# TYPOGRAPHY

Niels Joubert, 10th August 2010, CS147

The aim of the new design was to create a neutral typeface that had great clarity, no intrinsic meaning in its form, and could be used on a wide variety of signage.

# Helvetica

#### helveticafilm.com

Tuesday, August 10, 2010

#### ONE MINUTE AND FIFTY-TWO SECONDS WITH NEVILLE BRODY AND RICK POYNOR

A DOCUMENTARY FILM BY GARY HUSTWIT

helveticafilm.com

Tuesday, August 10, 2010

### Introducing Typography

"The Organization of Letters on a blank page ... [for] acts of visual communication"

#### **Designer Mentality**

Using Types to Represent Information

#### **Graphics Mentality**

Representing and Rendering Typography

#### Introduction

### **Designer Mentality**

#### LETTER

• The letterform, represented as a glyph

#### TEXT

Ongoing sequences of letters

#### GRID

• The organization of visual elements

# DESIGN MENTALITY

Tuesday, August 10, 2010

### References

Disclaimer: I am not a designer - I can only point you the right way.



The Intro



The Tome

## FONT

**Typefaces and Font Families** 

### Pre-Gutenberg (BC-1400s)

#### Western Alphabet

Cumae Alphabet (Greet) evolves to Roman Alphabet

#### **ΑΒ< ▷Ε F Ζ Η Θ Ι Κ └ Μ Μ Ο Γ Μ Ϙ Ρ ξ Τ Υ Φ Χ Ψ**

#### Eastern Alphabet

· Chinese invented 'movable type' (1040 AD), large alphabet hampers it

#### Words

Calligraphy: Gestures of the Body

#### I 3th Century Monk fixes incorrect line



### Movable Type

#### 1450

- Johannes Gutenberg independently invents movable type (1st mass production system)
- Large quantites of letters molded, arranged into galley proofs
- Uniform, precise lettering leads to fonts
- Tension:

Organic, Human Body vs Geometric, Abstract System



#### Font

**IOHANNES** GUTENBERG Printed text.

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### **First Fonts**

#### **Emulates Scribes**

- "Blackletter"
- contains Ligatures

#### Letter Styles

- Upper Case
- Lower Case

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### **Copyright Laws**

#### Print

- Establishes author as owner of text (commoditizes reproduction)
- Influences 18th Century Lawmaking

#### Modern Day Struggle

- Fundamental Liberty of Ideas
- Protect investment in authoring and publishing content

### **Type Classification**

#### Distinguishing groups of types

- Flourishes:
  - Serif
  - Slab Serif
  - Sans Serif
- "Organic"-ness:
  - Humanist / Old-Style
  - Transitional
  - Modern







HUMANIST OR OLD STYLE The roman typefaces of the fifteenth and sixteenth centuries emulated classical calligraphy. Sabon was designed by Jan Tschichold in 1966, based on the sixteenth-century typefaces of Claude Garamond.



HUMANIST SANS SERIF Sans-serif typefaces became common in the twentieth century. Gill Sans, designed by Eric Gill in 1928, has humanist characteristics. Note the small. lilting counter in the letter a, and the calligraphic variations in line weight.

# Aa A

Transitional

#### TRANSITIONAL These typefaces have sharper serifs and a more vertical axis than humanist letters. When the fonts of John Baskerville were introduced in the mid-eighteenth century, their sharp forms and high contrast were considered shocking.

Aa

#### TRANSITIONAL SANS SERIF

Helvetica, designed by Max Miedinger in 1957, is one of the world's most widely used typefaces. Its uniform, upright character makes it similar to transitional serif letters. These fonts are also referred to as "anonymous sans serif."

# Ad

Modern

MODERN

The typefaces designed by

Giambattista Bodoni in the late

eighteenth and early nineteenth

centuries are radically abstract.

vertical axis; and sharp contrast

Note the thin, straight serifs;

from thick to thin strokes.

#### GEOMETRIC SANS SERIF Some sans-serif types are built around geometric forms. In Futura, designed by Paul Renner in 1927, the Os are perfect circles, and the peaks of the A and M are sharp triangles.

#### Slab



EGYPTIAN OR SLAB SERIF Numerous bold and decorative typefaces were introduced in the nineteenth century for use in advertising. Egyptian fonts have heavy, slablike serifs.

