UBIQUITOUS DESIGN:

A STUDY OF POPULAR FONTS

AND TYPOGRAPHIC UNDERSTANDING

by

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DEDICATION

I dedicate this work to Bodoni, my greyhound. She is a constant reminder that typography lazily stays in one place often but occasionally will impress by moving forward quite quickly.

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I would like to acknowledge all the professors and teachers in the MFA program who gave me generous liberties to research type and focus on it throughout my studies, despite the main content of their courses. I would especially like to thank my chair, Claudia Röschmann, whose vast library of books helped give me insight into that third type of book—the ones written for and by typography nerds.

I would also like to acknowledge my oldest sister Clare, who provided her immense experience in editing to make this work the best it can be.

Finally, I would like to acknowledge Times New Roman, in which this thesis is typeset. I do not use it by choice, but as it has long been a requirement of academic writing to format work in Times New Roman, 12pt, double-spaced—I respect it.

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LIST OF ABBREVIATIONS

Abbreviation	Description
API - Application Programming Interface	a protocol for different software to communicate
ATF - American Type Founders	a typeface foundry and distributor
CSS - Cascading Style Sheet	a file used to add design to a webpage
EOT - Embedded Open Type	a font file format by Microsoft for the web
FF - FontFont	a digital typeface foundry and distributor
FOUT - Flash of Unstyled Text	a brief moment before a web font is loaded and a default font is displayed instead
ITC - International Typographic Corporation	a typeface foundry and distributor
LT - Linotype Corporation	a typeface foundry and distributor
MT - Monotype Corporation	a typeface foundry and distributor
OTF - OpenType Font	a font file format
SVG - Scalable Vector Graphics	a graphics file format
TTF - True Type Font	a font file format
WOFF - Web Open Font Format	a font file format for the web and browsers

ABSTRACT

Ubiquitous typefaces, such as Helvetica and Times New Roman, were designed in the age of metal type and, despite their age, are still ingrained into modern software—allowing these typefaces to continue to reach a wide audience and achieve ubiquity. In order for new typefaces to differentiate and compete with existing choices, type designers must employ user preferences and leverage digital technology to create a stronger relationship between typographic voice and physical properties of typefaces. By performing A-B typeface comparisons based on structure with designers and non-designers based on sentiment and perception, establishing emotional profiles for the most common typefaces, and interviewing prominent typeface designers about their practices, this research explores the relationship between ubiquity and physical features to set a baseline for future typeface designs. Further, this research investigates ubiquitous typefaces through measuring physical properties and determining their relationship to non-physical and emotional characteristics to better recognize how typeface design can address user preferences and understanding in a variety of typographic settings.

I. INTRODUCTION

Typefaces impart their characteristics in all forms of written communication. There are millions of typefaces from which to choose in for use everyday correspondence, publications, logos, signs—but a handful appear more frequently and prominently than the rest. How many typefaces are needed to convey the intent of a message to a reader? Some typeface designers argue for a handful, while others proclaim there should be as many typefaces as there are individual people—as each person has a unique voice, so should typography. Despite the plethora of choices, people tend to use only a specific few. Do these typefaces carry such an elegant mix of beauty and function that their gravity pulls and calls both designer and novice into their stewardship, or are they simply selected due to constant availability and perpetual familiarity? Consciousness or conditioning?

Do these typefaces possess intangible characteristics and an underlying feeling that make them the go-to choice for written communication, or are they reused out of habit or complacency by people who pay little attention to the typefaces they select? With this question in mind, this research investigates ubiquitous typefaces through measuring physical properties and determining their relationship to non-physical and emotional characteristics to better understand how typeface design can address user preferences in a variety of typographic settings. The intent is to bridge the gap between intended feel, measurable attributes, and common usage within the constructs of typography.

In looking at the history of some of the most popular typefaces, this research attempts to understand if they were designed under the right conditions to become ubiquitous, or if they are a product of timeless design. Further, an examination of a new

system for typeface classification that would alleviate the need for expertise when choosing the right typeface outside the field of design will be conducted. The new system will reflect the state of typographic understanding for non-designers as related to the intent of professional typeface designers.

This thesis will not only explore ubiquitous typefaces, but also examine the role of typefaces as a tool for communication for those outside the design profession. Before developing typographic understandings, a general look at ubiquity will set the stage for dealing with more specific topics inherent to type.

II. UBIQUITY DEFINED

Ubiquitous Objects

Ubiquity is a rare mixture of popularity, affordability, and availability. It is a bit of an oxymoron that ubiquity is a rare or uncommon occurrence as the ubiquitous object must be easily found everywhere, often simultaneously ("Ubiquity"). Ubiquity must be earned. It is not a guarantee, but a privilege granted by time and the people who find consistent value in a thing. Ubiquity can be a product design goal, but ultimately the status is beyond the designer's control. Users are the only ones who can assign an object's value and control its popularity.

