

CS 349 09 Typography

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Asian and Arabic Cultures

- First form of printing was block printing
 - Full pages carved on wood blocks
- Earliest dated, printed books from around 700-800 AD
- Movable clay printing press invented ca. 1041 in China
- By 1100-1200 AD, Arabic and Chinese libraries have thousands of printed books

Printing in Europe

- Pre-Gutenberg
 - Manuscripts prepared with ink and nib
 - Lots of care in presentation
 - Artwork, illustrations tightly integrated with text
 - Could take 20 years to transcribe a Bible
 - Books available only to the wealthy
- Gutenberg creates movable type ca. 1440



Late 20th Century

- Computers arrive on scene
- Increase ease of setting type
- But introduce new challenges for typography
- Also (initially) lose some of the previous conventions of visual design

Type and Computers

- First terminals employed a 24x80 character grid
- Characters uniformly spaced
 - Modeled after typewriter
- No real choice in fonts
- Convention remains in terminal software programs

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love	you	take	

High Resolution Displays

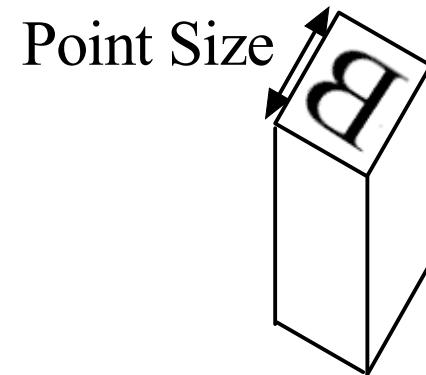
- High-res displays enabled wide variety of fonts
 - But a discrete output device
 - Fonts must be *rasterized*
- Two general types of fonts
 - Bitmap vs. outlines
- Bitmap font
 - Handcrafted font for bitmap display
 - Can't be properly scaled
- Outline font
 - Curve representation
 - Must be converted to bitmap prior to display

Typography

- Practice is >500 years old
- Lots of terminology
- Lots of tricks, tweaks to make type legible

Terminology

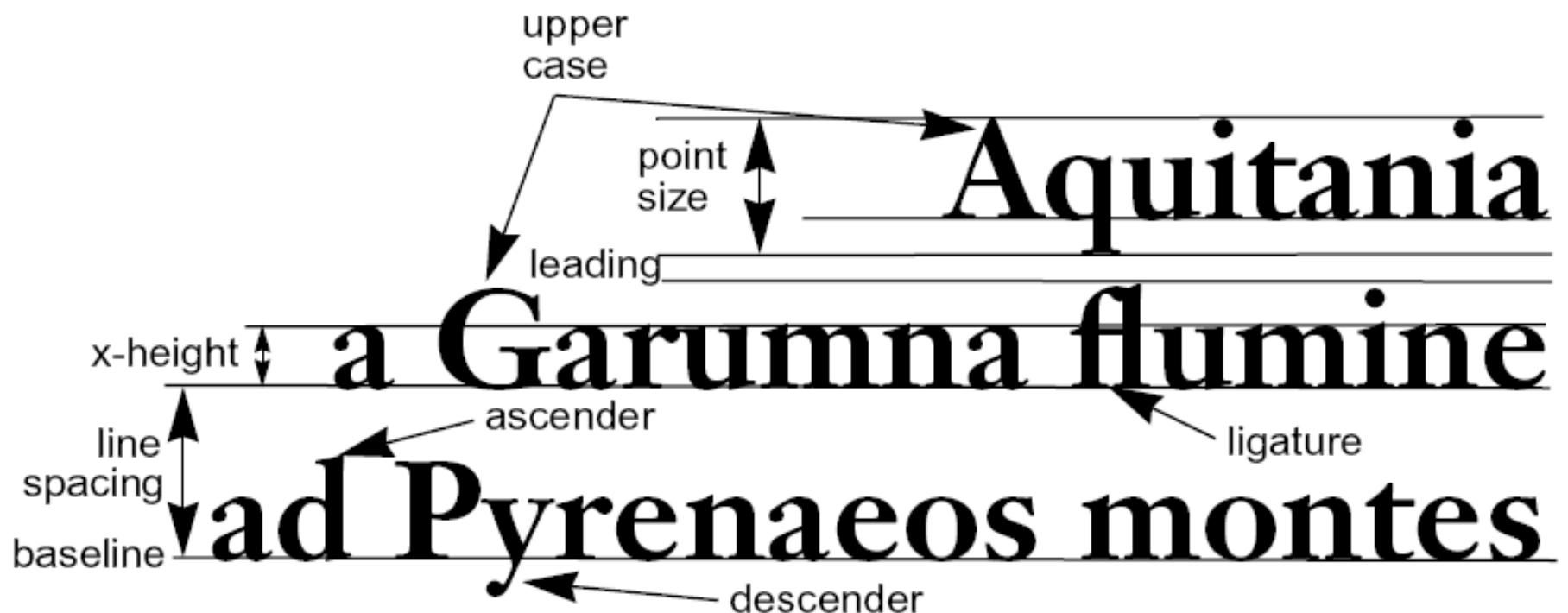
- **Glyph**
 - Lowest divisible unit
 - For movable type, it is a “stick” – the letter, number, or symbol
 - For computer, either pixel or character
- Each “stick” has a point size
 - Total height of stick, not the letter
- Sticks traditionally of variable width
 - Why?