### Serif

Sans Serif





### Goudy Palatino Times Baskerville Garamond

### Modern



### Bodoni Times Bold Myx Fenice, Ultra Walbaum

### Slab Serif



### Clarendon Memphis Memphis Extra Bold New Century Schoolbook

### Sans Serif



### Antique Olive Formata Folio Franklin Gothic Futura, Condensed Syntax

### **Example: Helvetica**

### Generations are defined by their typeface

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# What did Helvetica tell you today?

Tuesday, August 10, 2010

### **Glyph Metrics**





(No need to know all this)

#### Font



### Font x-height

# Times Garamond

Both have the same cap height.

Larger x-height gives Times a bigger feel

• Small fonts for screen usage has large x-heights.

Small difference between capitals and lower case.

### Sizes and Units

#### Height measures in Points (1700s)

- 72 pt = p72 = 1 inch (Adobe's standard. Traditionally, 0.996in)
- 12 pts = 1pica = 1p (column width measurement)

#### Font Size today: Pixels

- Problem: Displays at various resolutions
- How to get consistency across hardware?



### **Font Families**

#### A set of variations on a typeface

Thesis Serif Medium Roman, Thesis Serif Medium Italic, Thesis Serif Medium Small Caps, ...



### Font Families Example

#### THESIS FAMILY

Designed by Lucas de Groot, LucasFonts, 1994 Thesis is one of the world's largest type families.

This is not a book about fonts. It is a book about how to use them. Typefaces

are essential resources for the graphic designer, just as glass, stone, steel, and

OTHER MATERIALS ARE EMPLOYED BY THE ARCHITECT. SOME DESIGNERS CREATE THESIS SERIF MEDIUM SMALL CAPS

their own custom fonts. But most

graphic designers will tap the vast

store of already existing typefaces, THESIS SERIF BOLD ROMAN

choosing and combining each with

regard to the audience or situation.

Selecting type with wit and wisdom

requires knowledge of how and why

letterforms have evolved. The history

of typography reflects a continual tension between the hand and machine, the

organic and geometric, the human body and the abstract system. These tensions

MARKED THE BIRTH OF PRINTED LETTERS FIVE CENTURIES AGO, AND THEY CONTINUE TO THESIS SANS MEDIUM SMALL CAPS

energize typography today. Writing

in the West was revolutionized early THESIS SANS EXTRA BOLD ROMAN

in the Renaissance, when Johannes THESIS SANS BOLD ROMAN

Gutenberg introduced moveable type

in Germany. Whereas documents and

books had previously been written by

hand, printing with type mobilized all

of the techniques of mass production.

### TEXT

#### **Coherent Arrangement of Words & Sentences**

### Text

Letters -> Words -> Sentences

Question: How do we relate individual font elements to each other?

"Typography manipulates the silent dimensions of the alphabet, employing habit and technique - such as spacing and punctuation - that are seen but not heard or spoken." - Ellen Lupton

"Frees the reader from the bounds of linearity"

#### **Text Evolution**

### **Dominant Subject**

#### Humans interacting with information:

- No longer "reader" or "writer"
- "User"
  - Bundle of needs and impairments
  - Should be cared for but controlled and guided.
  - Typography is designed to do this.
- "Productive" vs "Contemplative"

### Kerning

## Variable spacing between letters depending on the letter pair

- Automatically Adjusted
- Manually Tweaked by Typesetter

### LOVE LETTERS

The VE and TT combinations make the words look mismatched.

### LOVE LETTERS

Kerning has been manually adjusted for a more even appearance.

### Takes two

SCALA, WITH KERNING SUPPRESSED Spacing appears uneven, with gaps around the T and w.

Takes two

Spacing seems more even, although some characters nearly touch.

nearly touch

SCALA ITALIC, WITH KERNING SUPPRESSED A gap appears between the 1 and y.

nearly touch

SCALA ITALIC, WITH KERNING The characteristic intimacy of italic requires kerning.

### Leading

## The distance from the baseline of one line of type to another. "Line Spacing"

### "Leading"

Reference to strips of lead inserted between lines of type

#### Text

The distance from the baseline of one line of type to another is called line spacing. It is also called leading, in reference to the strips of lead used to separate lines of metal type. The default setting in most layout and imaging software is slightly greater than the cap height of the letters. Expanding this distance creates a text block with a lighter, more open color. As line spacing increases further, the lines of type become independent linear elements rather than parts of an overall texture.

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7/7 SCALA 7-pt type with 7 pts line spacing 7/8.5 SCALA Auto spacing; 7-pt type with 8.5 pts line spacing 7/9 SCALA 7-pt type with 9 pts line spacing 7/10 SCALA 7-pt type with 10 pts line spacing

### Ligatures

Multiple 'letters' form a single glyph.