When thinking about the most iconic and well-designed things people interact with every day, technology like laptops or smart phones may immediately spring to mind for some. Others may think of kitchen gadgets like a toaster or coffee maker and their role in jumpstarting an early morning. While these things make people's lives easier, they are not quite to the level and pervasiveness required of ubiquity. Designs that do qualify, such as the paper clip and the ballpoint pen, live so omnipresently in the background of daily life that people rarely think about them as designed objects. They just are and feel like they always have been. In the context of ubiquity, typography is another candidate, and through applying the same concept of universality, it is easy to see how a typeface could transcend humble origins and become generic and seen daily.

The Paper Clip

Ubiquitous design by its very definition is everywhere. The design of the paper clip is just that. They are found in offices and homes and in pockets as well as in the dryer lint trap. They are cheap to buy and cheap to produce and have remained

unchanged for over a hundred years. Sure, there are variations on the classic rounded rectangular shape, but the shape that immediately springs to mind is the plain silver masterpiece (Figure 1) to which no one would give a second thought. The shape is instantly recognizable, but it did not start that way.

Figure 1. Paper Clip. The common paper clip in the most common format.

The paper clip grew from a need to temporarily fasten papers together without damaging them or requiring too much effort or dexterity from the user. Before paper clips, people would use straight pins like those used in sewing or tie strings around paper like a bundle of newspapers. The first version of the paper clip, invented by Samuel B. Fay in 1867, did not have the final loop on the inside, which led to the tearing and puncturing of paper during its removal (Moran 111). Another American named William Middlebrook added the final turn with his Gem paper clip machine, creating the iconic look still in use today.

Joe Moran claims, “The paper clip endures, though, because it remains a useful everyday object” (Moran 113). Despite the widespread use of computers and digital communication, the paper clip still holds a valuable spot in the modern office. It is this pervasiveness and simplicity that makes the paper clip iconic. It’s uncomplicated, and the design is hard to improve upon.

The Bic Cristal Pen

Another facet of ubiquity lies in global reach—not localized to a single part of the world or popular among only a subset of people. The Bic Cristal pen debuted in 1950 and according to Susan Lambert, “few brands share such longevity or geographical

penetration" (Lambert 126). Starting in France, the Bic pen sold for almost a fifth of the price of any competitor's ballpoint pen, and this cheap cost led to its widespread use. The factory set up to generate this plastic pen included sixty processes from creating the tiny spherical ball to injection molding the transparent body, which at the time was a feat of mechanical engineering (Figure 2).

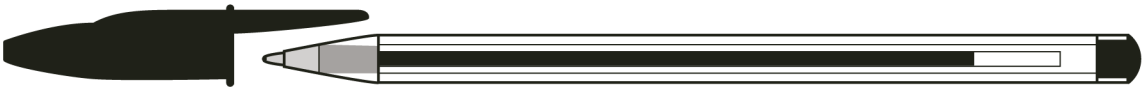

Figure 2. Bic Cristal Pen. The Bic Cristal pen is a basic pen representing lots of technical innovation.

The name Cristal not only describes the transparent nature of the plastic body, but also alludes to a rising technology of the modern era—crystallography. Associating the simplistic pen with modern technology cemented the design as iconic and forward-thinking, which would eventually secure the Bic pen a spot in the permanent collection in the Museum of Modern Art. While the Cristal pen was hardly the first ballpoint pen, it broke the barrier of affordability and ease of acquisition. The hexagonal, rather than circular, cross-section of the pen required fewer materials and led to a stronger casing that prevented the pen from rolling and made it easier to grip. Marcel Bich, owner of the Bic company, stated, "The pen is beautiful because it is functional" (Lambert 126). When technology and design meet in a harmonious intersection, an undeniably ubiquitous object likely ensues, which is clearly the case for the Cristal pen.

Another aspect of the Bic success comes from an extremely large advertising budget, where over 100 million francs (about the same in United States dollars) would be spent to ensure consumers were buying an authentic Bic pen. The revolutionary pen

already faced several similarly named copycat brands, but the technology used in creating it could only be replicated at the Bic factory at economy.

Ubiquity and Typography

Not all ubiquitous designs need to be physical. People are quite aware of the purpose and structure of a paper clip, but typography is a bit more complicated. The world of typography exists in many mediums—preserved in metal blocks, inked on sheets of paper, and illuminated on the screens of digital devices. Despite its very physical past, typography is rarely as analog as bending back the space between the curves of a paper clip to secure a group of papers, nor as simple as pressing the ink end of a Bic to make a mark. Typography is a term that covers both the creation of the letters and the eventual application of those letters into words. In today's digital world, typefaces are required to output communications into a visible format, so it only makes sense that an overwhelming majority of type is created digitally. However, many of the most popular typefaces have versions that exist in all typographic mediums.

