

Building User Interfaces

Designing

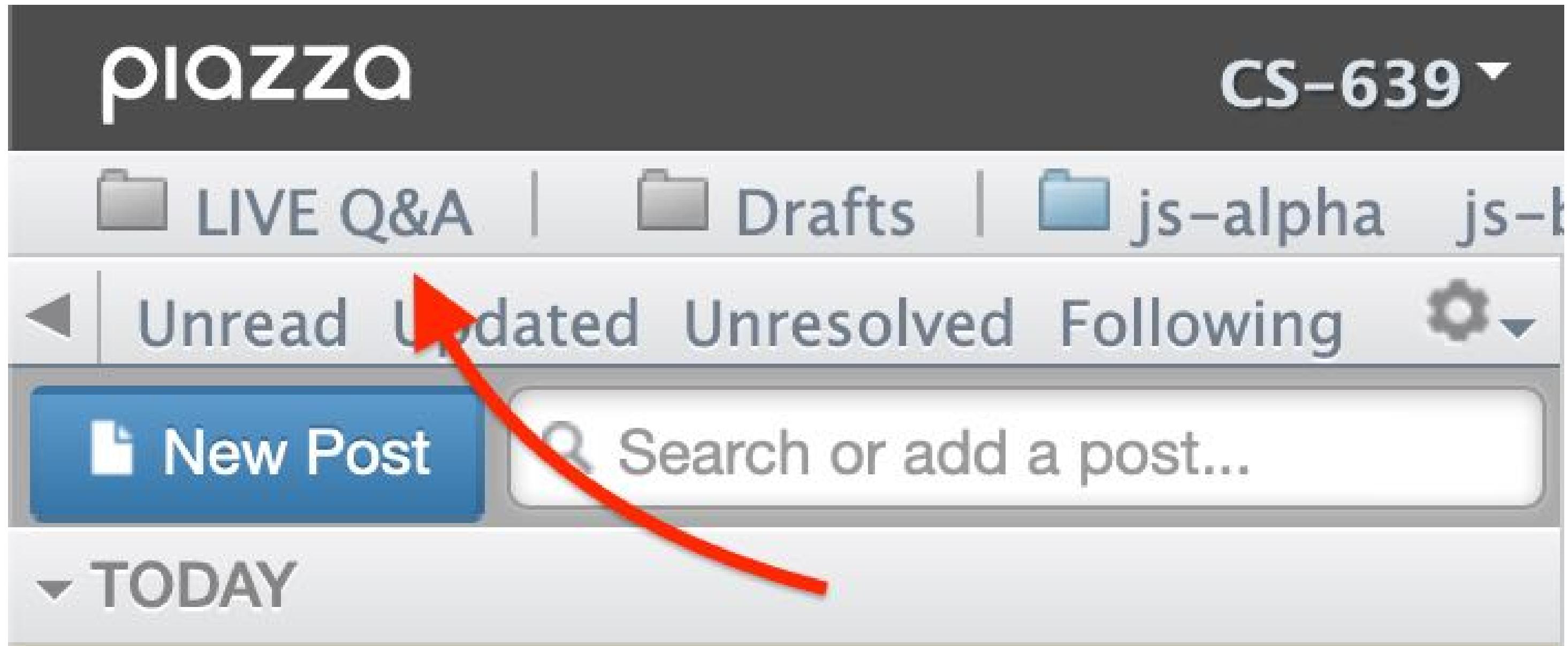
for Web & Desktop

Professor Bilge Mutlu

What we will learn today?

- A brief history of user interfaces
- Platform-specific design
 - Designing for the desktop
 - Designing for the web

Live Q&A Reminder



Commentary on React

Problem: *React components* vs *functional programming* 🤝 will not scale!

Solution: Effective use functional and React components.

Ask "what is the code doing?"

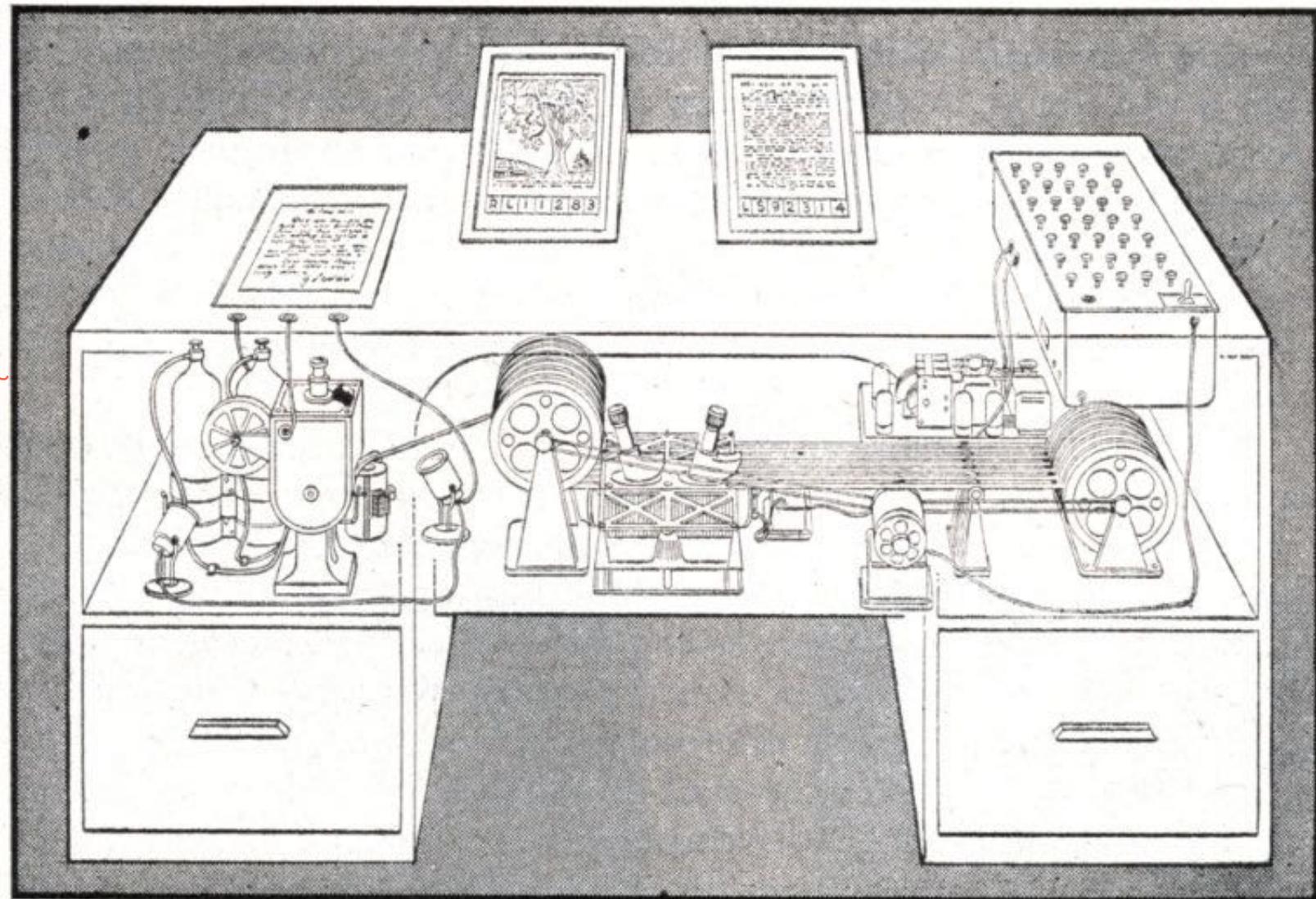
1. Creating reusable React elements ← class components
2. Computation, manipulating data, updating states ← functional components

Resources: Mosh Hamedani, ReactJS Hooks

A Brief History of User Interfaces

Milestone 1: Memex, 1945^{1 2 3}

A "proto-hypertext" system that connected documents using associated trails embedded into a desk, developed by Vannevar Bush.



MEMEX in the form of a desk would instantly bring files and material on any subject to the operator's fingertips. Slanting translucent viewing screens magnify supermicro-film filed by code numbers. At left is a mechanism which automatically photographs longhand notes, pictures and letters, then files them in the desk for future reference.

¹ Wikipedia: [Memex](#)

² [The Atlantic: As We May Think](#)

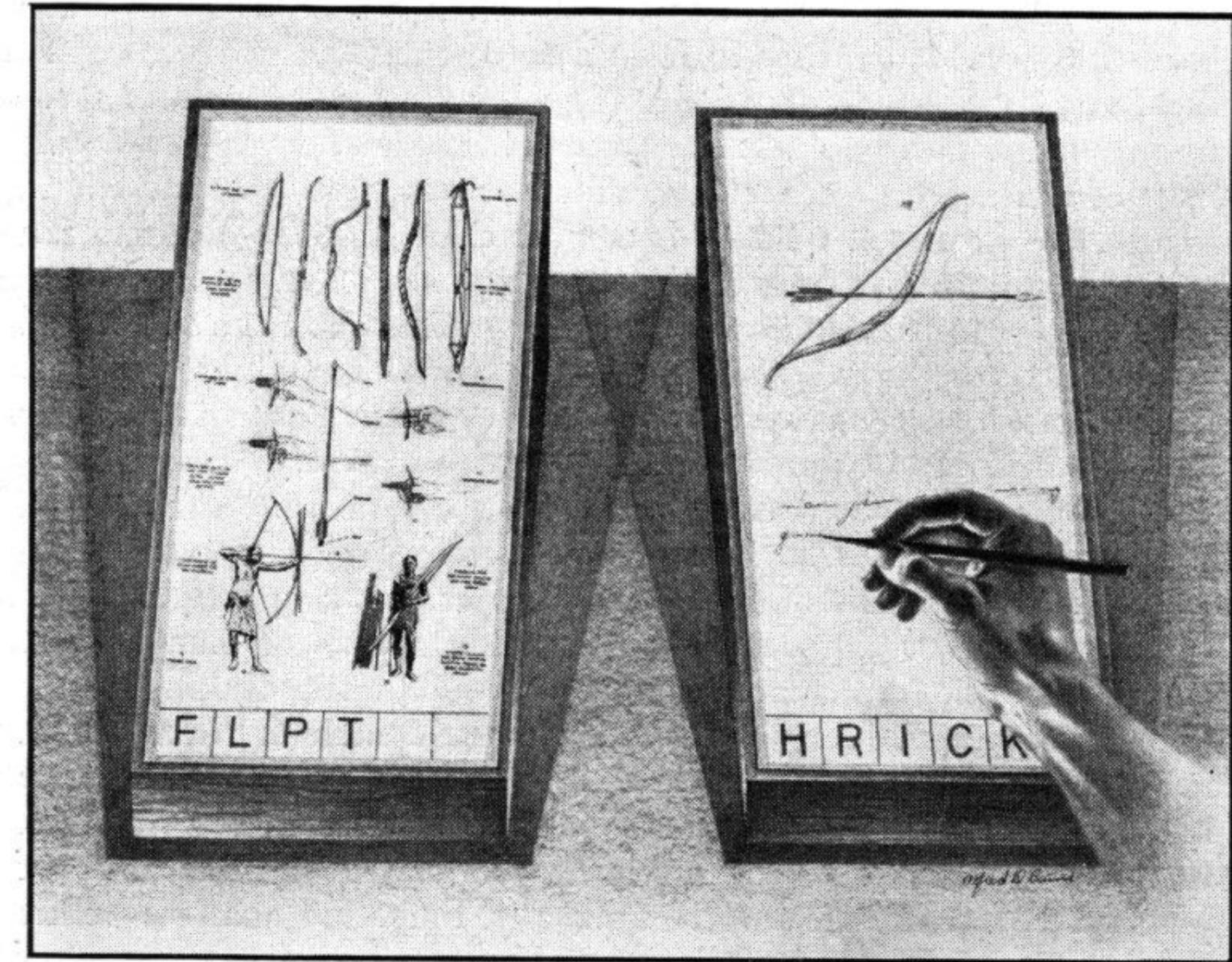
³ Image Source: [Monoskop](#)

Milestone 1, Continued⁴ ⁵

“Consider a future device ... in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to his memory.”

— Vannevar Bush, 1945

precursor to the ~~Internet~~ / hypertext



MEMEX IN USE is shown here. On one transparent screen the operator of the future writes notes and commentary dealing with reference material which is projected on the screen at left. Insertion of the proper code symbols at the bottom of right-hand screen will tie the new item to the earlier one after notes are photographed on supermicrofilm.

⁴ The Atlantic: As We May Think

⁵ Image Source: [Monoskop](#)

Milestone 2: *Sketchpad*, 1963⁶ ⁷

The first program to utilize a complete graphical user interface and that implemented object-oriented programming, non-procedural programming, constraints, pen input, etc. Sketchpad was developed by Ivan Sutherland.



⁶ Wikipedia: Sketchpad

⁷ Image source



urce

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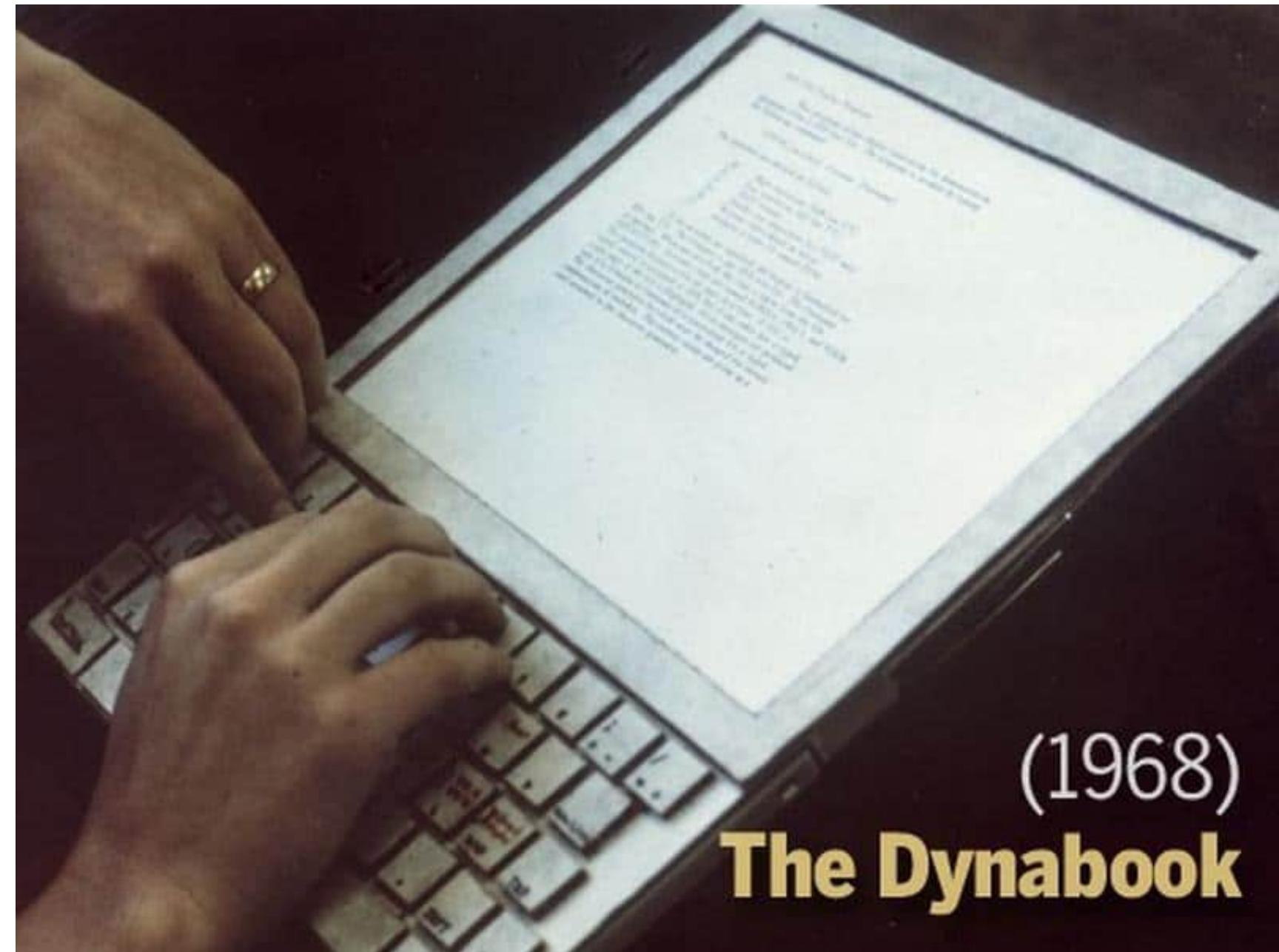
Milestone 3: Dynabook, 1968^{10 11}

A conceptual portable educational device for children (i.e., the first laptop/tablet computer) developed by Alan Kay.



