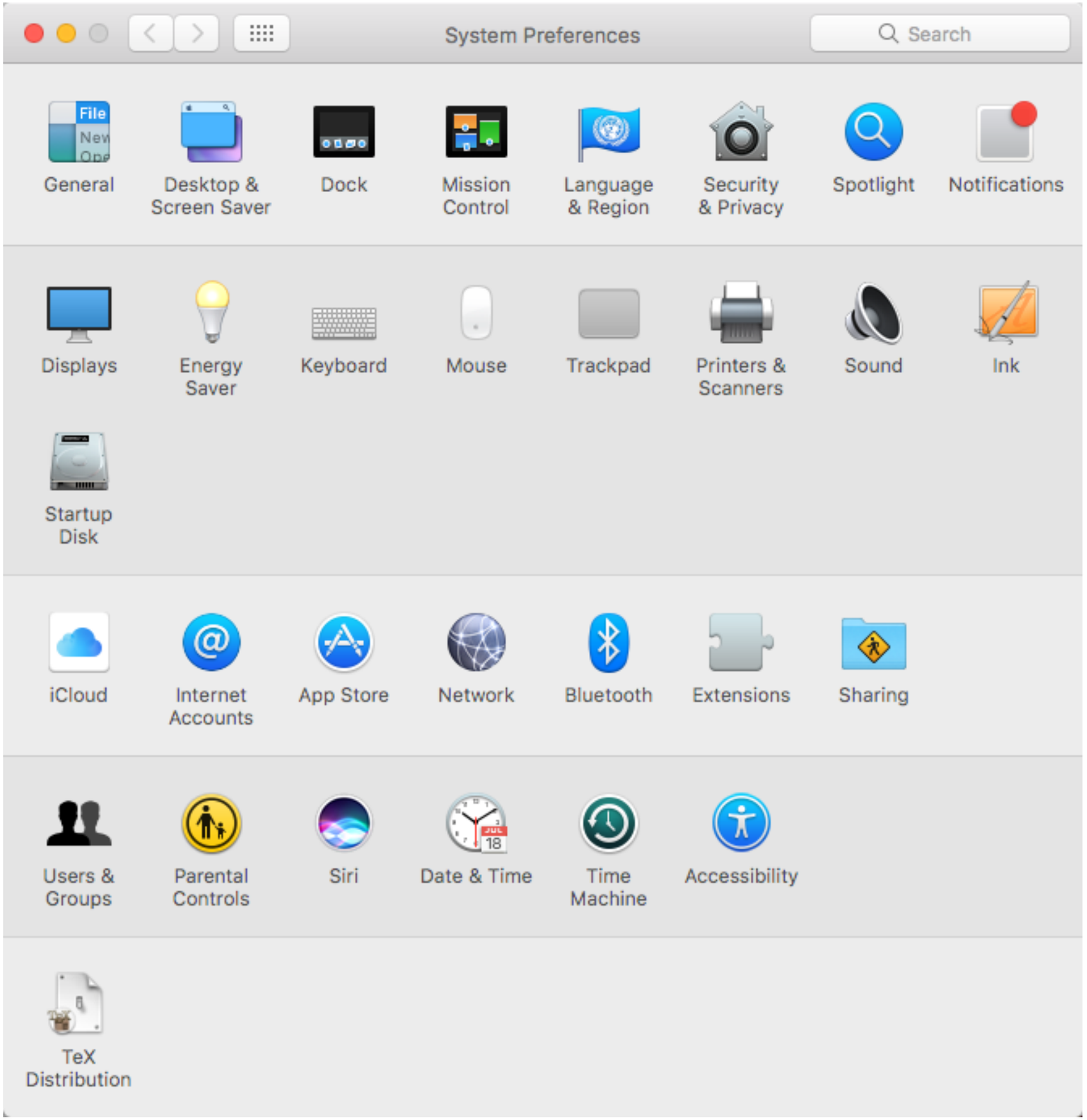
New Airbus Exit Sign

Error - Cultural or language dependence



Activity: OS 10.2 Preferences Icons

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


System Preferences
Search
General
Desktop & Screen Saver
Dock
Mission Control
Language & Region
Security & Privacy
Spotlight
Notifications
Displays
Energy Saver
Keyboard
Mouse
Trackpad
Printers & Scanners
Sound
Ink
Startup Disk
iCloud
Internet Accounts
App Store
Network
Bluetooth
Extensions
Sharing
Users & Groups
Parental Controls
Siri
Date & Time
Time Machine
Accessibility
TeX Distribution