While Helvetica (Figure 3) is not the oldest sans serif typeface, it is the most widespread. It can be considered the world's most familiar font (Garfield 220). Created in the slightly inconsistent wake of the German typeface Akzidenz Grotesk, Helvetica sought to true up the forms popularized by the proponents of the International Typographic Style and champions of Jan Tschichold's *Die Neue Typography*. According to Kerry Purcell, Helvetica represents "the ideals of universality, objectivity and rationality" (Purcell 80). These characteristics are what make Helvetica a true representative of a whole classification of sans serif typefaces.

Figure 3. Helvetica. Sample of Helvetica Regular at 56 points in size.

Like the paper clip and ballpoint pen, Helvetica is seen everywhere, but it began under the lesser known name Neue Haas Grotesk. Designed by Max Miedinger and Eduard Hoffmann for the Haas Type Foundry in 1956, its eventual name came from the Latin word for Switzerland—Helvetia—altered into Helvetica to avoid branding complications with a sewing machine company of the same name. This nod to the origins of the typeface and its connection to the Swiss Style made it a prime choice for corporate brands looking to modernize and present themselves as professional. The typeface works well at small and large scales, so it could be equally useful for internal letterhead and outdoor signage.

The popularity of Helvetica rises and declines, but its clarity and powerful interplay between positive letterforms and the negative spaces holding them in place endures. The structure of Helvetica speaks to uniformity. Each character occupies a space that feels stationary and upright. The pervasiveness of Helvetica is often the cause of its contraction in popularity. Since it became the corporate choice for branding and identity, many smaller companies and designers avoid it to purposefully seem contrarian. However, Helvetica will always survive design trends. The ubiquitous nature of this typeface prevents its demise, and its neutrality prevents it from feeling outdated. It almost exists outside of time.

While Helvetica is a prime example of how a typeface can become commonplace in everyday life, many other typefaces with different applications could also carry the

mantle of ubiquity. Times New Roman, Calibri, and, to some extent, Myriad all classify as mainstream typefaces. It would be quite a feat to find a computer without these typefaces preinstalled and perhaps even set to default in many word processing programs. While Helvetica has many fine characteristics, not every application of typography calls for its use. Novels and other long-form works in print almost entirely feature serif typefaces, which brings up the question of Helvetica's true readability in extended use.

To the general public, typefaces are not a huge part of everyday life. Designers, of course, relish choosing and pairing typefaces to match tonal voices and acquire a perfect page texture, but most people do not have a passion for type. Which characteristics lend themselves to putting a typeface into the realm of ubiquity? The success of a pen or paper clip can be associated with constant, indifferent use. Should the success of a typeface also be measured for how well it blends into the background, celebrated as another transparent tube of plastic or a tiny bend of wire like the Bic pen and paper clip?

III. TYPOGRAPHIC DEFINITIONS

Universal Properties

Before getting into potential answers to the proposed questions, it is important to determine a set of definitions to talk about typography in detail. While not entirely comprehensive, the following definitions are an overview of terms that will make understanding the testing methods and explanations of typographic choice clearer to those less familiar with typographic study. Usually, typefaces are discussed in terms of individual letter characteristics as well as by how a full set of letters form classification patterns. Starting with the properties that are most important to this study, the definitions will move from broad terms to more detailed terms.

Typeface—a typeface is the design of a set of characters (Coles, *The Geometry of Type* 9). The characters are the letters, numbers, punctuation, and every other piece or glyph that goes with that design. Sometimes this is shortened into type or face when referring to typographic features in general.

Font—a font is similar to a typeface, as it is a collection of glyphs (Bringhurst 339, Coles, *The Geometry of Type* 9). However, the font is distinct in that it is the delivery method for the design, rather than the design itself. Think of the font as the specific file on a computer that carries the glyph data, or the collection of metal letters used in printing before computers. The terms font and typeface are often used interchangeably in practice. Font also can be described as a set of characters in one size and style (Cheng 10), but the size aspect of the definition applies primarily when the collection is physical.

Classification—this refers to the category given to a typeface to help designate some ideas about its physical structure. Some broad classifications include serif, sans serif, script, and blackletter. The main system was created in the 19th century and continues to evolve as styles are mixed or modernized (Lupton, *Thinking with Type* 42).

Family—this is a collection of typefaces related by the same design structures. This includes all the weights and styles of typeface, such as uppercase, lowercase, small caps, italics, bolds, etc. (Bringhurst 54). Some families have a few different styles, while others have hundreds. In recent times, most families have at least three styles to be considered functional: regular, italic, bold. Often included is a combination: bold italic. Parts of a type family are often referred to as cuts, which comes from physically cutting punches for metal type casting (Bringhurst 338).

Roman—According to Lupton, the roman is the core font from which a typeface is derived (45). Kane describes this as the basic letterform style (*Thinking with Type* 8). The roman style is upright and sets the ground for how most Latin alphabets are designed. Most of the typography people see is roman in style, which is important when studying ubiquity. Often, a typeface will have a dedicated style called roman, but sometimes roman is implied through a lack of another descriptor. Roman is not a weight.