¹⁰ Image sources: [left](#), [right](#)

¹¹ [A talk by Alan Kay on the history of Dynabook](#)



Milestone 4: Xerox Alto, 1973^{12 13}

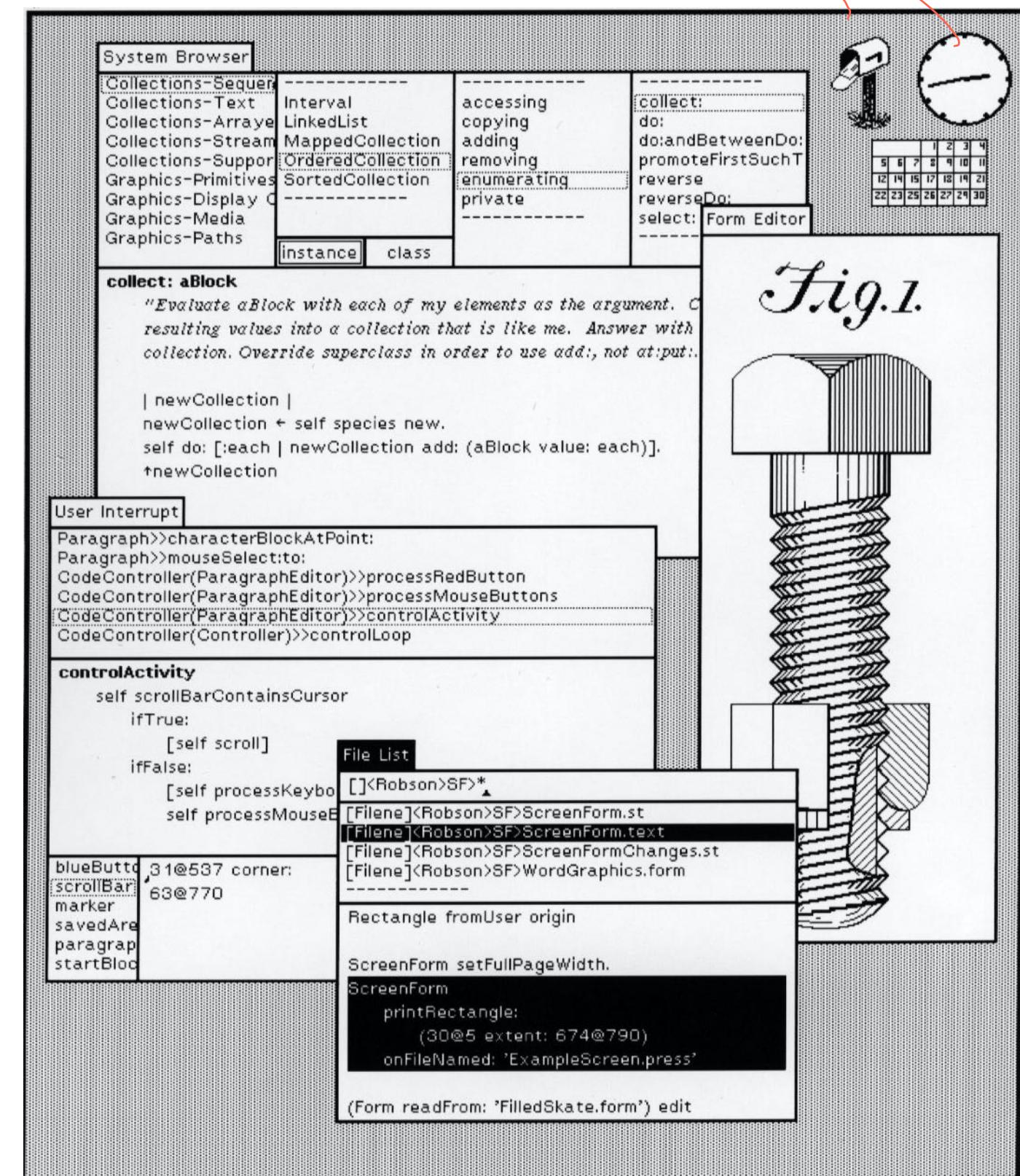
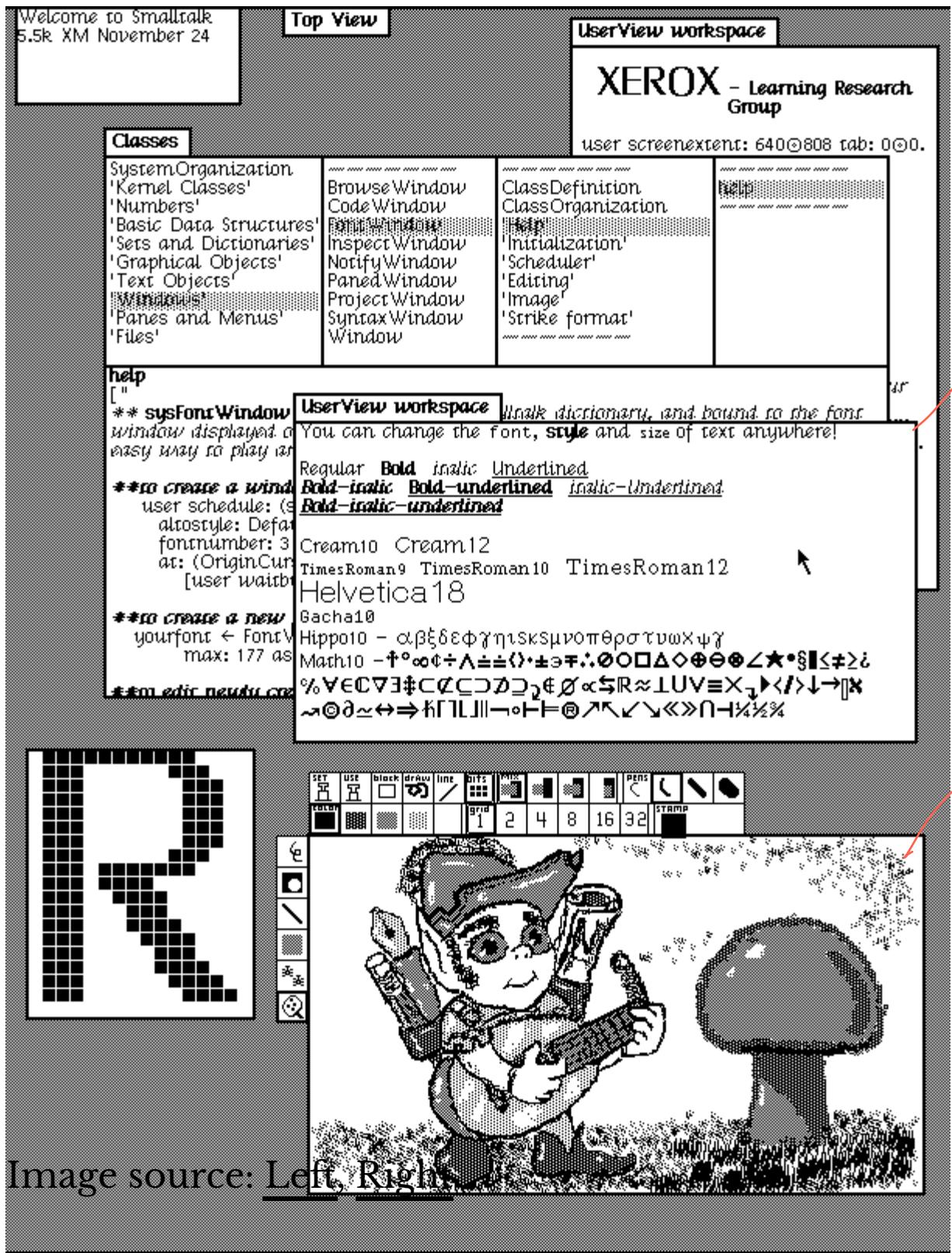
The first computer to support an OS based on a GUI that integrated the ideas developed for Dynabook. It was developed at the Xerox PARC (Palo Alto Research Center).

a
Workstation



¹² [Wikipedia: Dynabook](#)

¹³ [Image source](#)



14 Image source: Left, Right

Milestone 5: Xerox Star, 1981¹⁵ ¹⁶ ¹⁷

First commercial system with a user interface that integrates today's technologies, including windows, icons, folders, mouse, etc.



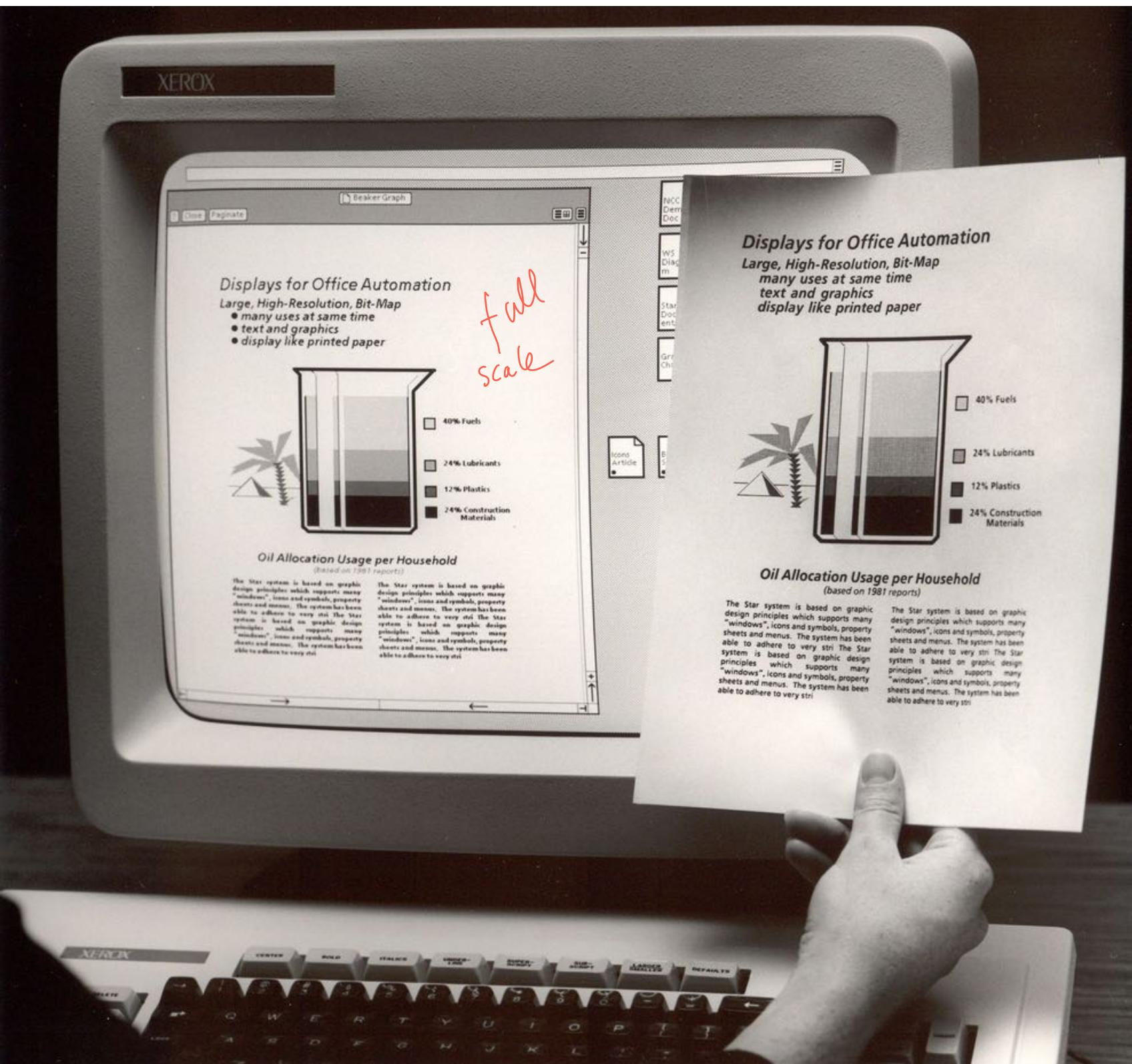
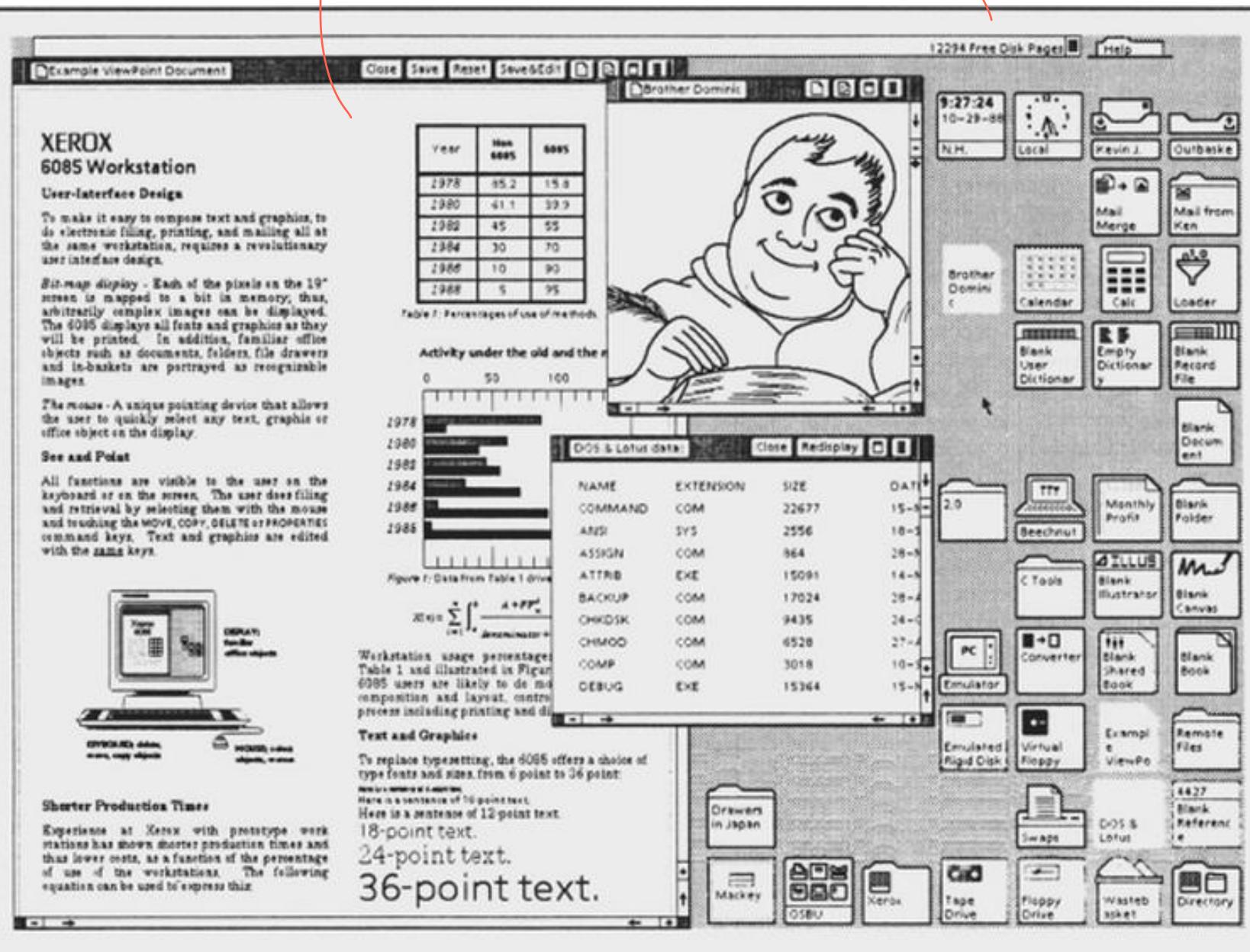
¹⁵ Wikipedia: [Xerox Star](#)

¹⁶ Videos of the Star Interface: [Part 1](#), [Part 2](#)

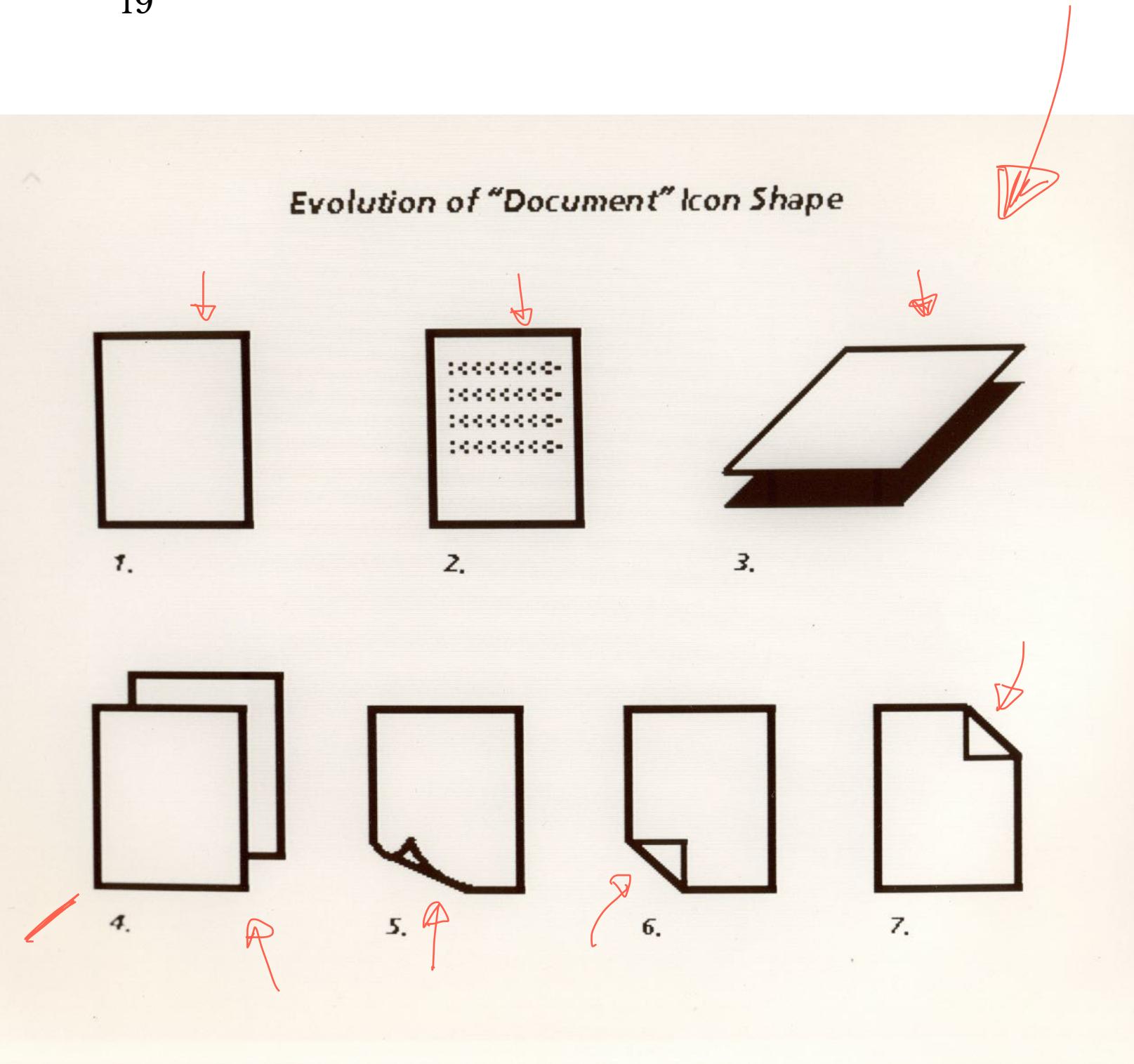
¹⁷ [Image source](#)