Terminology

- Typeface
 - Set of letters, numbers, symbols that make up a type design
 - “Abstract shapes”
- Font
 - One weight, width, and style of a typeface
- Font metrics
 - Information describing attributes such as spacing of letters
- “Typeface” and “font” used interchangeably now

Terminology

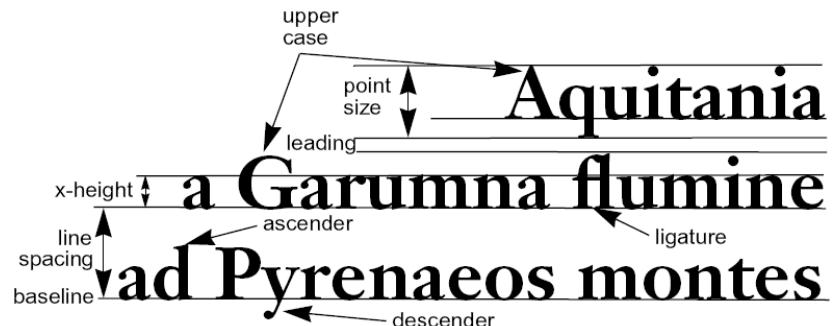


Points vs. Pixels

- Point: $0.351\text{mm} \approx 1/72"$ (English speaking countries)
 - 0.376mm elsewhere
 - Has had different values in the past
- Pixel: The size of one “dot” on the screen
 - A property of the display, which varies
 - Original Mac was deliberately designed with $1 \text{ pixel} = 1/72"$
 - Current pixel sizes are closer to $1/100"$
- Points and pixels often conflated
 - Not precisely the same

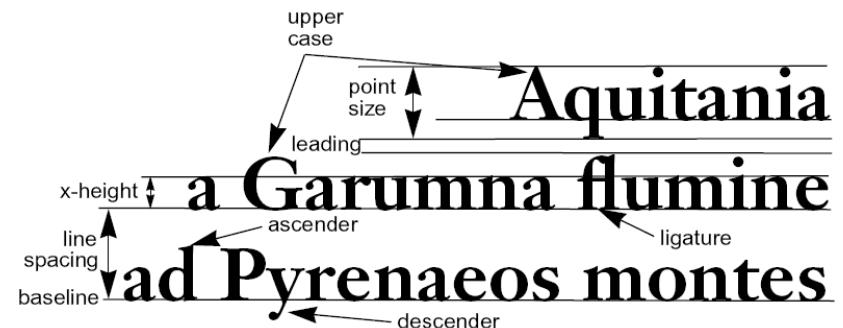
Terminology

- Baseline
 - Line on which most letters rest
- Leading (slugs) vs. line spacing
 - Leading is spacing between lines of text
 - Line spacing is sum of leading and point size
 - Can be seen as distance between baselines



Terminology

- Descender / descent
- Ascender / ascent
- Monospacing vs. proportional spacing



Kerning vs. Tracking

AV Wa
No kerning

AV Wa
Kerning applied

Tracking:

VAST. V A S T .

Kerning:

VAST. VAST.

From <http://en.wikipedia.org/wiki/Kerning>

Kerning vs. Tracking

- Kerning is distance between pairs of letters
- Tracking is average spacing between all letters

Ligatures

- Shapes of some pairs of letters interfere with one another
- Ligatures replace two adjacent letters with single printed unit
- Result is more visually appealing

fi → fi
fl → fl

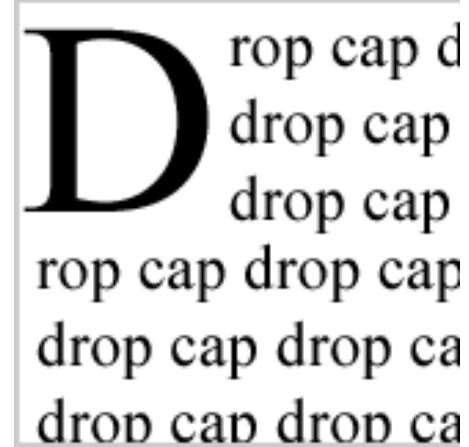
Illustration from: [http://en.wikipedia.org/wiki/Ligature_\(typography\)](http://en.wikipedia.org/wiki/Ligature_(typography))