Italic—this is the slanted style where the type leans to the right. It is based on 15th-century Italian handwriting (Kane 8). Oblique is a similar style to italic, but is a tilted version of a roman style, while italic is usually a redrawn set of letters with distinct forms from the roman style (Lupton, *Thinking with Type* 45).

Stroke (Figure 4)—this refers to any line that defines the basic shape of a letterform (Kane 2). Strokes can be vertical, horizontal, diagonal, straight, or curved. A

specific stroke that is significant to the formation of a letter is called a stem (Figure 4), which is often vertical or thicker (Kane 4).

Slant (Figure 4)—the slant or slope is the angle of inclination of the stem of the letter (Bringhurst 345). The most common example of slant is found in italic styles, but slant can be measured in all typefaces, and results in a 0-degree angle in romans. Slant is usually measured assuming perfectly vertical is 0 degrees and right-leaning angles are positive values. Contrary to this, measurements in this research for slant use a standard mathematical coordinate system, with 0 degrees being the horizontal axis and 90 degrees being the vertical axis. This mathematical system is more commonly used by software and measuring tools.

Figure 4: Stem, Stroke, Slant. Anatomy examples of stem, stroke, and slant.

Weight—the weight of a letter is determined by the ratio of the height of a stroke to its thickness. Often, specific words such as hairline, light, book, regular, medium, semi-bold, bold, heavy, black, and extra black are used to describe specific weights (Cheng 11). Since these are ratios, the weight is independent of the size of the letter (Bringhurst 346). It is also important that there is no consensus on what ratios make a letter a specific weight. Some fonts will have a regular weight ratio of 1:10 while the bold weight will be closer to 2:10. Another common factor of weight is that uppercase letters will usually have a higher weight than lowercase letters in the same font.

Width—this is the horizontal measurement of a letter (Lupton, *Thinking with Type* 36). Sometimes this measurement is referred to as set width. Bringhurst makes a distinction between set width and glyph width by stating that the set width includes the sidebearing of a letter, or the empty space included before and after a letter to separate letters within words (344). The set width is measured in units, an arbitrary value assigned by a designer or computer program (Kane 11). The set width is different for each letter, and modern software typically uses 200 units for the width of the letter M. This width is often referred to as the M-box. Thin, compressed, condensed, extended, wide, and extra wide are the names for width within a type family. Again, there is no real agreement between what width constitutes a specific name designation.

Contrast—Some typefaces have different stroke thicknesses for stems and other parts of the letter (Figure 5). The contrast is the ratio between the various levels of thickness, usually measured by comparing the thickest stroke with the thinnest (Bringhurst 338, Coles, *The Geometry of Type* 9). Sometimes it can be referred to as stroke contrast. This measurement varies within a typeface depending on what type of letter is measured. A letter with straight lines like an H or E may have a different contrast than a curved letter, like C or O. A higher contrast means the difference between thick and thin is greater. Contrast often increases as weight increases.

Figure 5. Contrast. Thick and thin strokes make up a typeface's contrast.

Kerning—the process of adjusting the space between a pair of letters or characters (Bringhurst 341). Some letters like f or j have a built-in kern, which describes the space

where the curved part of a letter overlaps the surrounding space of another letter. Kerning can be tighter (closer) or looser (backed away) (Figure 6). This property also can be adjusted by a designer to achieve consistent visual balance between individual letters.

Figure 6. Kerning. Spaces between individual letters can be adjusted.

Baseline—the baseline is an invisible line on which all the letters sit (Lupton, *Thinking with Type* 35) (Figure 7). Some letters extend below this line, but the baseline serves as the main vertical alignment point for all the letters in a typeface.

x-height—literally describing the height of the lowercase letter x (Figure 7) but can often be a general term for the height of typical lowercase letters (Kane 56). Typefaces with a larger x-height often appear bigger than typefaces with a smaller x-height when set to the same point size. X-height is often of major concern when determining how readable a typeface is when used in body text. Sometimes the x-height is represented as a line called the mean line. The reason for singling out the letter x as a standard measurement is due to x having flat edges on top and bottom rather than curves or sharp points, thus making it easy to determine its extremities—at least in roman designs.

Cap-height—the cap-height is the distance from the baseline to the top of the capital letters (Bringhurst 338) (Figure 7). The measurement is often taken from a letter with a flat top such as an E or an H to avoid any uncertainty with rounded strokes.

Figure 7. Cap-height, x-height, Baseline. Lines marking the cap-height, x-height, and baseline.

Ascender—lowercase letters such as b, d, f, h, k, and l have parts that are taller than other letters (Figure 8). These parts that specifically rise above the x-height are called ascenders (Unger, *Theory of Type Design* 218). Many times, the ascenders extend above the cap-height of a typeface up to a line called the topline (Bringhurst 336).

Descender—the parts of a letter that extend below the baseline (Unger, *Theory of Type Design* 220) (Figure 8). Descenders are found on the lowercase letters g, j, p, q, y, and sometimes on capital J, and Q. While the ascender and descender are related, it is uncommon for their lengths to be equal in a typeface design.