Multimedia
Docs

Workshop icons

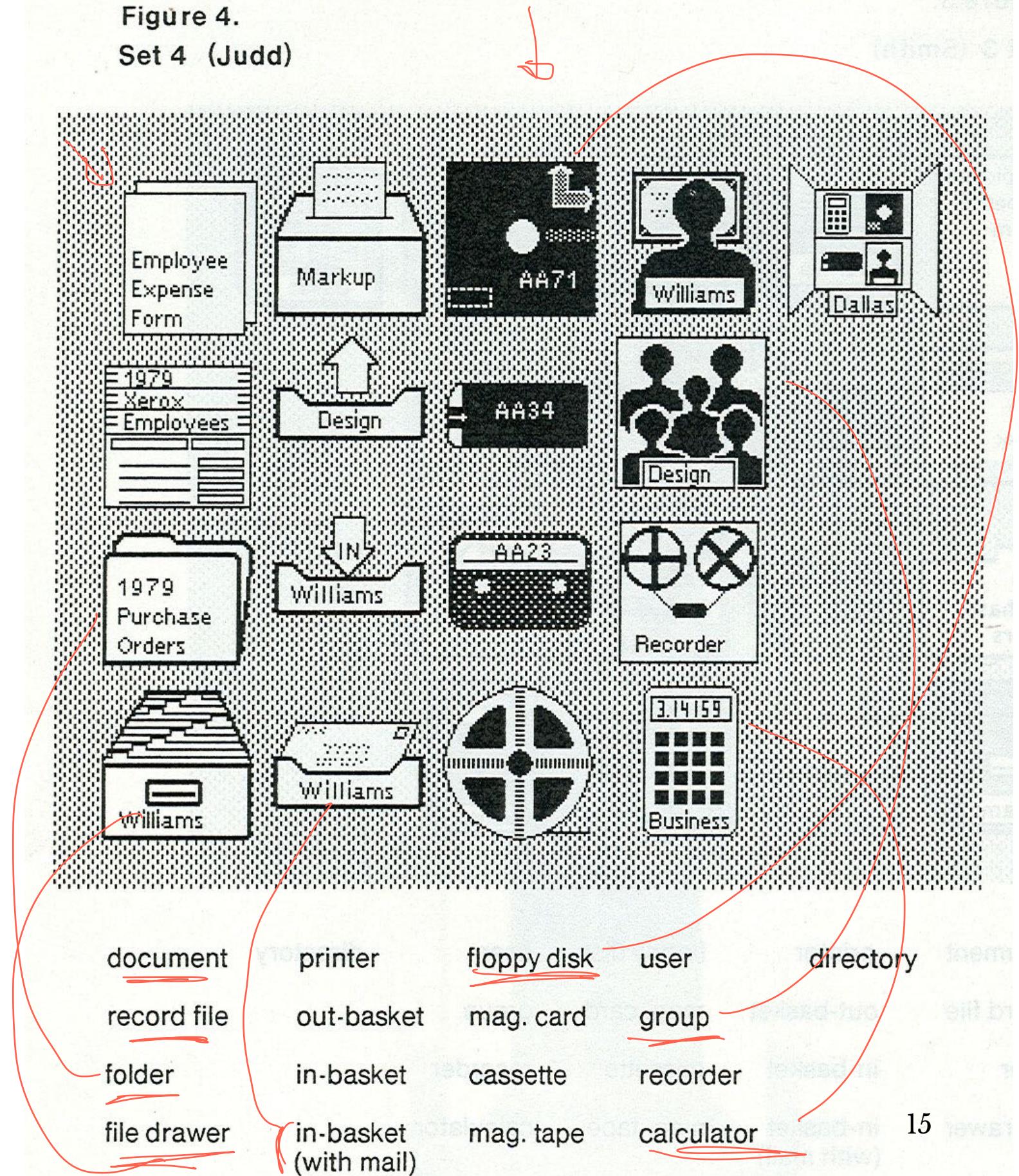


¹⁸ Image source: [Left](#), [Right](#)



¹⁹ Image source: [Left](#), [Right](#)

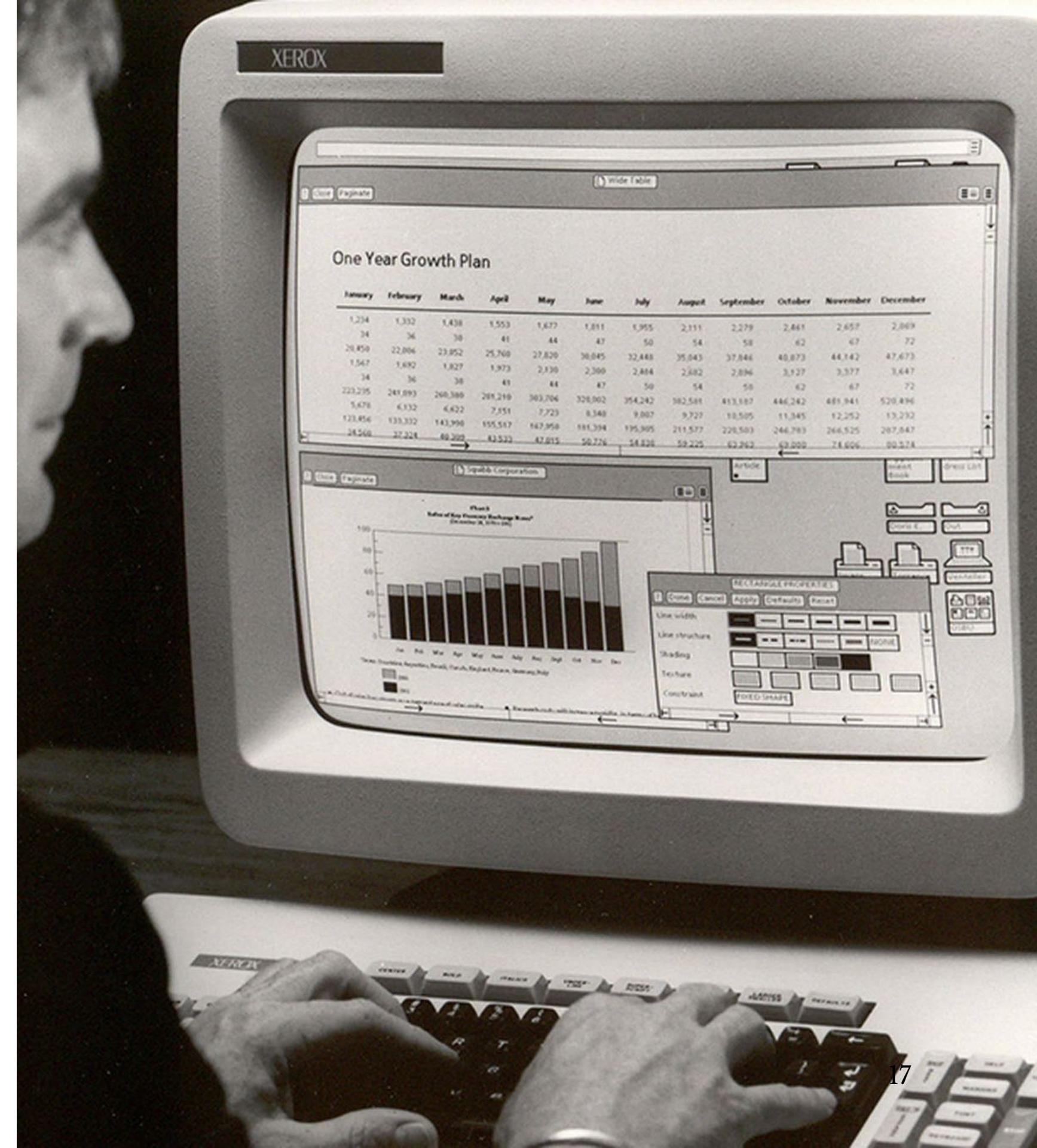
Figure 4.
Set 4 (Judd)



Designing for the Desktop

The WIMP Paradigm²⁰

Definition: Windows, icons, menus, and pointer, or *WIMP*, is a design paradigm that current desktop interfaces follow that dates back to the Xerox Alto (1973).

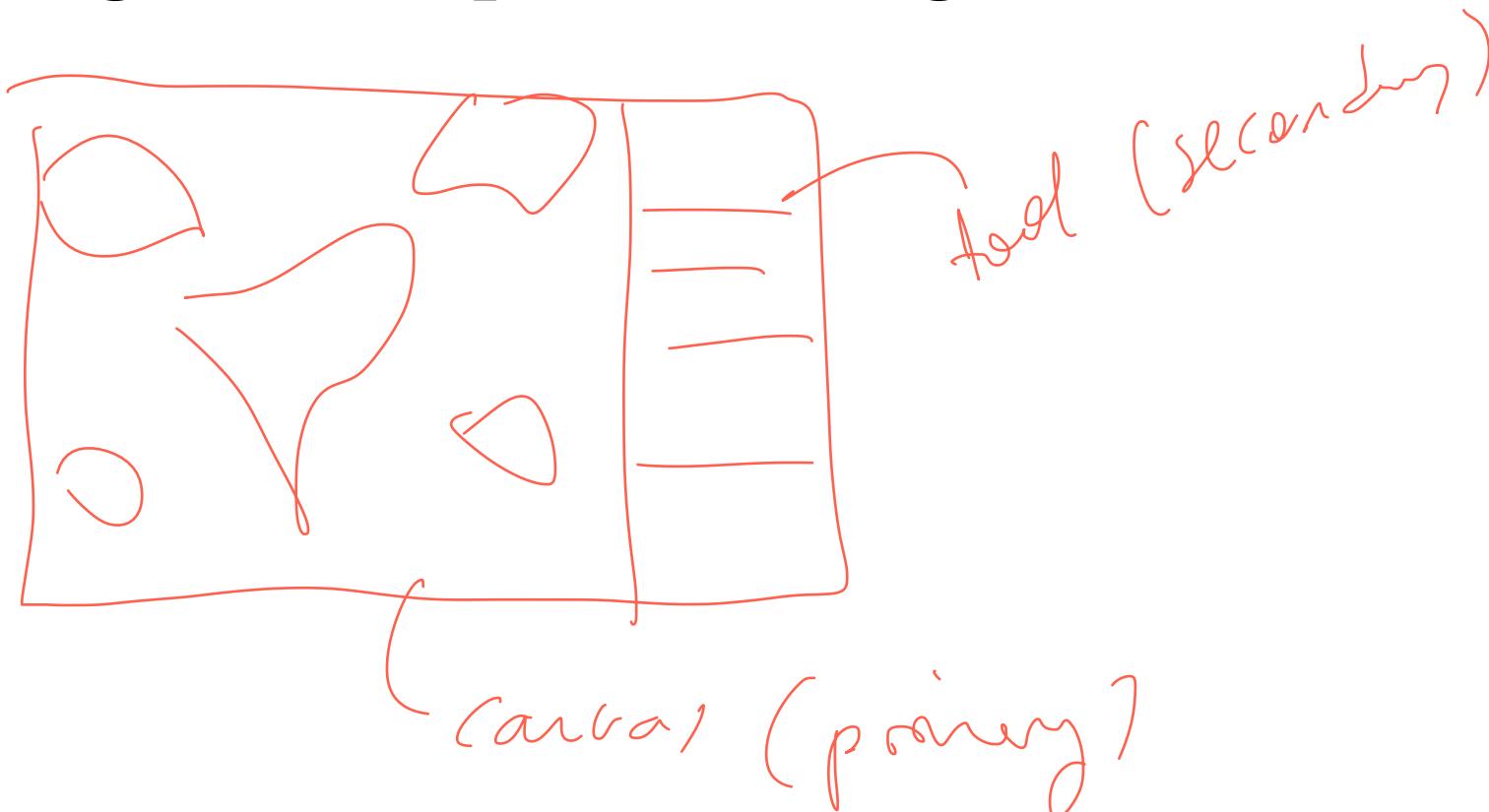


²⁰ [Image source](#)

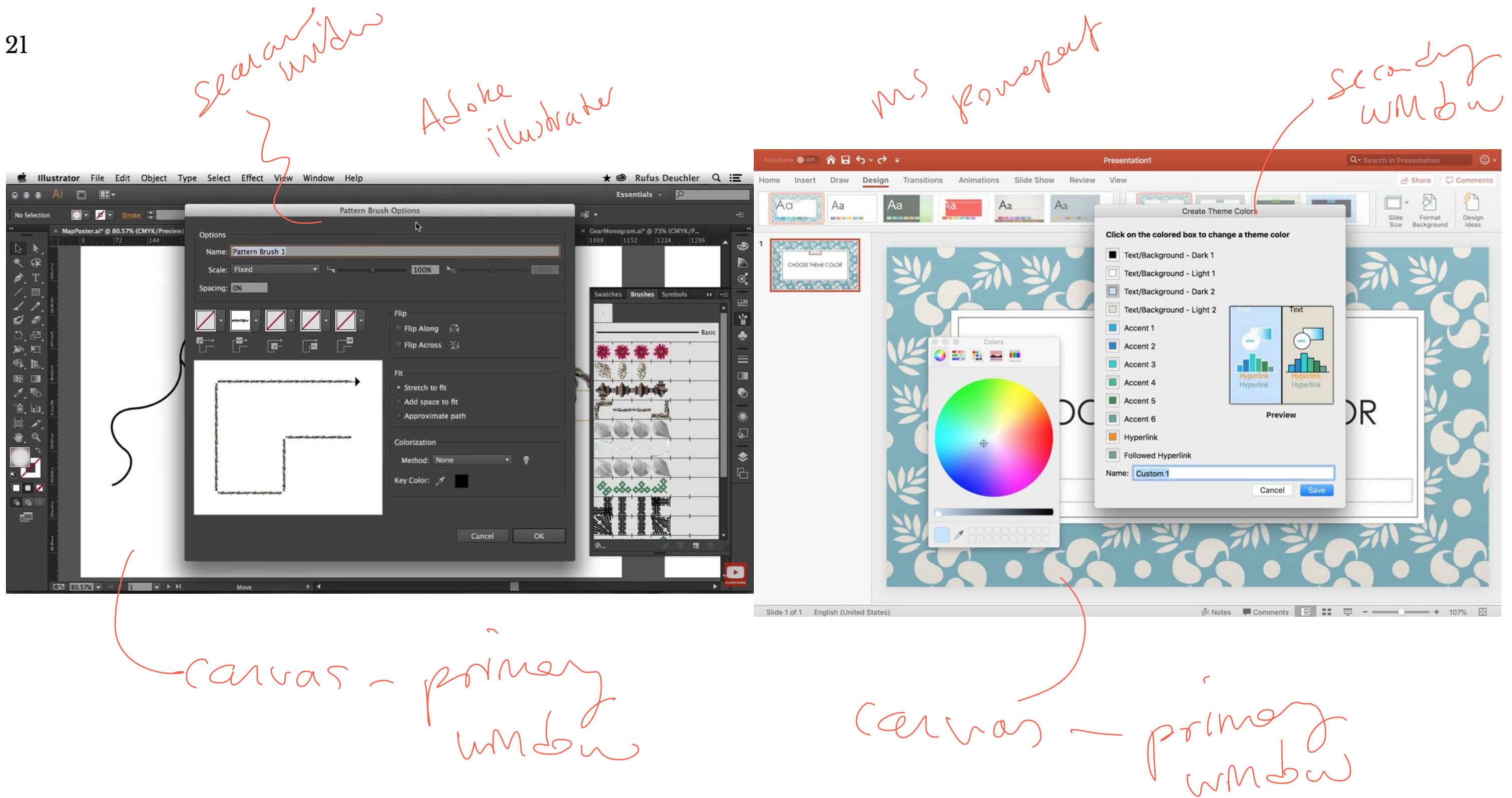
Elements of the WIMP Paradigm: Windows

Definition: Windows are resizable containers of individual applications.

Primary windows contain elements for the main functionality of the application, such as a canvas. Secondary windows support main windows through modal panes, dialog boxes, etc.



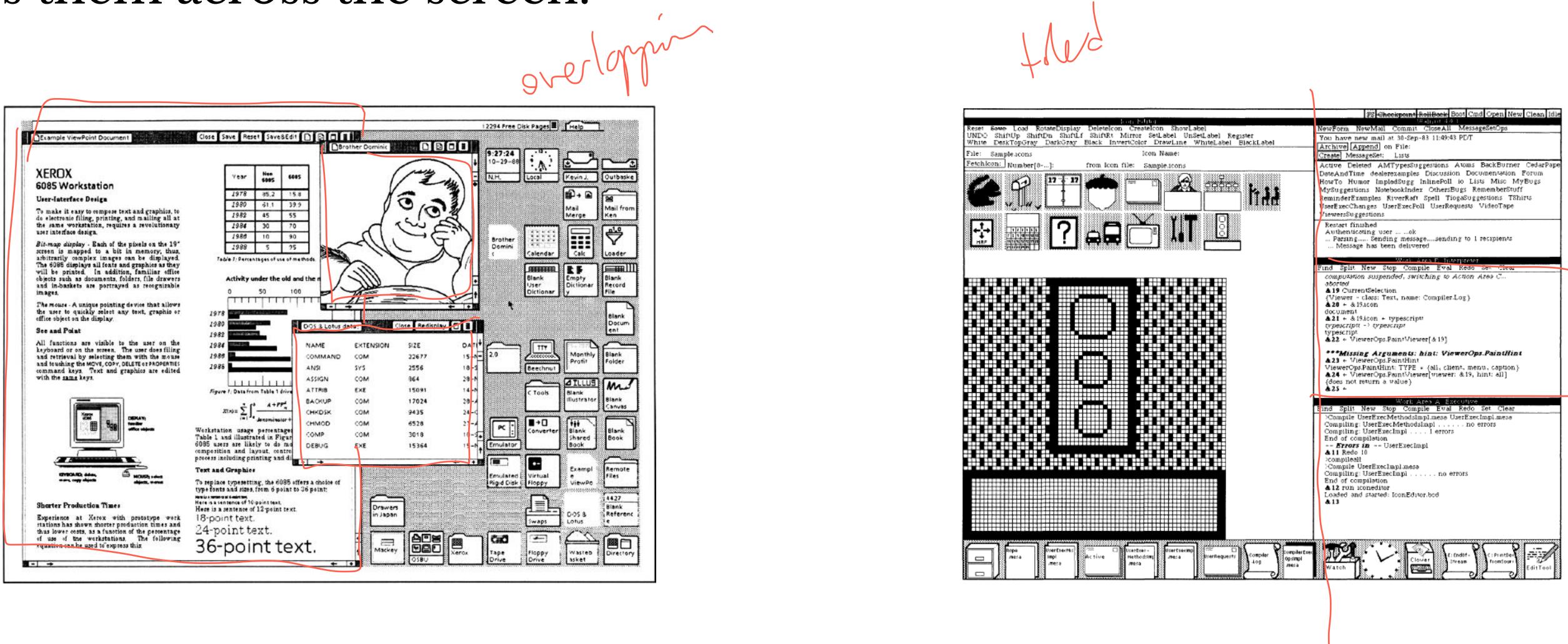
21



²¹ Image source: [Left](#), [Right](#)

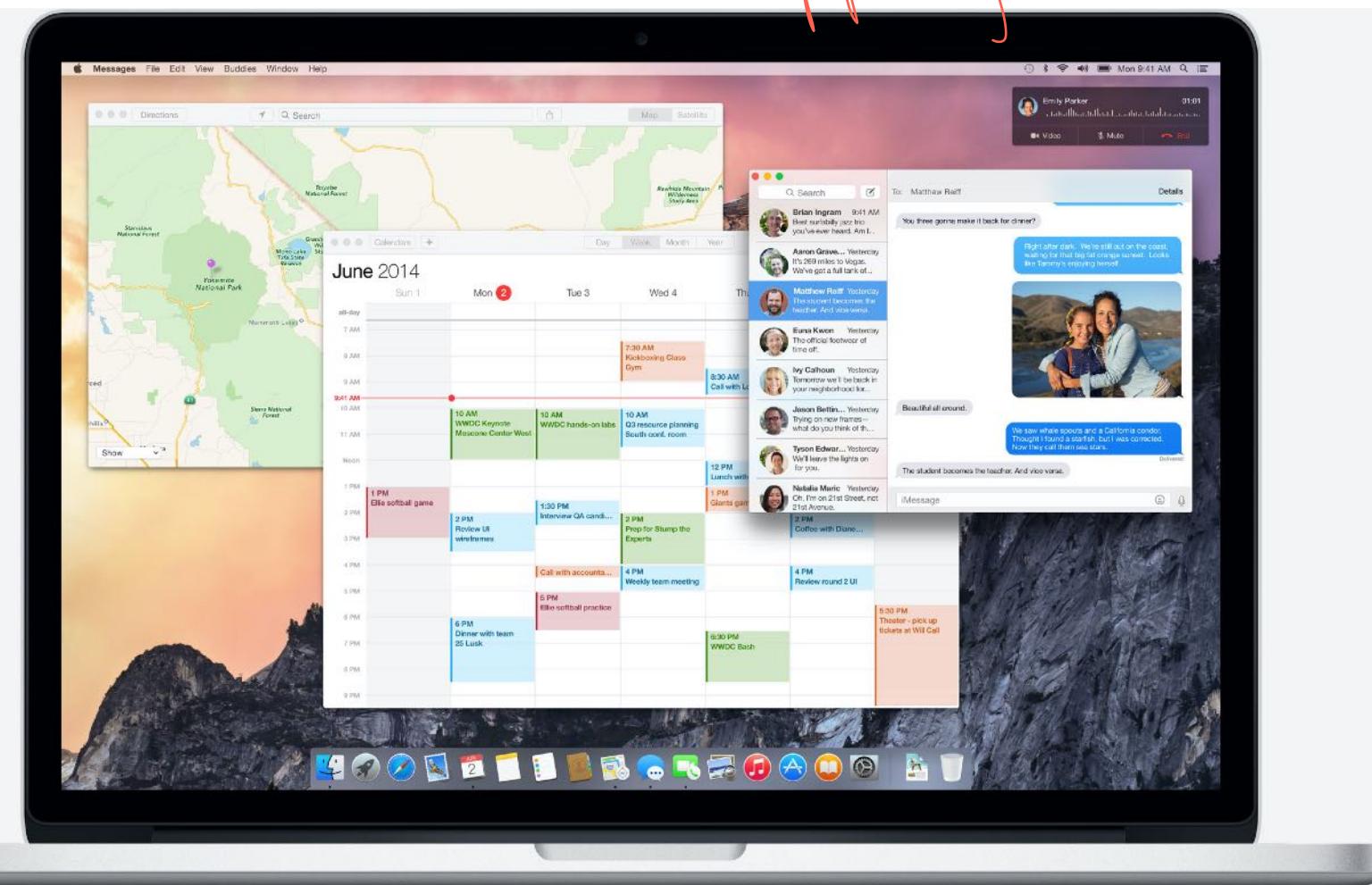
Window Organization²²

Definition: Windows can be organized in a way that overlaps several windows or tiles them across the screen.