Font Attributes

- Angle
 - Upright or *slanted*. Oblique, italic...
- Weight
 - Regular vs. **bold**
- Size
 - **Height** of sticks of type
- Style
 - A particular combination of attributes over which the typeface can vary

Terminology

- **x-height**
 - Height of letter “x”
- **em-space**
 - Width of uppercase M
- **em-dash**
 - Longer than hyphen (- vs. –)
- **Drop cap**
 - Capital letter at start of section that descends several lines



Drop cap d
drop cap
drop cap
rop cap drop cap
drop cap drop ca
drop cap drop ca

Illustration from [http://www.paratype.com/help/term/terms.asp?
code=106](http://www.paratype.com/help/term/terms.asp?code=106)

Terminology

- **Serif**
 - Small, decorative stroke at end of main strokes
- **Sans Serif**
 - Lacks the small decorations

A Sans Serif font

A Serif Font

Diagonal Stress
Slanted Sarif
Moderate Thick-Thin Transition

The diagram shows the word "Oldstyle" in a black serif font. Four blue lines extend from the top right towards the letters "O", "l", "d", and "s". The line for "O" is labeled "Diagonal Stress". The line for "l" is labeled "Slanted Sarif". The line for "d" is labeled "Moderate Thick-Thin Transition". The line for "s" is labeled "Vertical Stress".

Oldstyle

Radical Thick-thin Transitions
Vertical Stress
Serifs are thin and horizontal

The diagram shows the word "Modern" in a black serif font. Three blue lines extend from the top left towards the letters "M", "o", "d", and "e". The line for "M" is labeled "Radical Thick-thin Transitions". The line for "o" is labeled "Vertical Stress". The line for "e" is labeled "Serifs are thin and horizontal". A blue circle highlights the "Radical Thick-thin Transitions" feature.

Modern

No Thick-thin Transitions
No Stress
No Serifs

The diagram shows the words "Sans Serif" in a black sans-serif font. Three blue lines extend from the top left towards the letters "S", "a", "n", "s", and "S", "e", "r", "i", "f". The line for "S" is labeled "No Thick-thin Transitions". The line for "a" is labeled "No Stress". The line for "S" is labeled "No Serifs". A blue circle highlights the "No Thick-thin Transitions" feature.

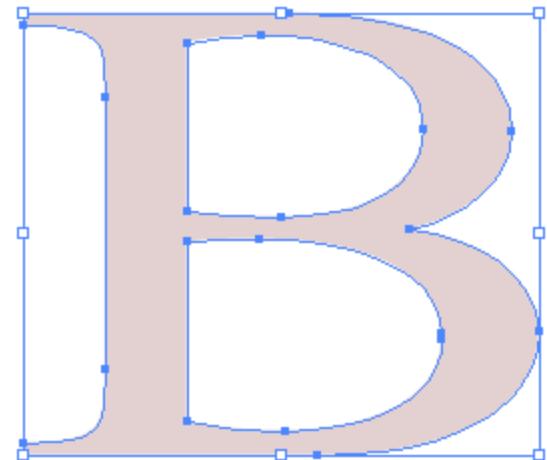
Sans Serif

Computer Issues

- Type traditionally metal sticks
- What issues arise when moving to bitmapped displays?

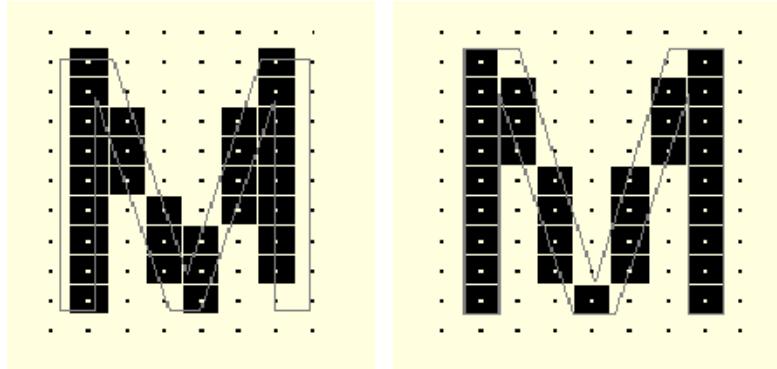
Representing Letter Forms

- Originally, represented as bit-maps.
 - Present problems in scaling to non-standard font sizes.
- Now, stored as mathematical curves.
 - Easy to scale to non-standard sizes.
 - Easy to adapt to higher resolutions (printers).
 - Compact storage.
 - Difficult to map onto a bit-map display.