Crossbar—a horizontal stroke in a letter (Coles, *The Geometry of Type* 10) (Figure 8). This element is usually found in the middle of the letter, like in H, B, A, or e.

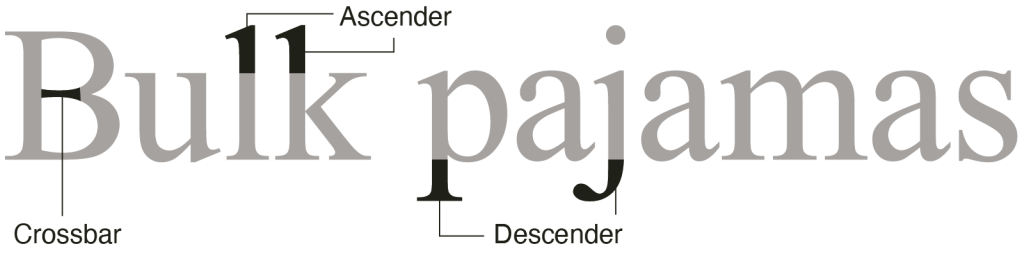

Figure 8. Ascender, Descender, Crossbar. Taller letters have ascenders, letters that hang down have descenders, and letters with horizontal strokes have crossbars.

Terminal—the end of a stroke or extremity in a letterform (Figure 9). There are many styles of terminal including ball, beak, hook, teardrop, triangular, rounded, or square (Unger, *Theory of Type Design* 228, Bringhurst 345). These help with classification as they are often unique to a style of typography.

Serif—a protruding part appearing at the ends of the main vertical, horizontal, and diagonal sections of letters (Unger, *Theory of Type Design* 227) (Figure 9). Serifs come in a variety of styles, aiding in classification, and look different from letter to letter. Serifs can be bracketed or unbracketed, long or short, thick or thin. Brackets refer to the curve or lack of curve connecting the serif to the main part of a letterform (Figure 9).

Figure 9. Terminal, Serif, Bracket. The terminal is the ending to a stroke on a letterform, while the serif is an extension of the terminal. The bracket, while not always present, is the curved portion of a serif.

Counter—the counter is the empty space contained within a letter (Bringhurst 338) (Figure 10). It can be fully enclosed, such as with the letter O or d, or open, as with the letters c and u. Some letters have both variations, such as a and e.

Bowl—the bowl is the curved shape that surrounds or forms the counter of the letter (Lupton, *Thinking with Type* 34) (Figure 10).

Aperture—the opening of a counter to the exterior of a glyph (Coles, *The Geometry of Type* 9) (Figure 10). This term applies only to letters with open counters, such as c, e, and s. This measurement helps with classification.

Axis—this is a special measurement similar to slant within a rounded letterform. It is measured by examining the angle at which the pen or drawing tool was used when creating the letterform (Bringhurst 335). A straight line can be drawn between the thinnest areas of the letter to determine the angle (Figure 10). Sometimes this is referred to as the stress or stroke axis.

Figure 10. Counter, Bowl, Aperture, Axis. The counter, bowl, axis, and aperture are generally terms used to describe anatomy of curved letterforms.

Optical Compensation—this refers to the adjustment of rounded letterforms to protrude slightly above and below the x-height or cap-height of a font (Unger, *Theory of Type Design* 119). The rounded nature of letters like c and o and their uppercase equivalents make them appear smaller when designed to the exact size as straight letters. This compensation gives the curved letters the appearance of equal sizing.

Point—a point is a unit of measurement that equals 1/72 of an inch (Lupton, *Thinking with Type* 36). This is the most common method for measuring typography. It is abbreviated as pt or pts, such as 1pt or 12pts. For computers, a pixel is usually designated as being equal to a point. When describing the size of a typeface, the point size is the measurement of the height of the digital box that surrounds the letter, which is taller than the actual letter.

Pica—a pica is another unit of measurement equal to 12 points or 1/6 of an inch. This unit is often used when measuring page sizes or larger aspects of typography such as the length of a line on a page. It is abbreviated as p, such as 2p.

Display—this designates type that is used at 18 points or above, often referring to headlines (Kane 14). Sometimes designers refer to display type as a more decorative style that relies on a larger size to show off details within the letter design.

Body—type presented at sizes between 6 and 12 points is often referred to as body or text type size (Kane 14). These sizes are preferred for paragraphs and other long-form reading.

Measure—the measure consists of how many characters or words are on a single line of text (Bringhurst 341). The measure affects readability and is not built into the typeface as it depends on the discretion of the designer to decide the length of a line.

Resolution—a term relating to digital typography and how fine the grain is on the typeset image either printed or on screen (Bringhurst 344). Resolution and screen size play an important role in how clearly a font is displayed at a certain size. Higher resolution allows for more detail at a smaller size.

Hinting—this is a term specific to digital typography that exists as instructions within a font file. Hinting tells the computer to adjust the height, stem width, spacing, slant, and other proportional relationships to better fit the fixed pixel grid that makes up a screen (Lupton, *Type on Screen* 14). Hinting becomes a greater factor when type is displayed in a small size on a screen, or when the screen has a low resolution.