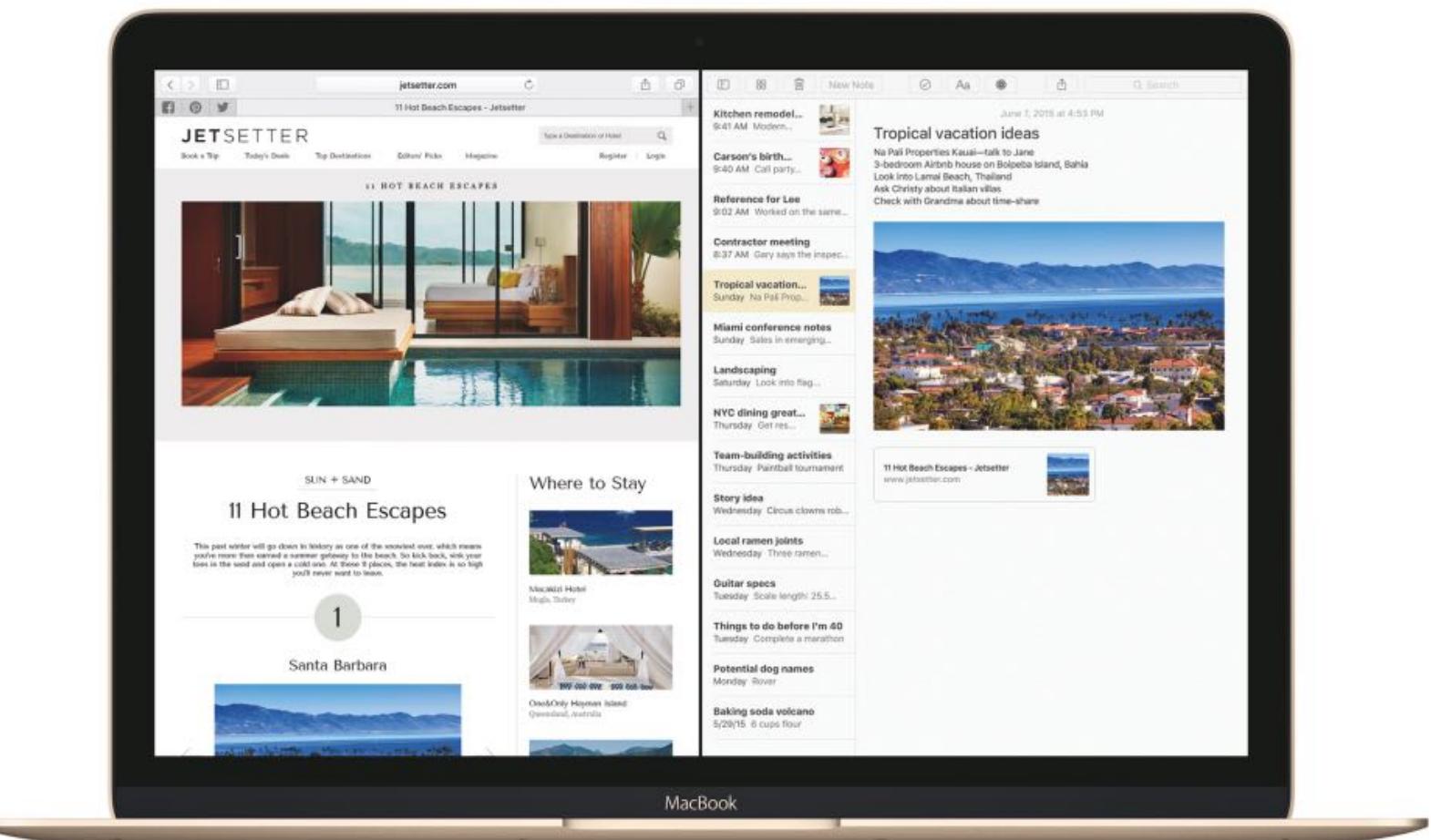


²² Image source: [Left](#), [Right](#)

overlapping

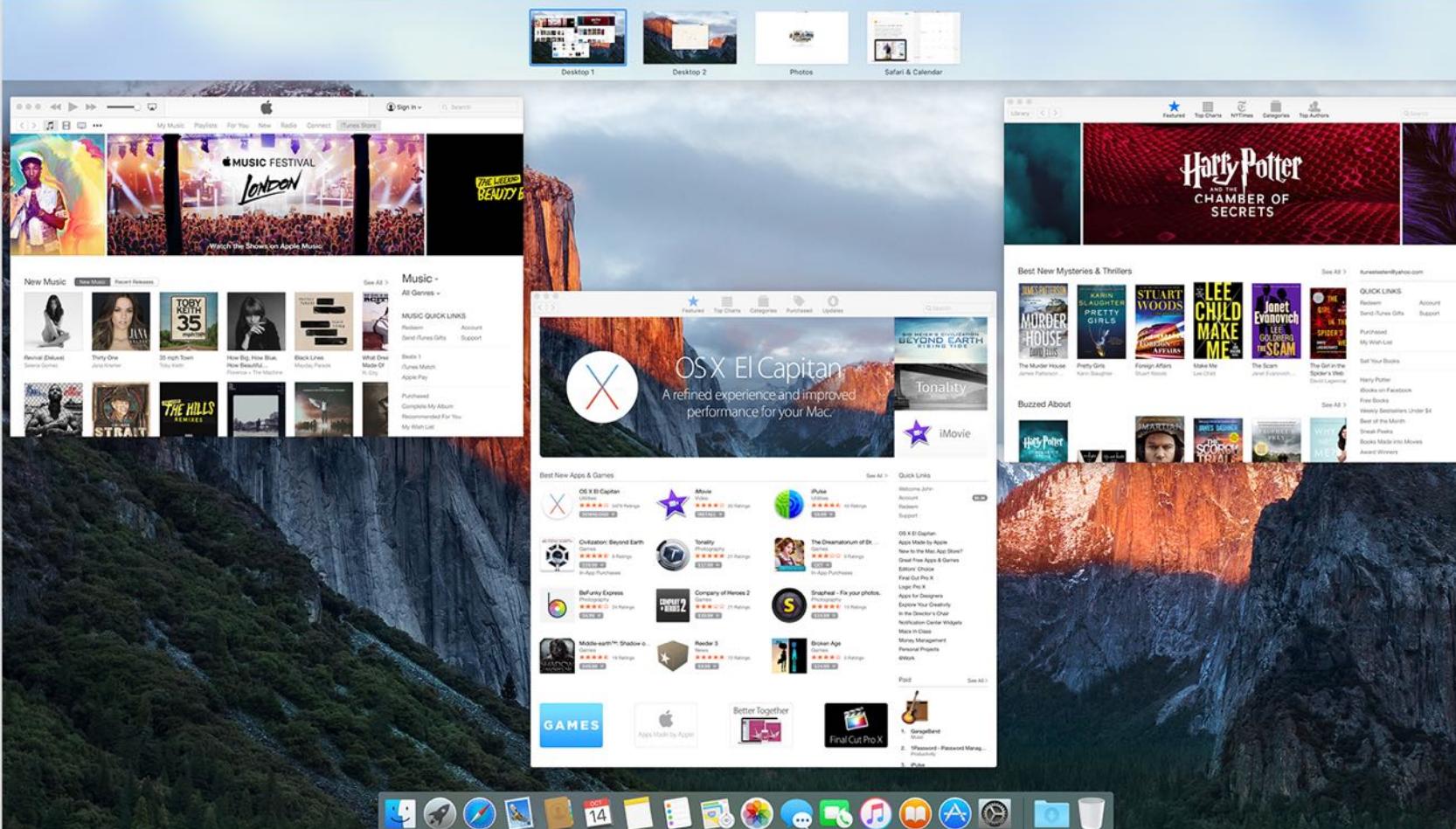


filed

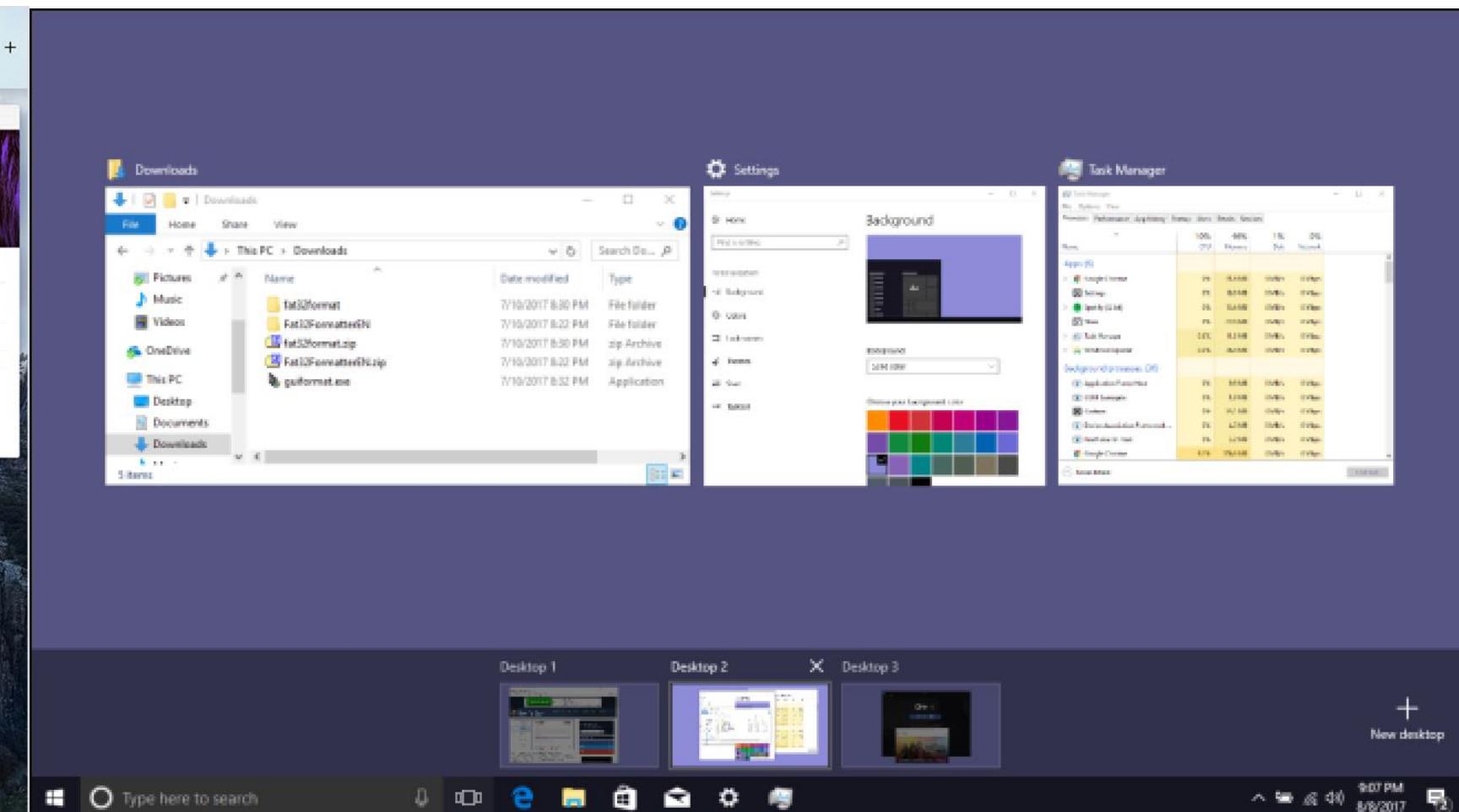


²³ Image source: [Left](#), [Right](#)

Mac OS



(Windows)

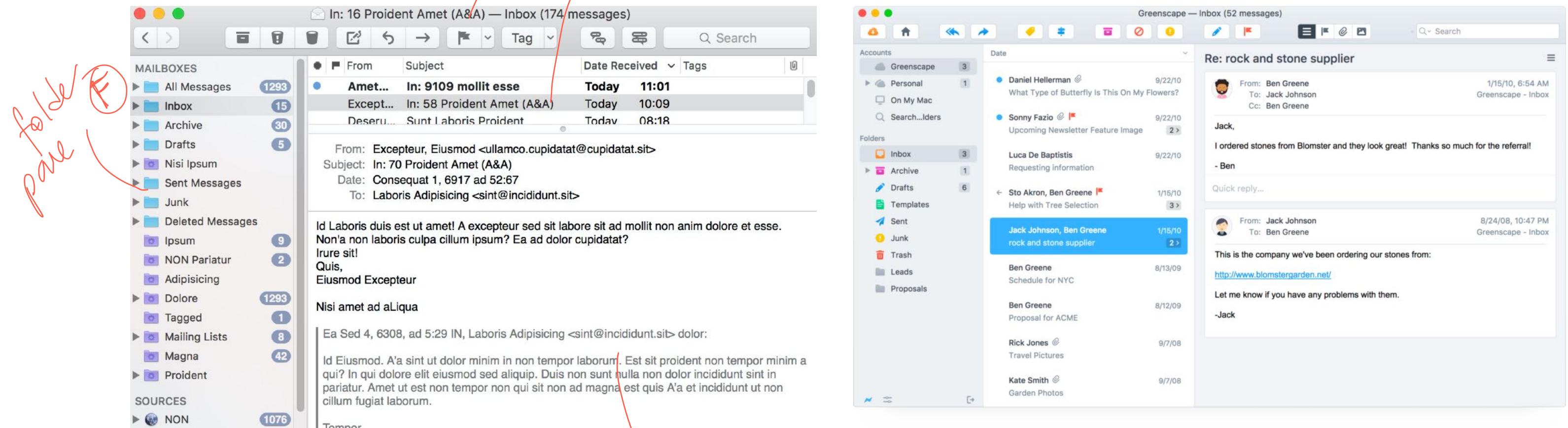


filed windows

²⁴ Image source: Left, Right

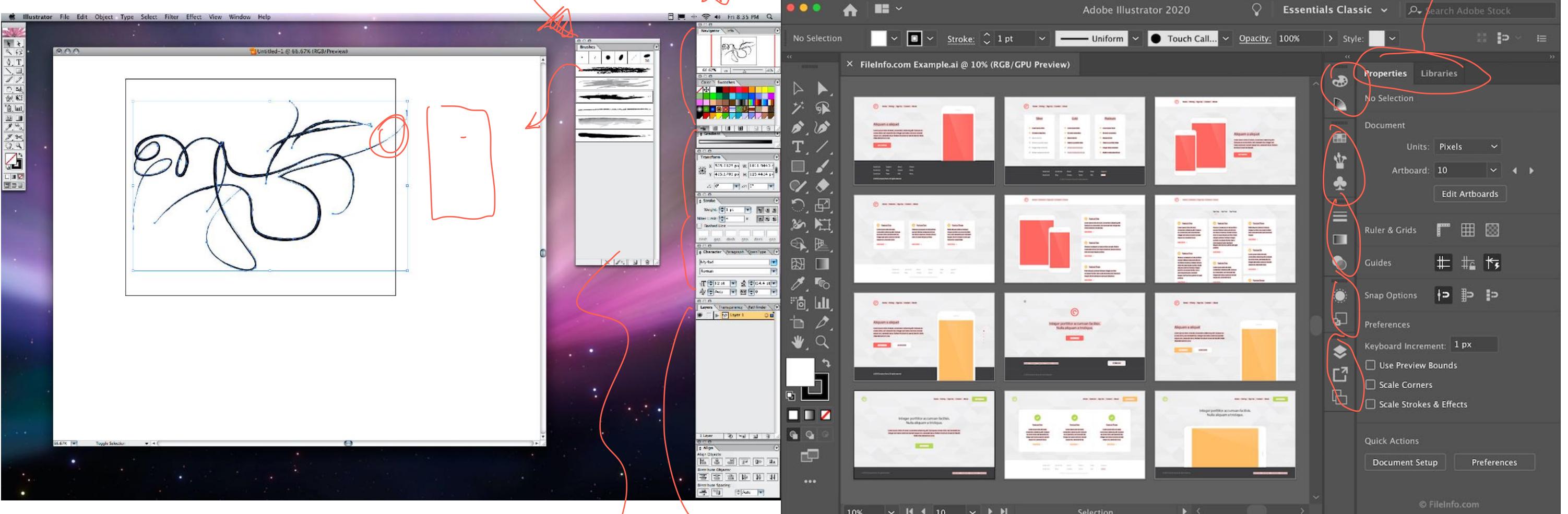
Window Structures²⁵

Windows bring together dedicated *panes* in different configurations.