Used to create correct kerning.

# ff fi fl ffi ffl ff fi fl ffi ffl

### Paragraphs

Unlike Sentences, Paragraphs do not occur in nature. Literary convention to help reader.

- Start with indent
- End with line break

#### Text: Paragraphs

The table is covered with a table cloth which itself is protected by a plastic table cloth. Drapes and double drapes are at the windows. We have carpets, slipcovers, coasters, wainscoting, lampshades. Each trinket sits on a doily, each flower in its pot, and each pot in its saucer.

Everything is protected and surrounded. Even in the garden, each cluster is encircled with wire netting, each path is outlined by bricks, mosaics, or flagstones.

This could be analyzed as an anxious sequestration, as an obsessional symbolism: the obsession of the cottage owner and small capitalist not only to possess, but to underline what he possesses two or three times. There, as other places, the unconscious speaks in the redundancy of signs, in their connotations and overworking. The table is covered with a table cloth which itself is protected by a plastic table cloth. Drapes and double drapes are at the windows. We have carpets, slipcovers, coasters, wainscoting, lampshades. Each trinket sits on a doily, each flower in its pot, and each pot in its saucer. Everything is protected and surrounded. Even in the garden, each cluster is encircled with wire netting, each path is outlined by bricks, mosaics, or flagstones. This could be analyzed as an anxious sequestration, as an obsessional symbolism: the obsession of the cottage owner and small capitalist not only to possess, but to underline what he possesses two or three times. There, as other places, the unconscious speaks in the redundancy of signs, in their connotations and overworking.

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#### LINE BREAK ONLY, WITHOUT INDENT

#### EXTRA SPACE INSIDE LINE, WITHOUT LINE BREAK

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#### LINE BREAK AND 1/2 LINE SPACE

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SYMBOL: NO INDENT OR LINE BREAK

#### Text: Takeaway



## GRID

**Layout of Visual Elements** 

### **Context for Arrangement**

#### All traditional design is built from a grid

- · Legacy of printing press grids that was painstakingly built
- Skeleton for layout of typography

#### Design Pro-tip:

• Make a grid, and align things with it.

in libram Job

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### Latin Bible 1497

#### Grid

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### 4 layouts one grid

#### Grid

Grid systems	
A grid can be simple or complex, specific or generic, tightly defined or loosely interpreted. Typographie grids are all about control. They establish a system for arranging content within the space of page, screen, or built environment. Designed in response to the internal pressures of content text, image, data] and the outer edge or frame (page, screen, window), an effective grid is not a rapid formula but a flexible and resiliem structure, a skeleton that moves in concert with the muscular mass of content. Grids belong to the technological framework of typography, from the concrete modularity of letterpress to the ubiquitous rulers, guides, and coordinate systems of graphics applications. Although software generates illusions of smooth curves and continuous tones, mory digital image or mark is constructed—ultimately—from a grid of neatly bounded blocks. The ubiquitous language of the Gui (graphical user interface) creates a gridded space in which windows overlay windows. In addition to their place in the background of design production, grids have become explicit theoretical tools. Avant-garde designers in the 1910s and 1920s exposed the grid of letterpress, bringing it to the polemical surface of the page. In Switzerland after World War II, graphic designers built a total design methodology around the typographic grid, hoping to build from it a new and rational social order. The grid has evolved across centuries of typographic evolution. For graphic designers, grids are earefully honed intellectual devices, infused with ideology and ambition, and they are the inescapable mesh that filters, at some level of resolution, nearly every system of writing and	A grid can be simple or complex, specific or generic, tightly defined or loosely interpreted. Typographic grids are all about control. They establish a system for arranging content within the space of page, screen, or built environment. Designed in response to the internal pressures of content (text, image, data) and the outer edge or frame (page, screen, window), an effective grid is not a rigid formula but a flexible and resilient structure, a skeleton that moves in concert with the muscular mass of content. Grids belong to the technological framework of typography, from the conduction mass of content. Grids belong to the technological framework of typography, from the conduction sphics applications. Although software generates illusions of smooth curves and continuous tones, every digital image or mark is constructed—ultimately— from a grid of neatly brunded blocks. The ubiquitous language of the cui (graphical user interface) ereates a gridded space in which windows overlay windows in addition to their place in the background of design production.
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This modular grid has four columns and four rows. An image or a text block can occupy one or more modules. Endless variations are possible.