Existing Classification System

"Many readers have never heard of serifs...yet changing the typeface in a morning paper can unleash powerful emotions" (Unger, *While You're Reading* 9). Clearly a disconnect exists between how designers describe typography and how the public thinks about typography. While it may appear that few people show concern over the minute details of the shapes of letters, most people seem to intrinsically have opinions about type, but lack the means of expression. Zachrisson suggests that readers rank typography as the primary factor when expressing the most important element of a book followed by

physical properties like size and materials. Though readers may not be able to name all the elements of typography, they seemingly possess the ability to unconsciously understand typographic systems enough to navigate complex printed documents like newspapers (Unger, *While You're Reading* 12).

It would suggest that non-designers do not have the training and industry specific vocabulary to express their thoughts completely in regard to letter details. Vocabulary is often categorized as general, polysemous, or technical (Gillis 184). Most people have a wide general vocabulary, as this consists of everyday speech. Polysemous terms consist of words with multiple meanings determined by context. Technical terms are industry specific but are somewhat easy to understand as they usually have singular definitions (Gillis 183).

The fine arts, and thus relating to typography and communication, have a particular issue with polysemous terms, since many of its disciplines require use of the lesser known definition. For example, when describing a typeface as being bold, a non-designer would likely think of it as courageous rather than as referring to the weight and stroke-width of a letterform. Gillis states that polysemous terms are more easily gleaned when participatory learning takes place (184). Even for people involved directly with type creation, Jonathan Hoefler expresses that "attempts at typographic scholarship have long been impeded by the difficulties of describing typefaces, let alone organizing them" (201).

Students of typography often spend weeks learning individual parts of letters to better describe with a degree of clarity and accuracy their reason for choosing a particular typeface in a project. The anatomy of type has names derived from human anatomy,

writing and drawing tools, household objects, structural components, language and cultural norms (Coles, *The Geometry of Type* 11). Some terms like stroke and arm apply to multiple letters, but some letters, like S, have single-use terms like spine—the curved section in the middle. Without studying these terms in a typographic context, a normal reader would not likely derive many of them on their own.

In a more familial level, whole font families can be classified into numerous categories that often overlap due to the iterative nature of font design. Font families can be serif, sans serif, script/calligraphic, or gothic as a basis. Then on top of that, humanist, Venetian, Garalde, old-style, geometric, transitional, modern, Didone, rational, contemporary, grotesque, and everything in between (Cheng 14–15, Coles, *The Geometry of Type* 12–13). Since there is no universal system for classification and naming categories, basic definitions will be used in this research that speak to classification, noting alternate and overlapping names to aid in clarification.

Serif—this typically describes any typeface that has serifs, as mentioned previously. There are sub classifications based on the style of the serif, most notably slab serif, or Clarendons, where the weight of the serif is equal or nearly equal to the stroke weight. The serifs on a slab style also meet the strokes at right angles without any curve, or bracket. Serif typefaces predate sans serif typefaces.

Sans serif—this style literally translates as having no serifs (Unger, *Theory of Type Design* 226). The terminals of the letterforms are typically the same thickness as the rest of the stroke. Sometimes this term is written as sanserif, sans-serif or sans.

Script—a classification based on writing that shows the influence of pencil, pen, or brush (Unger, *Theory of Type Design* 227). The letters often have a flowing appearance and may be connected like in calligraphy or cursive writing.

Gothic—this classification is for heavy, high-contrast scripts with broken curves (Unger, *Theory of Type Design* 221). This style is popular for the names of newspapers and is also referred to as Blackletter, Textura, or Fraktur. This is one of the oldest styles, dating before 1400 AD (Cheng 14). Confusingly, the United States also uses the term gothic to refer to certain sans serif typefaces designed at the turn of the 20th century.

Humanist—this style is a subset of the main classifications and refers to the early roman designs that show characteristics of handwriting (Unger, *Theory of Type Design* 222). The term humanist can be applied to serif and sans serif typefaces. Sometimes it can refer to an old-face, old-roman, or old-style design as well as Garalde or Venetian. Only subtle distinctions exist between the numerous classifications, making it simpler to lump them together (Cheng 14).

Transitional—transitional typefaces show characteristics of both humanist and modern designs (Unger, *Theory of Type Design* 228). They usually have more contrast than an old-face design, but less than a modern design. The name is applied retroactively as this category marks the transition between humanist and modern.

Modern—this style is a subset of serif typefaces that strictly use vertical and horizontal strokes with high contrast (Unger, *Theory of Type Design* 224). This style may also be described as Didone (a combination of Didot and Bodoni) or new roman. Despite its name, the pioneering typefaces from the modern category were drawn in the 1700s and early 1800s (Cheng 14).