²⁵ Image source: [Left](#), [Right](#)

Secondary windows can be *docked*, *stacked*, and *floating*.²⁶



²⁶ Image source: [Left](#), [Right](#)

floating so that the user
can bring next to
their works pale

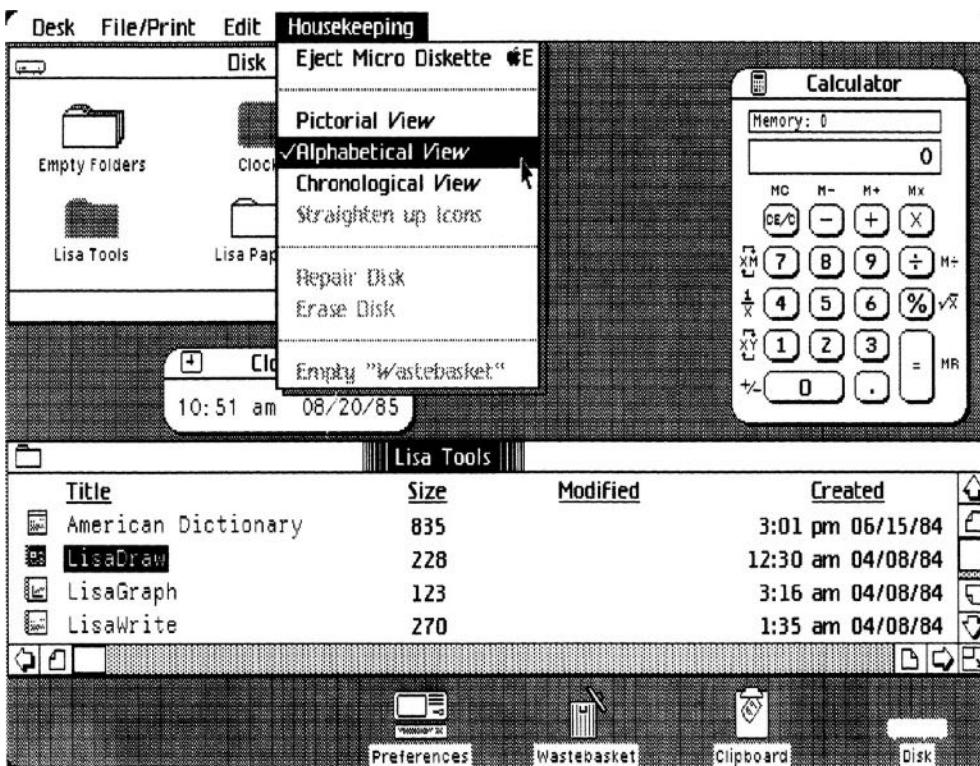
stacked / collapsed

Menus²⁷

Definition: Menus list all the functions of the an application. Menu lists serve *educational* and *reference* purposes.

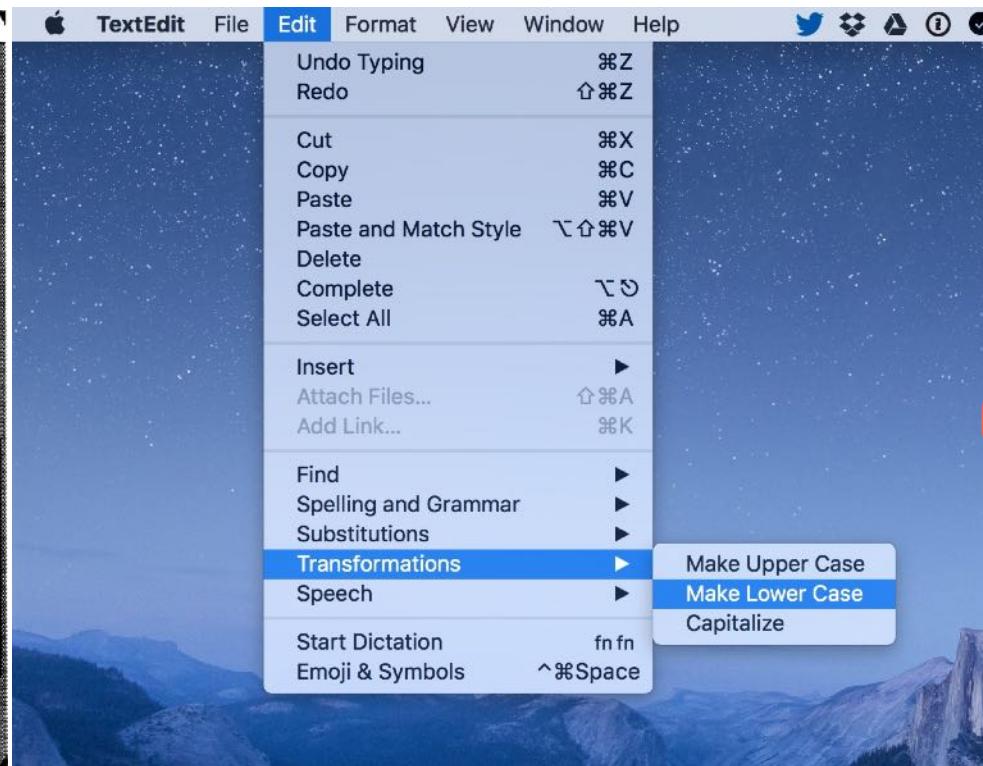
#1

historical

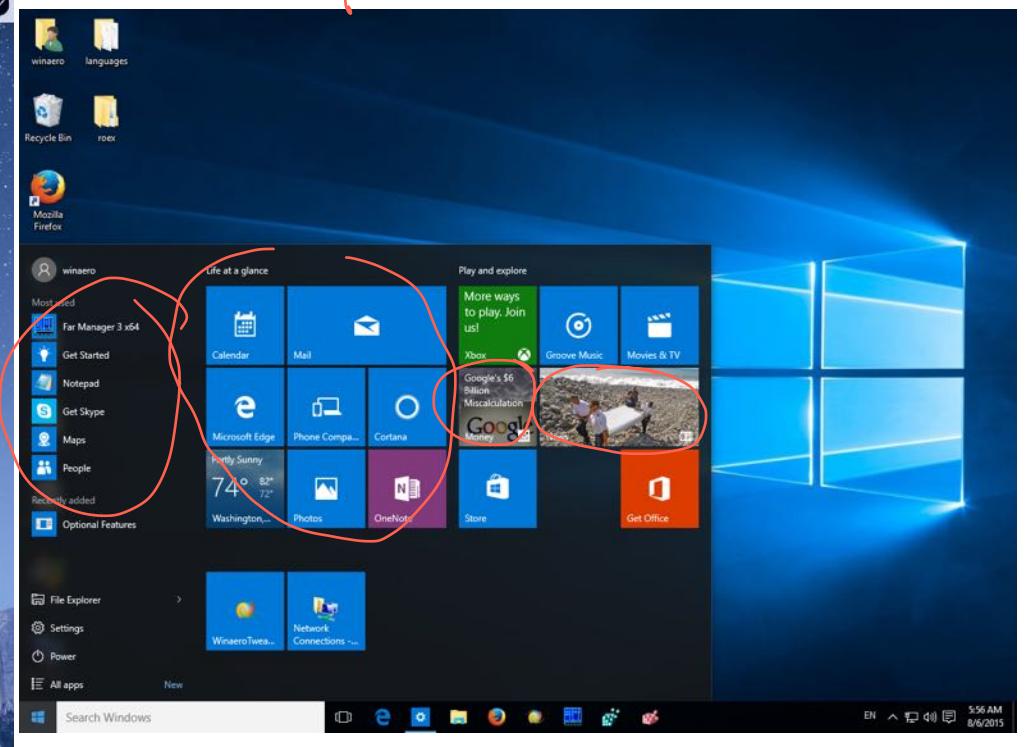


#2

today's



composite
menus

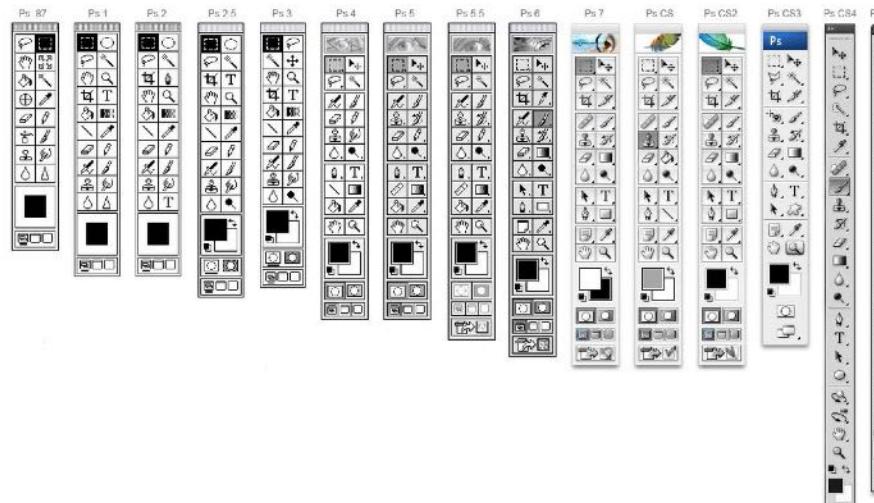


²⁷ Image source: Left, Center, Right

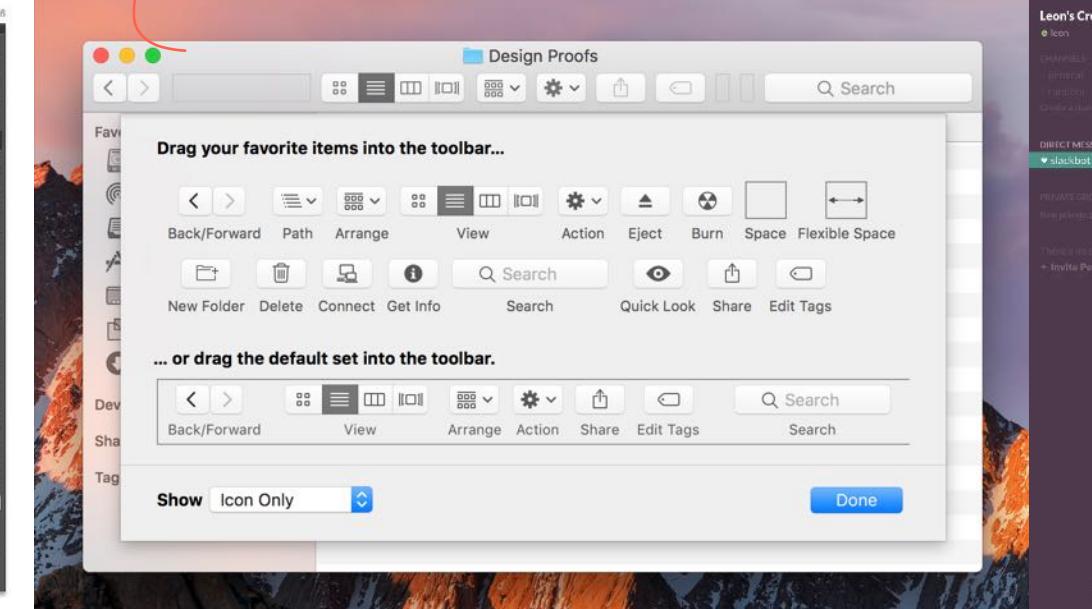
Toolbars, Palettes, Sidebars, & Tooltips²⁸

Definition: *Toolbars, palettes, sidebars, and tooltips* facilitate (visual and manipulation) access to frequently used functions.

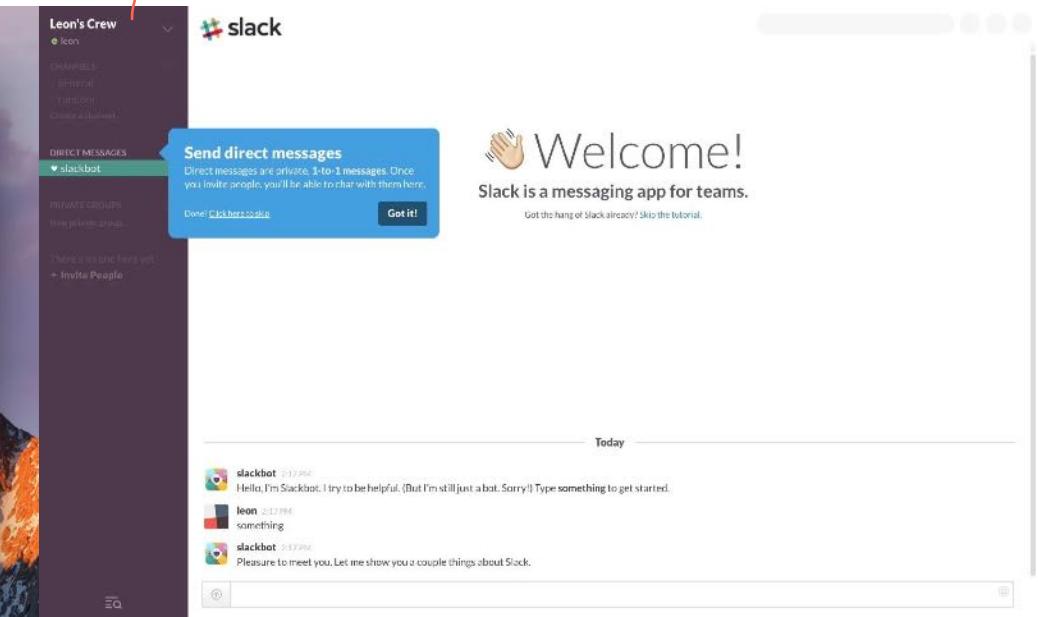
toolbars



toolbar customization



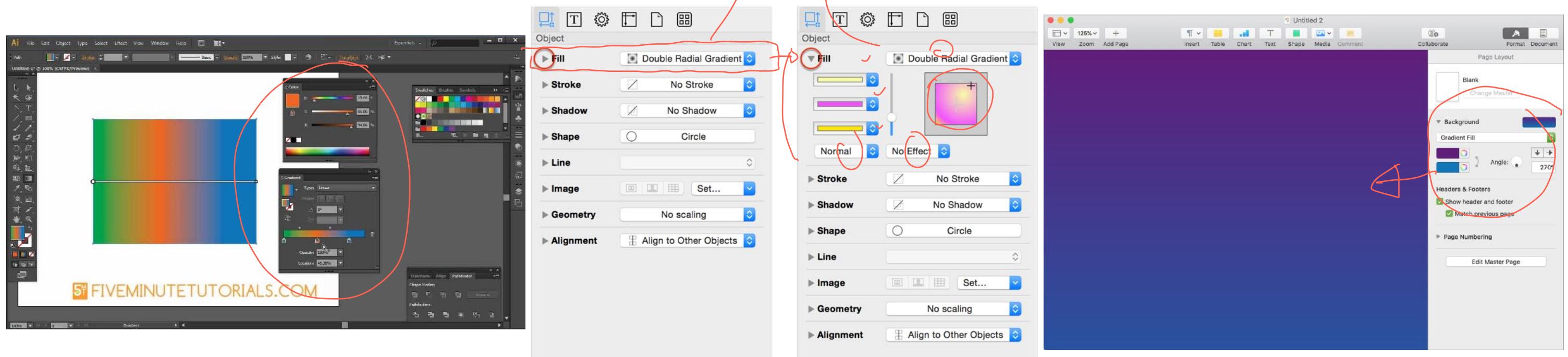
sidebar



²⁸ Image source: [Left](#), [Center](#), [Right](#)

Tool Palettes²⁹

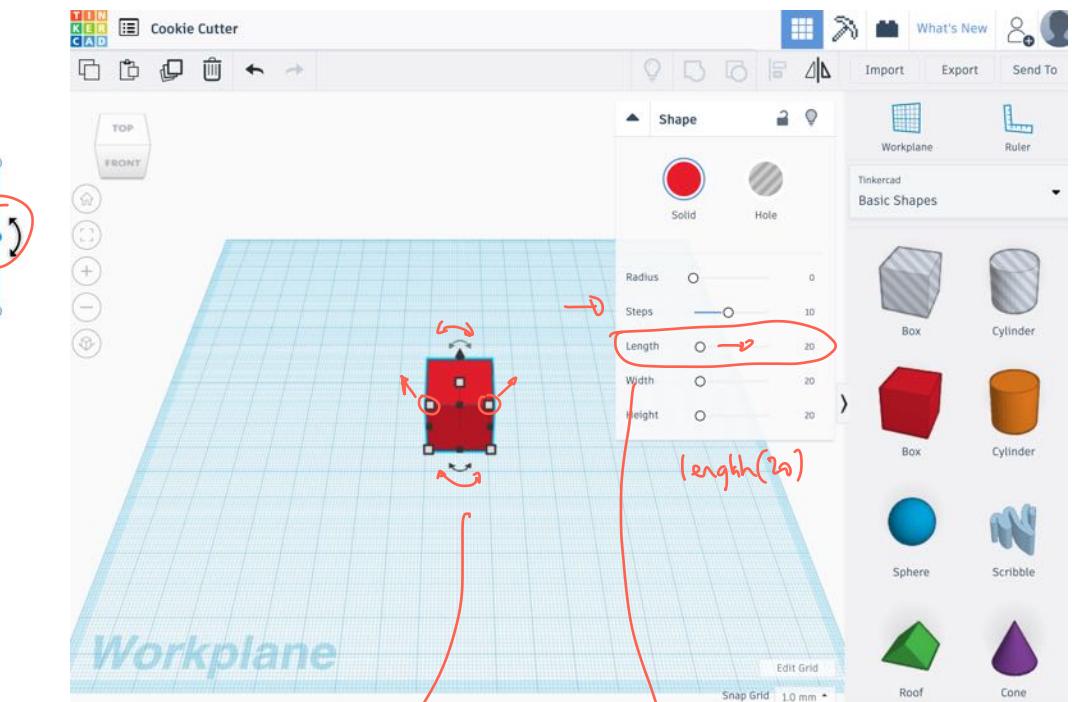
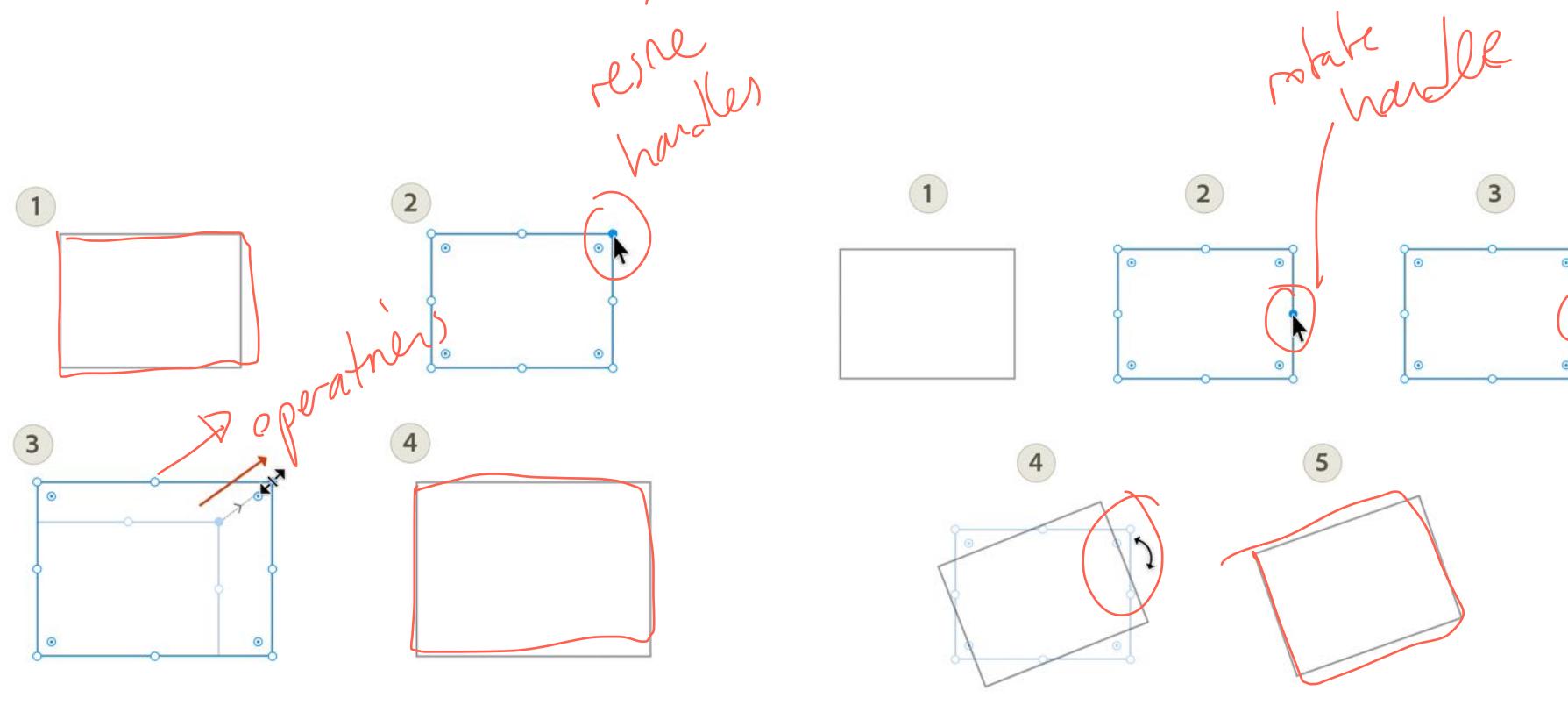
Definition: Tool palettes provide *advanced controls* for a particular function rather than frequently accessed functions.