Computer Issues

- Bitmap display causes problems
 - Limited resolution
- Example: Small fonts
 - When fonts are small, can result in poor representations
 - Need “hints”
- Example: Serifs



Source: <http://www.microsoft.com/typography/TrueTypeHintingWhat.mspx>

Computer Issues: Serifs

- Not enough precision to render them at smaller sizes
 - Edges get blurred because of anti-aliasing
 - Not as crisp
- But serif preferable for printed text
 - Some studies suggest greater comprehension with serif fonts

Screen Fonts

- Screen fonts specifically designed for output on bitmap displays
- Examples:

Verdana abc xyz 1lLiI

Trebuchet abc xyz 1lLiI

Common Screen Font Features

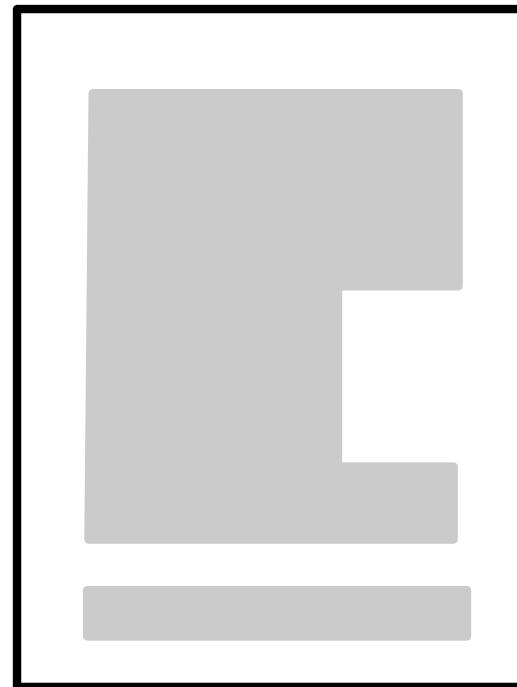
- Wide letter spacing
- Tall x-heights
- Uniform stroke thicknesses
- Commonly confused letters (i j l I J L 1) easily distinguishable
- Often sans serif
- Features help readability on bitmap displays
 - Greater width, spacing help out at low resolution when not a lot of pixels to spare

Design Rules of Thumb

- Consider visual design from multiple distances
 - Far away, nearby, reading-length
 - Each distance should provide information

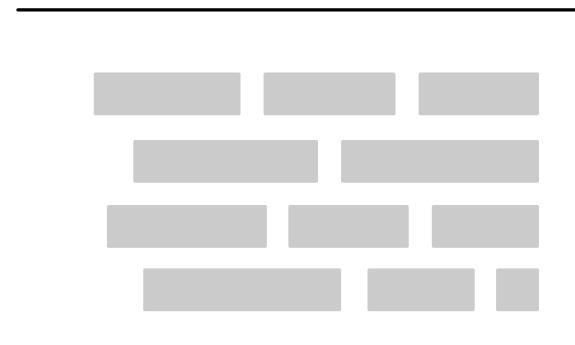
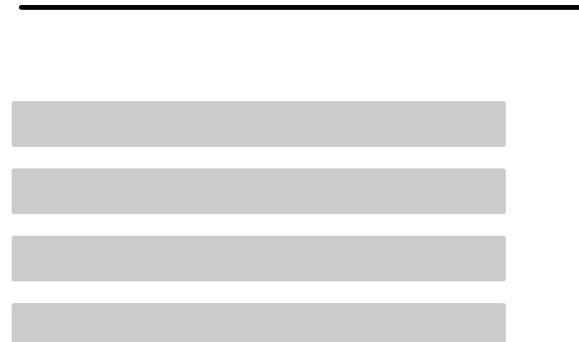
Design Rules of Thumb

- At a distance, should see a uniform display
- Headings should stand out
- Whitespace should guide eye, separate sections



Design Rules of Thumb

- Nearby, distinct lines of text should be visible
- At reading distance, words visible and clearly chunked



Design Rules of Thumb

- Limit number of fonts per page to 2-3
- Do not use similar fonts on same page
 - Use distinct fonts to guide reader to different meanings for each font
- Use white space, headings to delineate areas
- Use short lines of text (eg, multiple columns)
 - Increase line spacing if you have long lines
- Bullets useful for lists

Design Rules of Thumb

- Move to computers has lost some of richness of original methods of information presentation
 - Figures, text flowed freely in past
 - Examples: Galileo, DaVinci's notebooks
- Computers typically enforce rectangular divisions
 - Figures can be far from related text