Grotesque—this is another name for sans serif that has grown over time to be a more specific style associated with less geometric qualities. The name originally meant ugly or bizarre (Unger, *Theory of Type Design* 222). This term is often paired with the prefix neo, as in neo-grotesk (the preferred spelling in German and other European languages), to describe the particular era of the sans serif.

Geometric—these typefaces are static and clinical, and showcase letters formed from nearly perfect circles and square proportions (Coles, *The Geometry of Type* 13). They are usually sans serif and vary little in stroke weight or contrast.

Display—this category is a catch-all for whatever is left in the type world. This category is also described as novelty, decorative, or contemporary (Cheng 15). Typefaces in this category often serve a singular purpose and have limited or singular families. As the name suggests, their primary use is with larger sizes of type.

Monospace—a typeface with all characters designed to fit in the same horizontal space (Unger, *Theory of Type Design* 224). This style was created to solve a technological problem with typewriters and is not really its own category as monospace fonts also can be serif or sans serif, geometric, or anything. This style, also referred to as typewriter, is often associated with computer code, or the font styles used in early video games.

While the most common classification types aid in understanding typefaces, many typeface designers mix genres to create unique results and stylizations that no longer fit in any existing categories.

Coles notes that the classification system "makes similar designs easier to compare and introduces vocabulary that will not only make you sound smart at parties,

but will also help you identify, select and combine typefaces (*The Geometry of Type* 12). But is this really the best structure for people without any training? Should the most widely used method of visual communication be designed as a tool to impress those without extensive study?

The origins of the current classification system stem from the work of Maximilian Vox, a French typographic historian (Cheng 14). The main issue with this system is an underutilization of information. Vox's system relies on two properties: visual characteristics and the date of origin. This system no longer works well since the age of digital design creates typographic combinations that do not represent a singular time period. However, Karen Cheng in *Designing Type* argues that "attempts at classification should not be abandoned altogether" (16). She states that a new system should rely on additional factors of function and intent. These additions would help classify hybrids such as semi-serifs that only include serifs on a few of the strokes in the design by giving them a classification based on their intended use.

Type manufacturers play a major role in how typography has been classified, as it is often due to their need to market new products using some form of system (Hoefler 205). Many stick to the basic conventions mentioned above, but there are many styles that fall into miscellaneous categories—which will undoubtedly grow in the digital era to be as large as the rest of the system put together. Some of the more interesting names for alternative categories include Out of the Norm, Exotic, Graphic, Ironic, and Typographic (Hoefler 205).

Because communication has expanded through global connectivity, adding geographic and cultural associations would better serve the communication needs in

specific parts of the world. While the Vox system takes into account the time period, many type styles are specific to countries and continents (Cheng 16). Robert Bringhurst suggests a classification system that is more in tune with cultural and artistic movements. He notes that typography never occurs in isolation and the history of typography shares the same relationships with human activity as politics, art, and ideas (Bringhurst 122). Reflecting this, his proposed categories are Renaissance, Baroque, Neoclassical, Romantic, Realist, Geometric Modernist, Lyrical Modernist, and Postmodernist.

Key differences in American and European styles exist and are often formed out of the letters needed to fulfill the written requirements of languages. Although these attributes may clarify distinctions between styles, they fail to address the level of understanding required by the average type user to take advantage of the extra information that an extended classification system provides. This study will propose a new way to think about typefaces that takes into account the issues non-designers have with the current classification system.

Letters and Readers

Typefaces can be active in occupying the reader's attention, but also passively ignored. Gerard Unger, in his book *While You're Reading*, describes the automatic processes in which people consume massive amounts of letters and words without having a single thought about those individual pieces of type (8). People constantly read road signs, articles on computers, and messages sent between mobile devices, but rarely think about the components that make up the words. People have a basic ingrained understanding of what letters look like but seldomly recollect their exact form.

At this point, it is pertinent to talk about two factors of reading regarding typography—readability and legibility. Walter Tracy, in *Letters of Credit*, makes the case that readability is a broader term for the comfort of reading, while legibility takes into account the details of the individual letterforms (32). Typeface designers deal with both aspects when creating a typeface since they are somewhat tied together, but often focus on the characteristics dealing with legibility more than readability. After all, a letter j that does not somewhat match the accepted form of a standard j does not fit the criteria of legibility. Unfortunately for a typeface designer, the level of readability is somewhat outside the scope of typeface design, as it can be affected by external factors related to how the type is used—or misused. A good example of a typeface that is particularly lax with the rules of legibility is Wim Crouwel's New Alphabet (Figure 11), which oversimplifies the letterforms and strictly adheres to a grid making reading difficult. While a nice experiment, this typeface is not very popular outside of its own novelty.

Figure 11. New Alphabet. Wim Crouwel's 1967 typeface is a bit difficult to read due to poor legibility.

Readability arguably impacts daily reading activities more than the specific legibility of certain letters within a typeface. However, an interesting aspect of readability is that it changes depending on how often a reader views a particular style of text. A reader can learn new styles of letterforms, which increases their readability. From a

standpoint of ubiquity, popular typefaces more frequently seen by readers will have an advantage over newer typefaces that attempt to extend the structures of letterforms outside of the familiar shapes. Should typeface designers attempt to conform to these traditional structures in order to create a popular typeface?