²⁹ Image source: [Left](#), [Center](#), [Right](#)

Pointing³⁰

Definition: *Pointing* on an application canvas enables a range of advanced capabilities for *direct manipulation*.

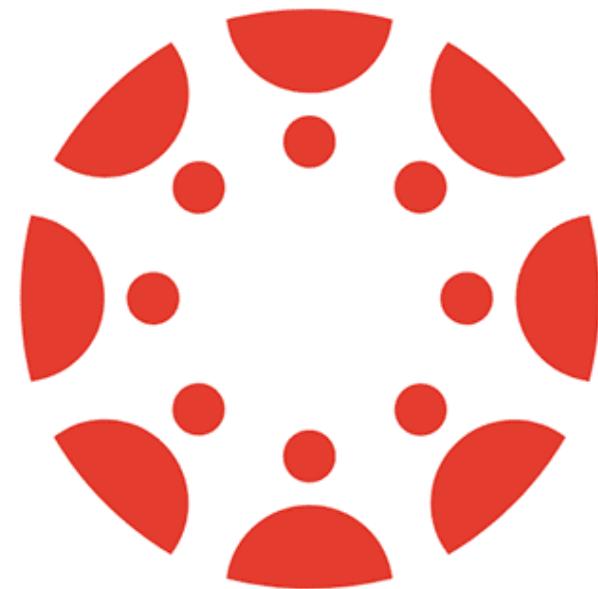


direct manipulation
command-based

³⁰ Image source: [Left](#), [Center](#), [Right](#)

Quiz 1

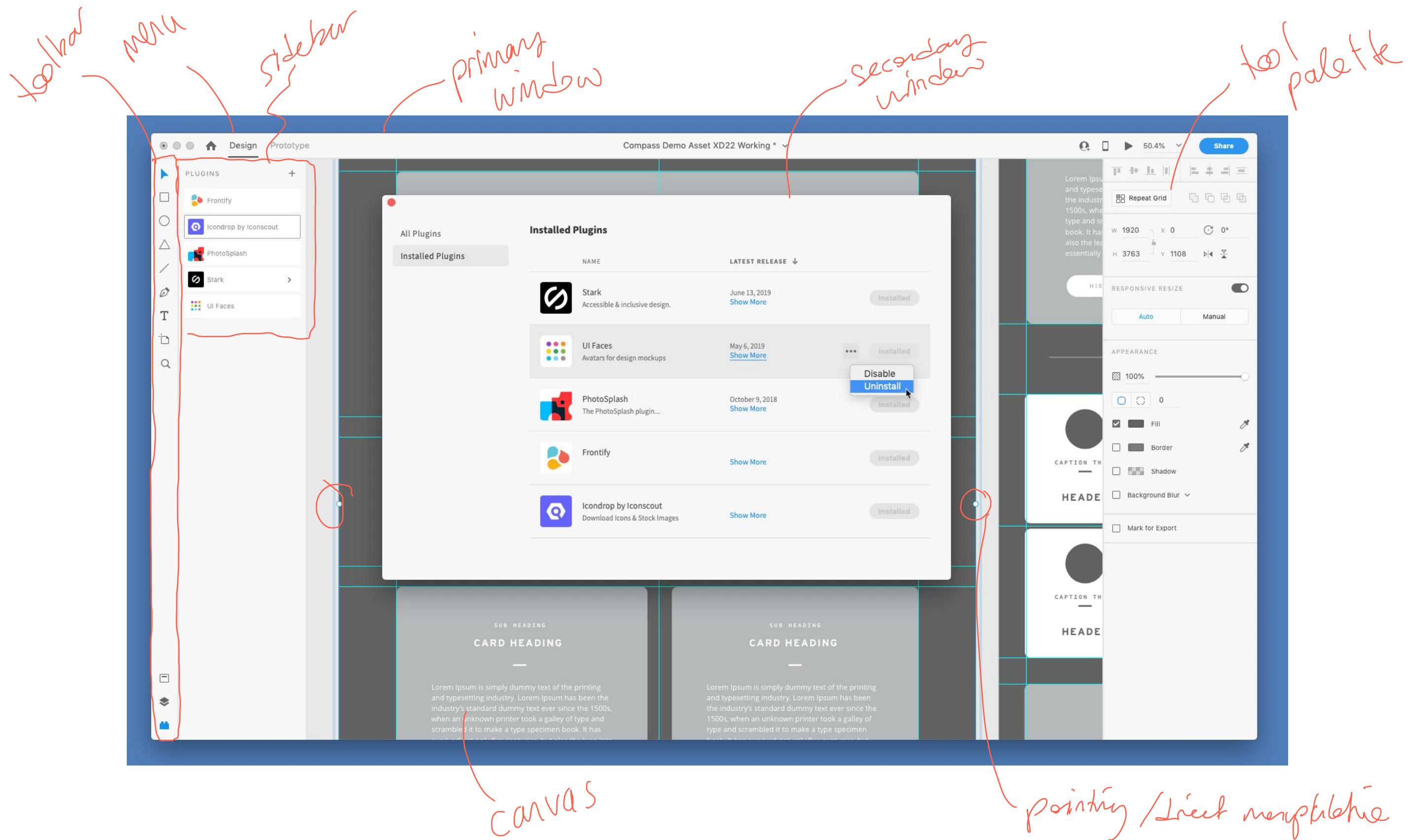
Complete the Canvas quiz.



canvas

In-Class Activity 1: Desktop Application Deconstruction

Image Source



Designing for the Web

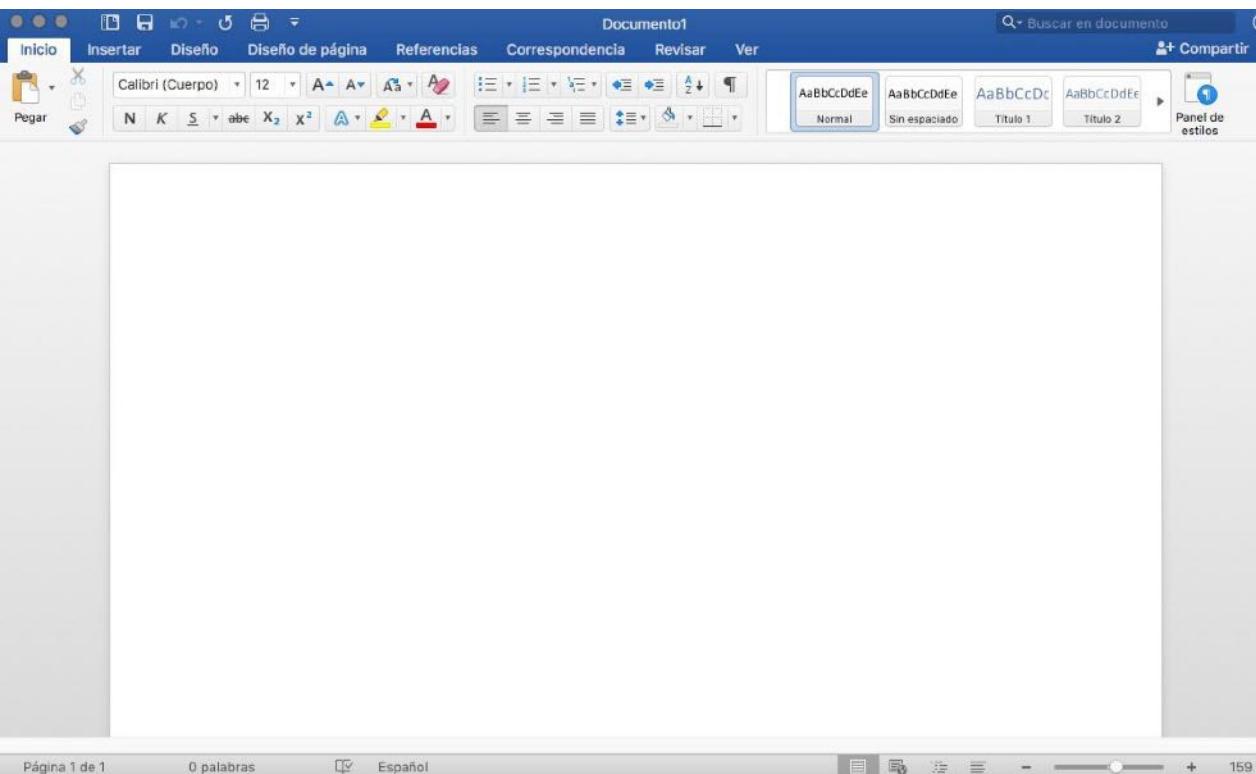
Desktop Applications vs. Websites

Desktop applications: Dynamic, persistent screens and supporting components that enable users to perform complex tasks.

Webpages: Interconnected pages with aids that help users navigate and access a large body of content.

Web Applications³¹

Definition: Single-page applications (SPAs) provide the functions of a desktop application on a webpage following the conventions of desktop applications.

A screenshot of the Google Docs interface, titled 'Word'. The top navigation bar includes 'Word Online', 'OneDrive > Documents', 'Google Docs vs. Word - Saved to OneDrive', 'Share', 'Michael Ansaldi | Sign out', and 'Tell me what you want to do'. The ribbon tabs shown are FILE, HOME, INSERT, PAGE LAYOUT, REVIEW, and VIEW. The 'HOME' tab is selected. The main content area contains a paragraph of text: "We ran into some frustration out of the gate when we went to create a header. Whereas Google Docs intuitively placed this feature under its Insert menu, Word treats headers and footers like they're already present in a blank document. A quick help search reminded us they can be revealed from the View menu: View > Header and Footer. Word gives you far more control over headers with an entire ribbon of tools that let you add page numbers, date and time and pictures to it and designate on which pages it appears." Below this, another paragraph continues: "Unlike Google Docs, Microsoft Word does have an actual column feature, which can be found under its Format menu. However, it's designed to flow paragraph-heavy text from one column to the next, as would in a newsletter. It's less than ideal for something like a resume that intersperses short blocks of text and bulleted lists. Because of that, we opted to again use tables to give us better control over the layout." At the bottom, there is a note: "The first major difference you'll notice from Google Docs is [Word offers a head-spinning seven ways to create Tables](#), including drawing them freehand and a couple that are only relevant if you're importing Excel data. The Graphic Grid is the most straightforward method and the most similar to Google Docs tables function. You just click the table icon under the Tables tab and in the drop-down grid, select number of rows and columns you want." The status bar at the bottom right shows 'Editing'.

³¹ Image source: [Left](#), [Right](#)

The Page

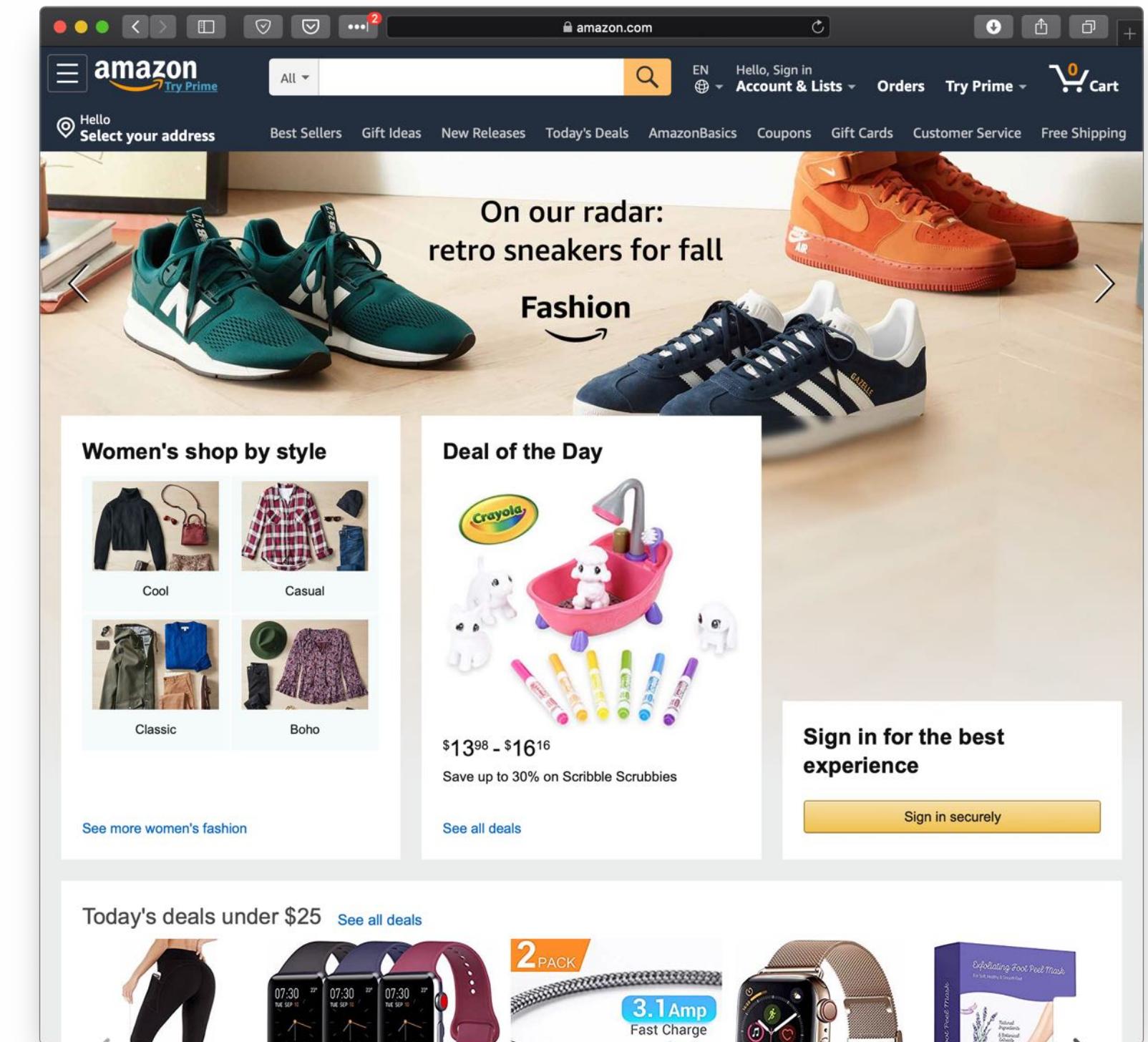
~~the page~~

Since its inception, the *page*, has been the building block of web content.

If the web is made out of pages, how do we organize and help users navigate them?

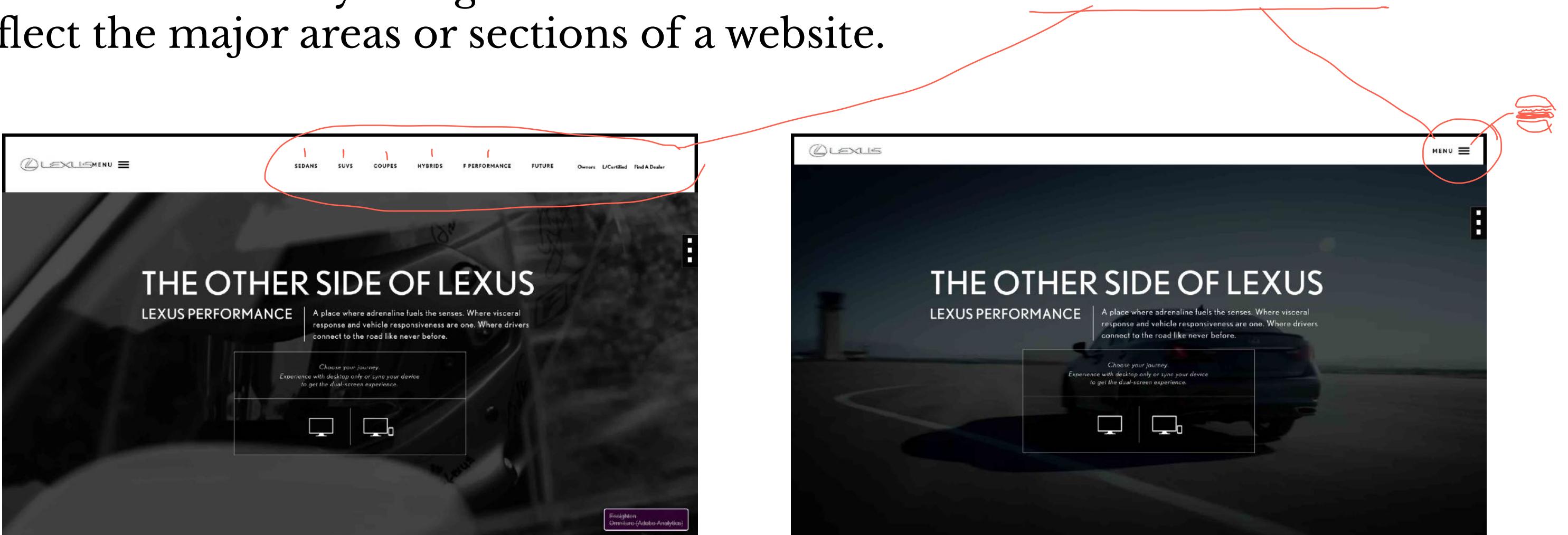
Using primary and secondary navigation aids.