# ENCODING

**Representing textual information** 

### Encoding

#### Storing text in a digital format:

- ASCII byte-by-byte representation of 256 letters
- Unicode much expanded variable-length letter representation

### Storing typography in a digital format:

- Basic Gylphs "Font"
- Document Layout PostScript, TeX, PDF, Word processors

### ASCII

Uses a single byte for each character

- Limited to 256 characters, mainly roman numerals
- Stateless each character stands alone

Outdated

### Unicode

"Unicode provides a unique number for every character, no matter what the platform, no matter what the program, no matter what the language."

- 256 Code Pages, 107k characters (http://www.unicode.org/charts/)
- Defines character numbers but does not specify storage requirements

#### **Encodings:**

• UTF-8: uses the ASCII character set (8 bits) and can expand up to 4 bytes for other characters.

1	000	001	002	003	004	005	006	007
0	NUL	DLE	SP	0	@	P		P
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	**	2	B	R	b	<b>r</b>
3	ETX	DC3	#	3	C	S	C (1963	S
4	EOT	DC4	\$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	511N	&	6	F	V	f	V
7	BEL	ETB	•	7	G	W	g	w
8	85	CAN	(	8	H	X	h	X
9	HT	EM	)	9	I	Y	i	y
A		SUB	*	:	<b>J</b>	2	j	Z
в	VT	ESC 018	+	;	K	0000	k	{ 
с	<b>FF</b>	FS	<b>9</b> 9090	<	L	1	1	1
D	CR	GS	-	=	M	]	m	}
E	80	RS	•	>	N	A	n	~
F	SI	US	1	?	0		0	DEL

### OpenType [Adobe, Apple, Microsoft]

#### Contains:

- Character map: Unicode # -> Glyph
- · Glyphs (Bezier curves), thus it is a vector font
- Glyph Metrics (sized)

#### May contain:

- Multiple character maps and fonts
- Bitmaps and Outline fonts

### Encoding

### Anatomy of a Glyph



## **BEZIER CURVES**

**Representing Glyphs** 

### Requirements

Smooth Curves at any resolution

Sharp Corners and Smooth Transitions

Choose between C0 and C1 continuity

Fast and simple to calculate

Small storage footprint

### **Remember Splines**

#### Set of basis functions and control points

- Different types of splines gives us different curve properties and control points
- Cubic Hermite:

Two endpoints (interpolates), two tangents

Catmull-Rom generates Smooth path

• B-Splines:



### Cubic Bézier

### Like Hermite splines, but tangents indirectly specified.





### Cubic Bézier Properties

Like Hermite splines, but tangents indirectly specified. Just another cubic polynomial

- Local Support
- Interpolates endpoints
- Convex Hull
- Invariance under affine transforms transforming points is enough
- Extrapolation to subdivide splines

### Local Support

## Perturbing a control point does not have a global impact

- Good for editing purposes!
- Fast evaluation don't need to do global solves
- Interpolates endpoints

#### Curves

### DeCasteljau's Algorithm



### Joining Bézier

### **C**0

• Endpoints touch

#### C1

• C0 + 'tangent' points (a, c) on line

#### C2

• C1 + 'tangent' points (a, c) equidistant wrt. b



### Encoding

### Anatomy of a Glyph



# RASTERIZATION

**Displaying Glyphs on Bitmap displays** 

#### Rasterization

0	0	0	0	0	0
o	0	0	0	0	0
o	0	0	0	0	0
۰Ľ	0	0	0	•	0
0	0	0	0	۰	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

0	0	0	0	, 0	0
	0	0	0	•	0
e	0	0	0	0	0
e -				10	0
	0	0	0	0	0
¢	0	0	0	¢	0
¢	0	0	0	0	0
0	0	0	0	0	0

1

#### Scaled Outline

#### **Raster Image**

(from Apple TrueType Reference Manual)

#### Rasterization

### Anti-Aliasing

#### Pixels are partially black

Make intensity be relative to vector overlap of pixel



### Subpixel Smoothing

#### Exploit pixel arrangement of monitor

- Increases apparent resolution
- Anti-aliases on a per-color value depending on device pixel arrangement



### Things to Remember:

- Type Classification
- Font Metrics, Sizes & Units
- Font Families
- Kerning, Leading
- Encoding UTF vs ASCII
- Character Encoding versus Glyph
- Bezier Curve Properties, DeCastaljau, Joining
- Rasterization

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