Pages w/ aids ↗



Primary Navigation Aids³²

Definition: Primary navigation aids take the form of menus/menubars and reflect the major areas or sections of a website.



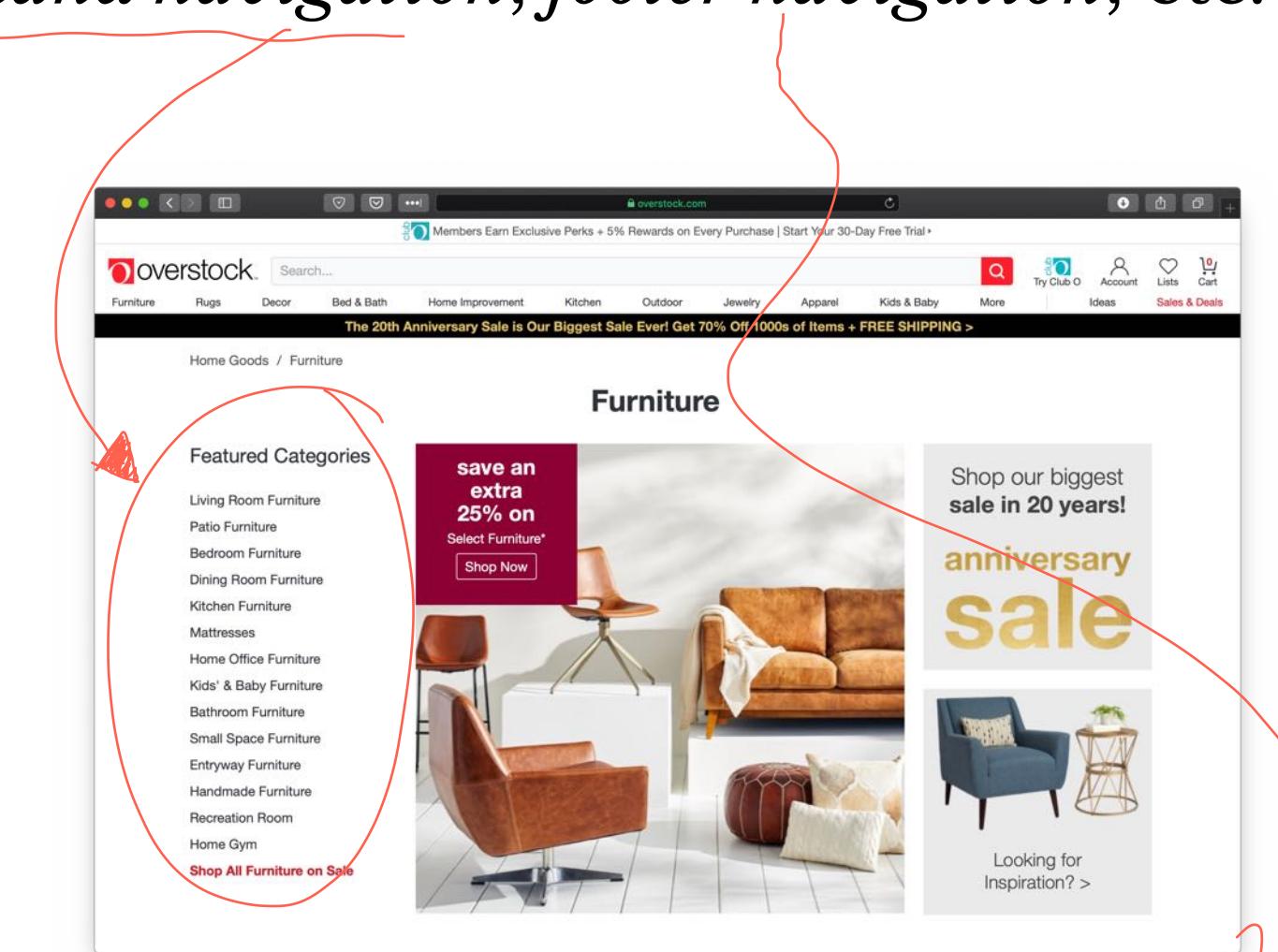
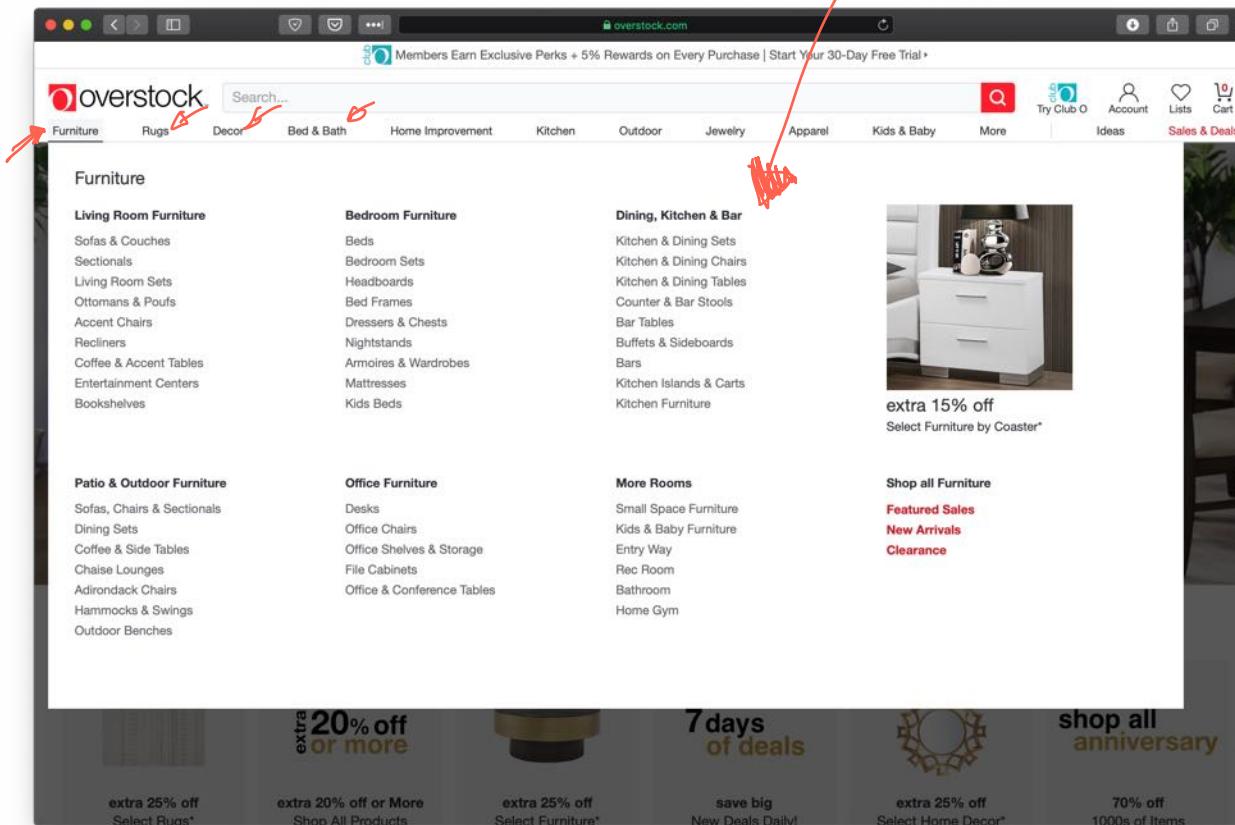
³² Image source: [Left](#), [Right](#)

Secondary Navigation Aids

SPAS

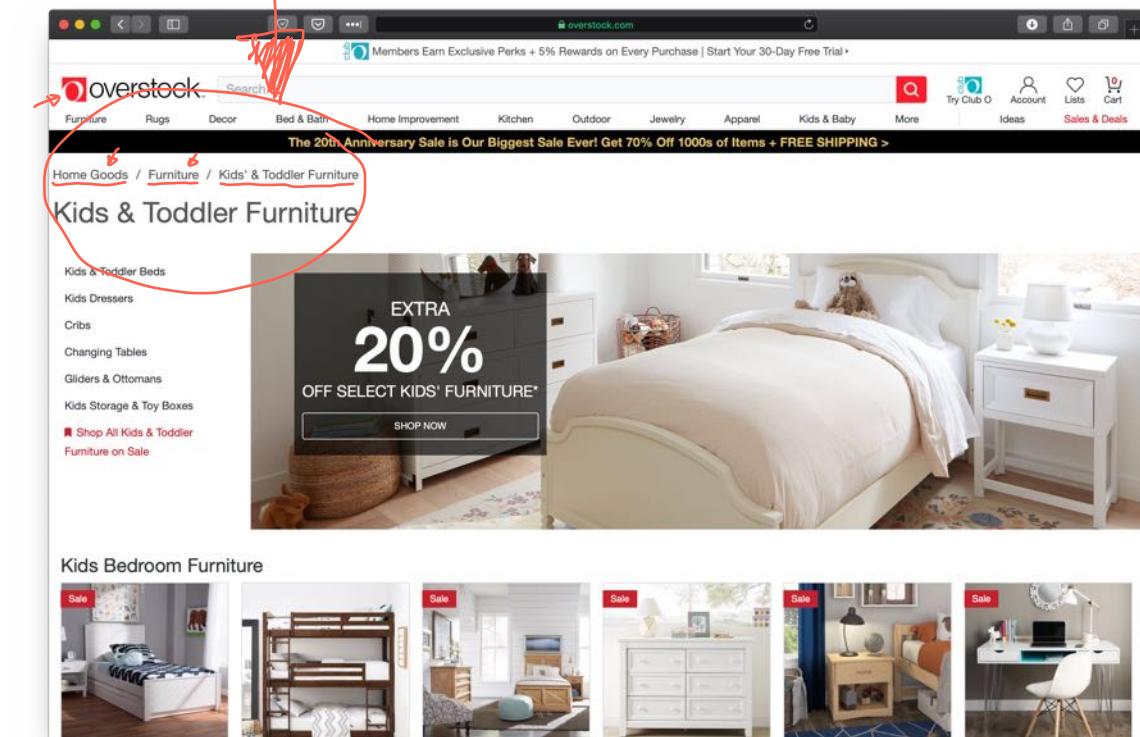
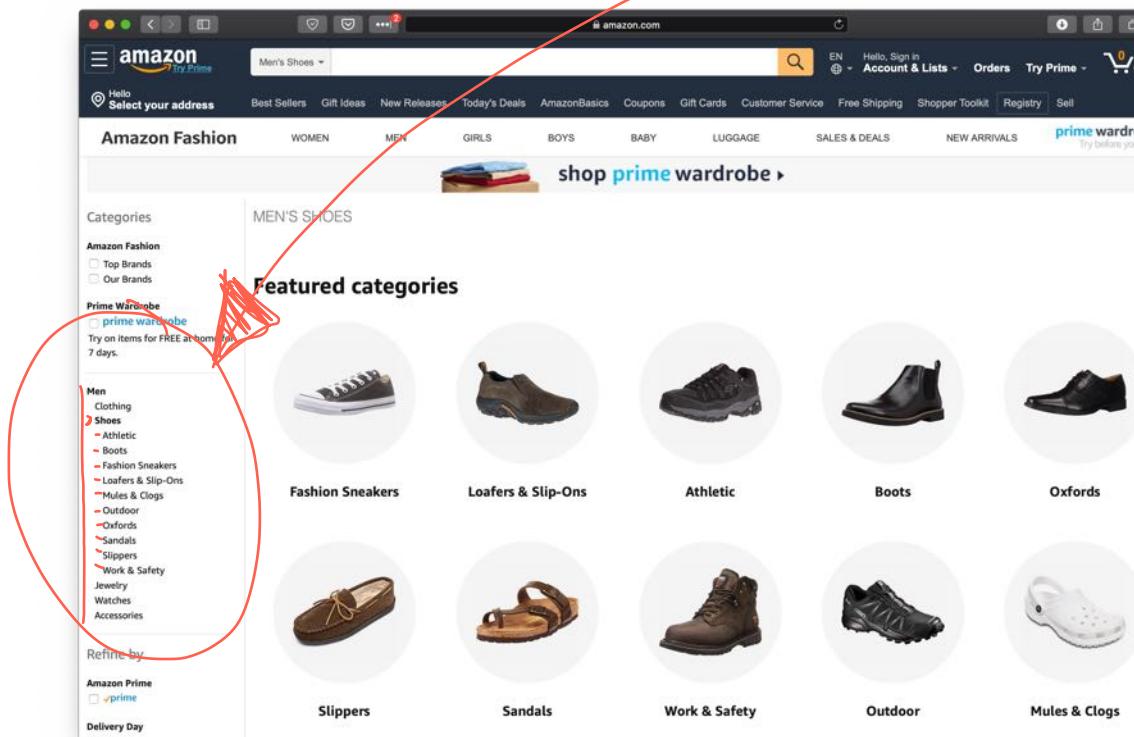


Definition: Secondary navigation aids provide comprehensive links to specific content on the site as *fat navigation*, *left-hand navigation*, *footer navigation*, etc.



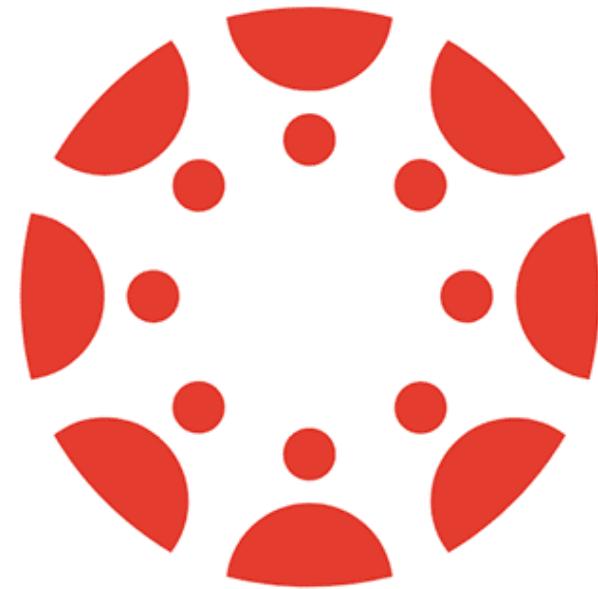
How do we get home?

A key problem in complex sites is to get back to previous pages or other pages that are higher in the navigation hierarchy. *Breadcrumbs* and *hierarchical lists* are solutions to this problem.



Quiz 2

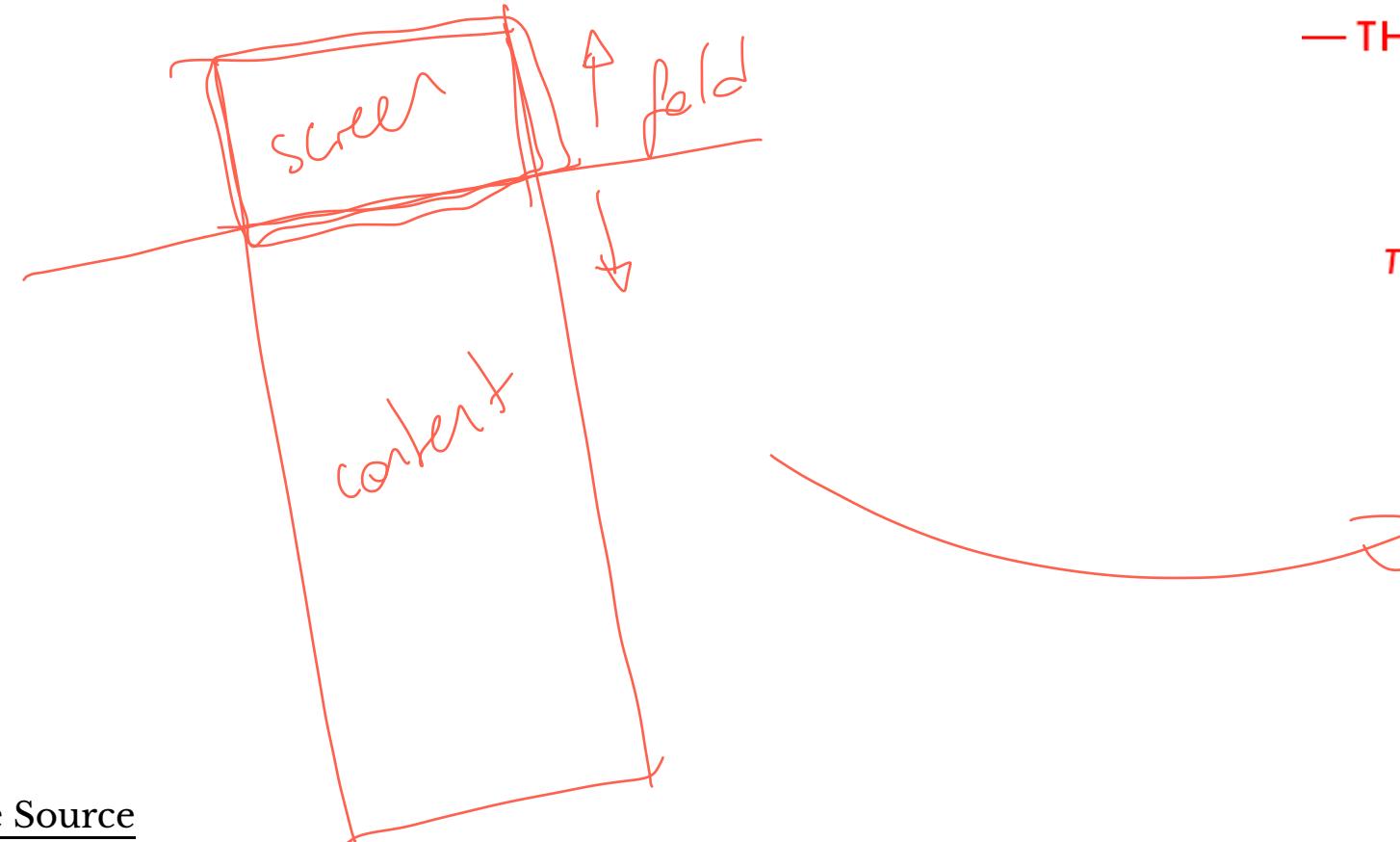
Complete the Canvas quiz.



canvas

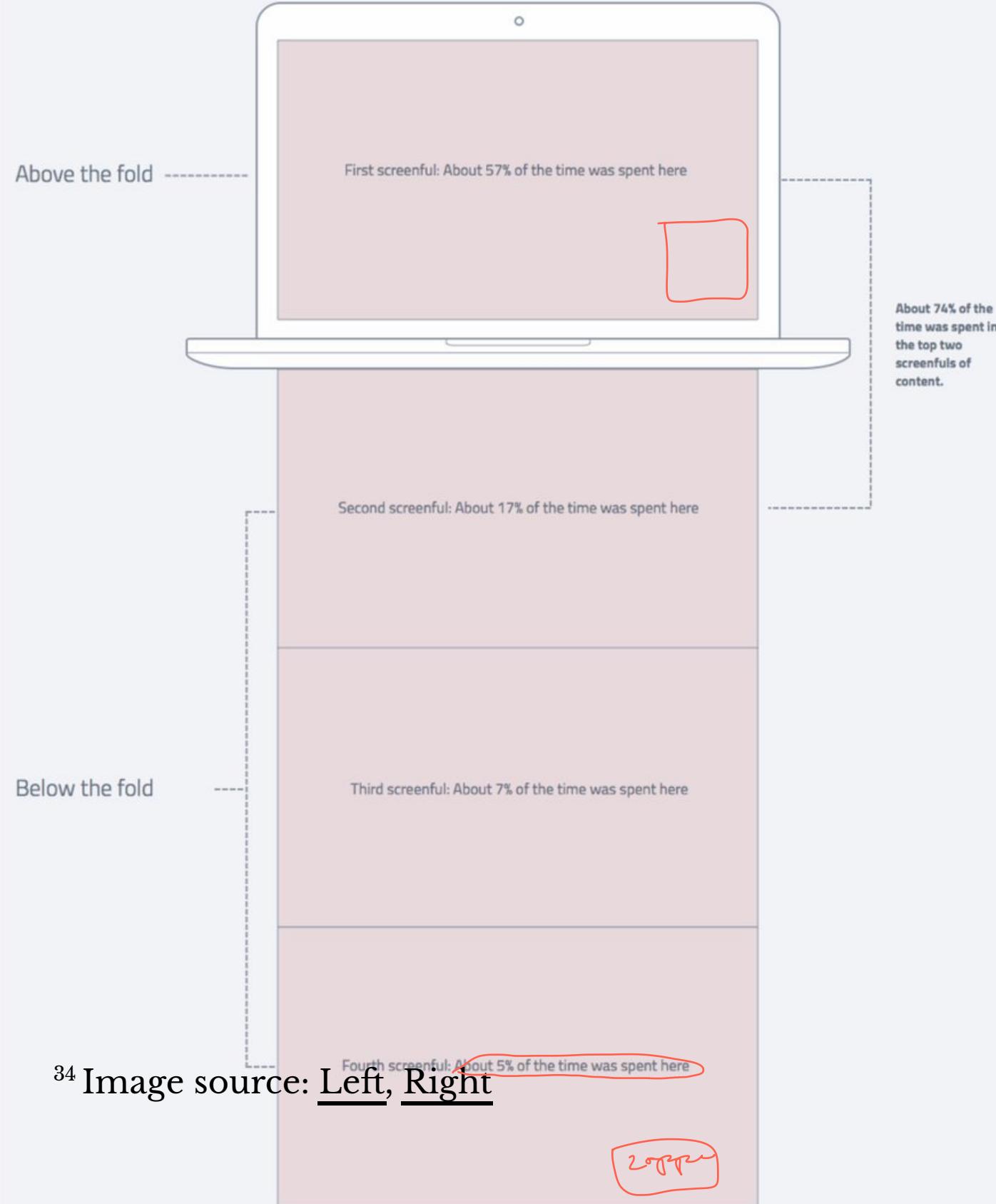
Organizing Page Content: The Fold³³

Definition: The *fold* is the dividing line between the area that is visible when a page first loads and the remainder of the page.

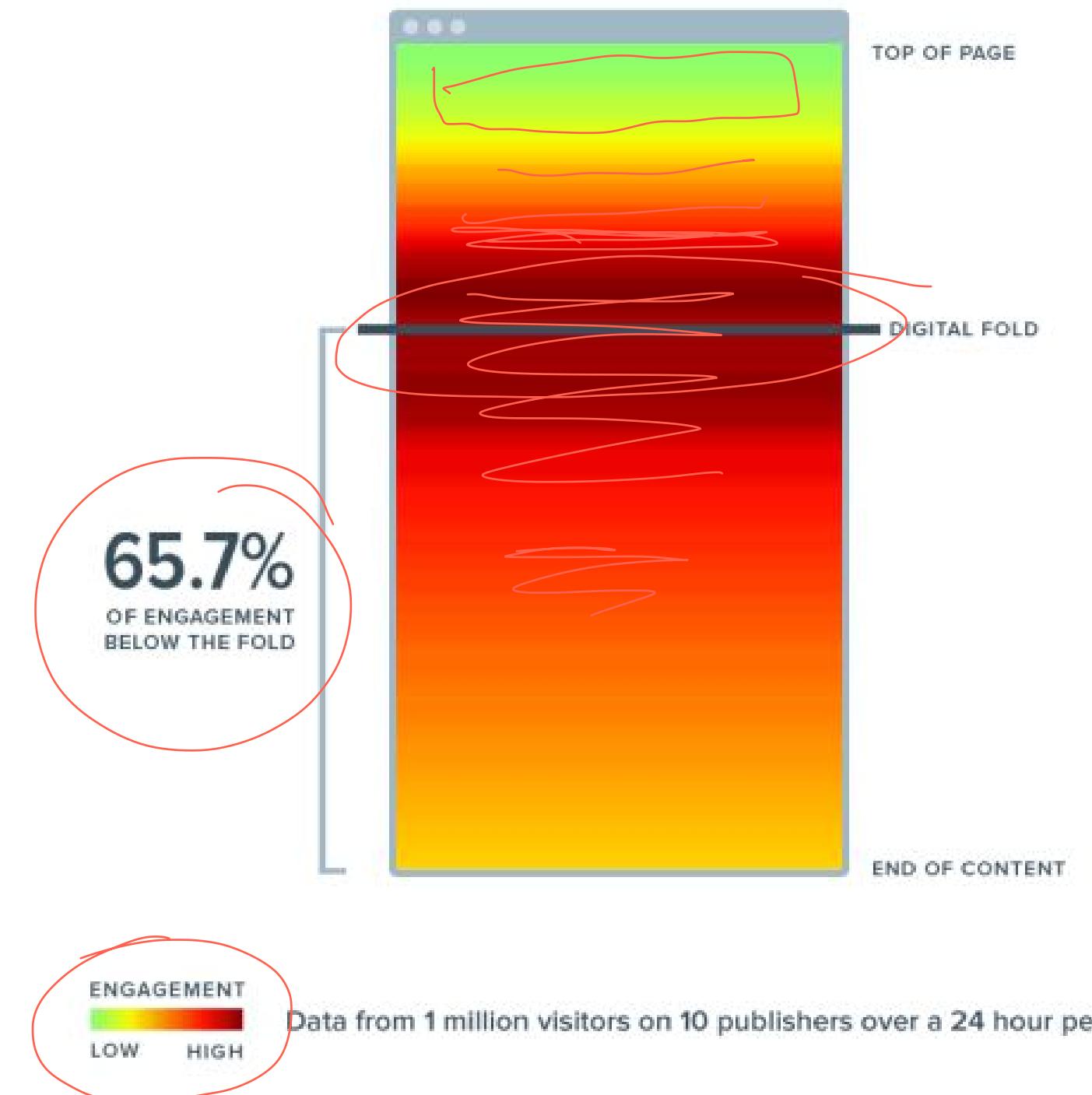


³³ [Image Source](#)





WHERE WE SPEND TIME READING

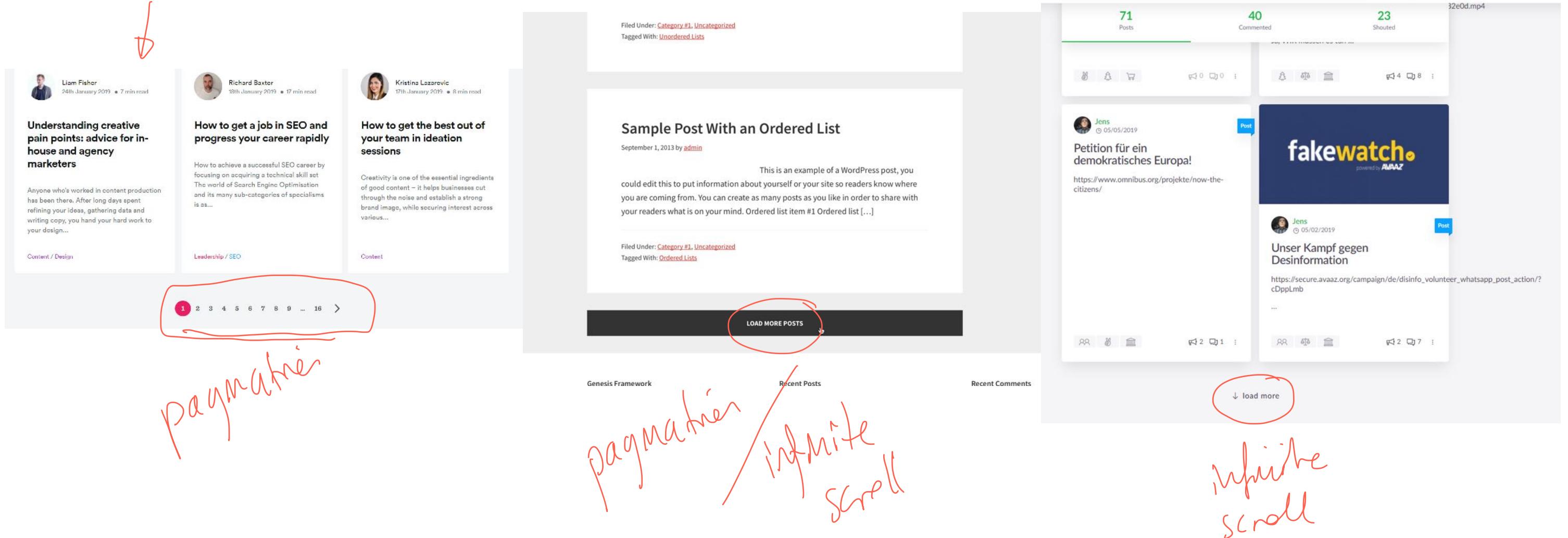


Organizing Page Content: Fitting It All in³⁵

Large volumes of content is either broken into discrete pages through *pagination* or incrementally loaded through *infinite scroll*.



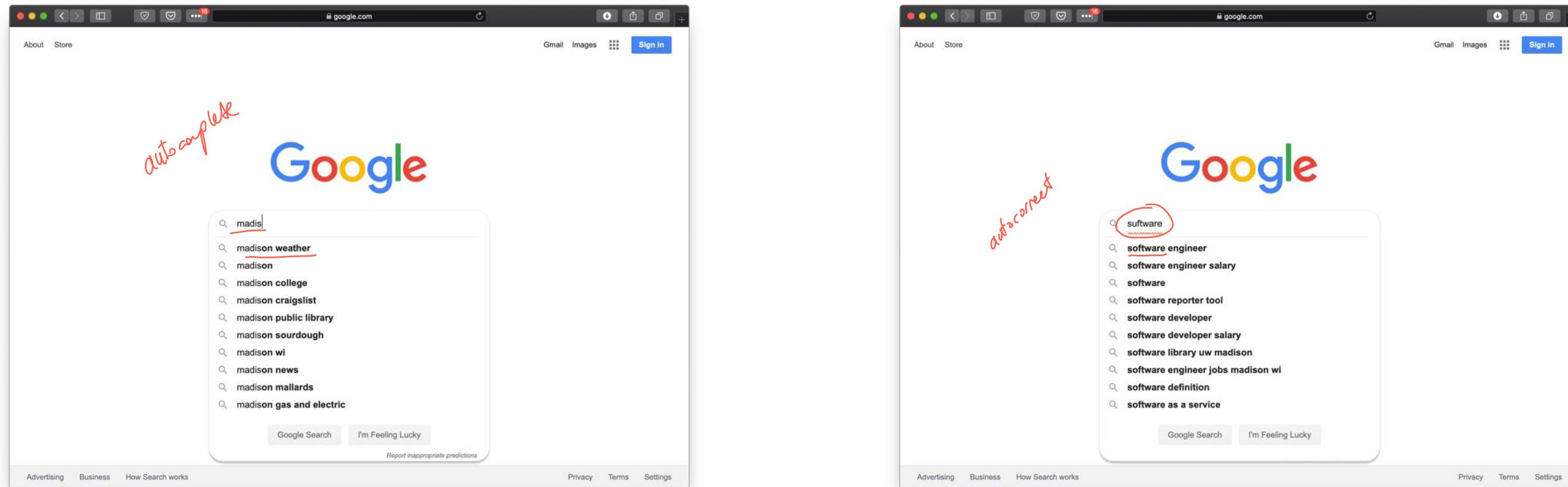
Examples of pagination and infinite scroll:³⁶



³⁶ Image source: [Left](#), [Center](#), [Right](#)

Search

Definition: Search, an alternative to page navigation, provides users with listings of content based on a search query.



Faceted search helps users narrow down a search once results are returned based on a simple query by providing functions to sort and filter the results.

The screenshot shows the Yelp website interface for finding restaurants near South Campus, Madison, WI. At the top, there's a red header bar with the Yelp logo, a search bar containing 'Near South Campus, Madison, WI', and navigation links for 'Log In' and 'Sign Up'. Below the header, there are several filter buttons: 'All Filters', '\$ \$ \$ \$ \$' (highlighted with a red circle), 'Open Now', 'Delivery', 'Takeout', and 'Good for Lunch'. A 'Sort By' dropdown menu is open, showing options like 'Recommended', 'Highest Rated', and 'Most Reviewed'. To the right of the sort menu are sections for 'Neighborhoods' (listing South Campus, Orchard Ridge Community, Capitol, and Midvale Heights Community), 'Distance' (listing Bird's-eye View, Driving (5 mi.), Biking (2 mi.), and Walking (1 mi.) - also highlighted with a red circle), 'Price' (with checkboxes for \$, \$\$, \$\$\$, and \$\$\$\$), 'Features' (checkboxes for Delivery, Takeout, Open Now 11:19 AM, Take-out, and Sandwiches), and 'Category' (checkboxes for American (Traditional), Pizza, Mexican, and more). Below these filters is a map titled 'Mo' Map' showing the locations of 26 restaurants numbered 1 through 26. A callout arrow points from the 'Walking (1 mi.)' filter to the map. The main content area displays the top result, '1. Asian Noodle', which includes a photo of a bowl of ramen, a star rating of 4.5, 3 reviews, and the address '(608) 467-6210, 902 Regent St, South Campus'.

The screenshot shows the Zappos website for 'running shoes'. The top navigation bar includes 'Customer Service', a phone number, and a search bar containing 'running shoes' (highlighted with a red circle). Below the search bar are categories for Women, Men, Kids, Departments, Brands, and Sale. A 'Sort By' dropdown is set to 'Relevance'. The main content area is titled 'Running Shoes' and shows 5727 items found. It features a 'Narrow Choices' sidebar with sections for 'Gender' (listing Women (2725), Men (2109), Boys (658), and Girls (653)), 'Product Type' (listing Shoes (5626), Clothing (97), Bags (3), and Sporting Goods (1)), and 'Brand' (with a search bar and a list of brands including 361 Degrees, Acorn, adidas, and adidas by Stella McCartney). The main grid displays four pairs of running shoes with their names and ratings: Newton Running Distance 8 (4.5 stars, 79 reviews), Newton Running Gravity 8 (4.5 stars, 75 reviews), Newton Running Fate 5 (4.5 stars, 26 reviews), and Newton Running Distance 8 (4.5 stars, 19 reviews).

Quiz 3

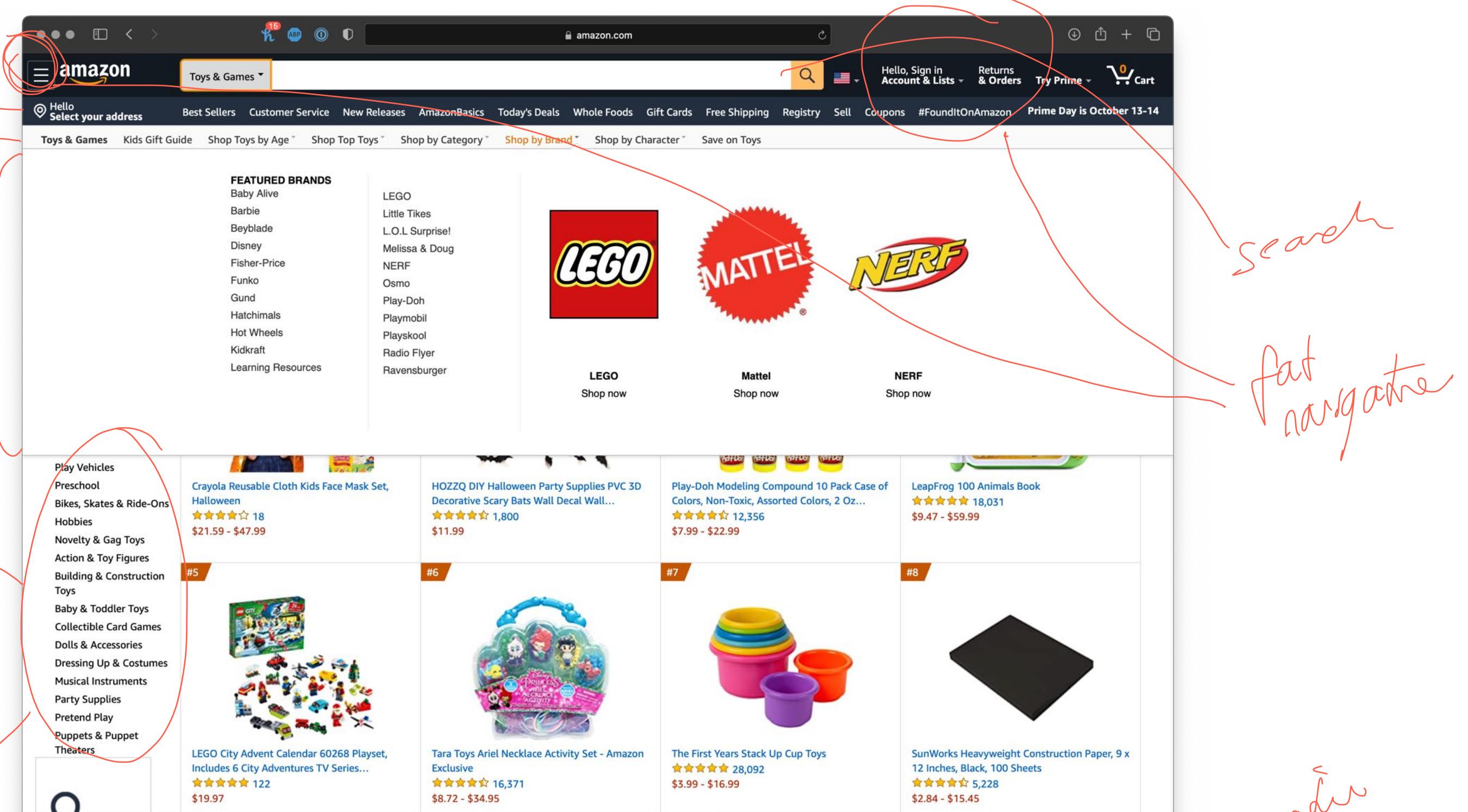
Complete the Canvas quiz.



canvas

In-Class Activity 2: Web Application Deconstruction

Image Source



What we learned today?

- A brief history of user interfaces
- Platform-specific design
 - Designing for the desktop
 - Designing for the web