Unger talks about the implicit trust people hold in letterforms because they represent a familiar pattern in the brain that leads to the basic recognition of letters on the page (*While You're Reading* 10). Sofie Beier in *Reading Letters* also talks about how people have a preconceived notion of what a typeface should look like (23). This theory of letter identification is called the template matching theory and has been cited by notable typeface designers such as Adrian Frutiger—creator of many prominent typefaces including Univers and Avenir.

The mental map people create of the ideal letter form for each character of the alphabet can explain why certain typefaces are harder to read than others. When applied to which typefaces become ubiquitous, perhaps those that meet such a threshold are more aligned with the model that best represents the collective experience of letterforms. Nonetheless, this theory does not take into account how people are able to read such a wide variety of typeface styles with little trouble.

Beier also describes another feature of readability—recognizing whole words rather than reading individual letters and matching them to a mental map (29). People do not need to see the detail or have the complete picture of a word to surmise the whole structure. The same way that a word's meaning can be determined from context clues in a sentence, the recognition of a word can be gleaned from the context of the most distinct characters and how they are ordered in regard to the overall word shape. Certain letters

are often cited as more legible than others, such as letters with ascenders and descenders like *b, d, p, q,* and *k* (Beier 70).

A model for reading that considers both individual letters and reading whole words is the Parallel Letter Recognition Model (Beier 29). This model explains that readers will get a sense of the whole word using the most matching parts to expected letter features. This process is still not fully understood but has not been disproven by studies in legibility (Beier 29).

In a similar manner relating to readability, Gerard Unger claims that letters are used unconsciously, since readers must have some unearthed knowledge in order to use them so freely (*While You're Reading* 11). In this regard, almost any collection of letters could be described as ubiquitous, but then why do people choose specific typefaces to represent these letters on a page or screen? To answer this question, the inextricable tie between technology and typography must be examined.

IV. TECHNOLOGY AND TYPOGRAPHY

Origins and Iterations

Great typography and its practitioners are often at the forefront of technology whether it be an early form of repeatable printing or a complex digital system. Typography welcomes new technology since communication plays an essential role in how technology is used. “The printing process was one of the main facilitators in the development of the modern world” (Kinross, *Modern Typography* 13). The process required a standardization of materials and techniques that only pushed the direction of typography into what it has become today. Johannes Gutenberg’s 42-line Bible, printed around 1440 AD, is believed to be the first work printed using movable type—individual letters cast in blocks of lead that can be rearranged to print any word (Meggs and McKelvey 16). The process utilized by Gutenberg sparked the evolution of typography, and the specifications of his machine demanded the legacy of the letterform. Just a few decades later, the first independent fonts became commercially available, allowing printers to make a conscious choice about the appearance of their type without designing letters on their own (Meggs and McKelvey 13). Without Gutenberg’s printing press and movable type, books would all be unique collections of hand lettering and the written word would not have spread as rapidly. Typography tends to be an early adopter of technology and each iteration of technology forces typefaces to rise to the occasion.

The metal letters of Gutenberg and other hand-set systems came in very few sizes and usually with just one weight due to the physical volume and mass of the blocks of type. To compose and prepare a page to be printed, the typographer had to manually arrange every letter in every line, then lock each line of text into the printing bed (Meggs

and McKelvey 11). And the letters were backward in orientation due to the reversed nature of offset printing, meaning typographers had to be especially mindful when setting symmetrical letters like p and q.

The tedious process remained fairly unchanged until 1884, when typesetting became fully automated through Ottmar Mergenthaler's invention of the Linotype machine (Meggs and McKelvey 22). The machine utilized a keyboard interface allowing the typesetter to compose a complete line of metal cast type by punching buttons. In 1887, Tolbert Lanston invented a slightly different and more expensive automatic typesetting tool called the Monotype machine (Meggs and McKelvey 22). This machine functioned by casting individual letters rather than whole lines. The Monotype machine allowed for individual letter swaps or corrections. While the Monotype machine produced a higher-quality typesetting, the Linotype machine was more economical, which led to a significant rivalry between the two companies for more than a century. Since the medium for both machines was cast metal, the typefaces designed for them were bound to the same rules, as it was for Gutenberg. The biggest advantage of these machines was the ease and speed at which publications like books, newspapers, and magazines could be composed and produced.

Another technological breakthrough came in the form of photo-based typesetting. In 1955, Monotype introduced the Filmsetter, its first commercial machine to use the new technology (Osterer 87). A photosetting machine exposes a drum of film through a matrix or transparent template of letters one at a time. The machine operator could carefully space letters by looking through a viewer and press a lever to flash a quick burst of light to expose the letter onto the photo paper (Meggs and McKelvey 26).

Machines like the Monotype Filmsetter could zoom or focus on the letters independently to compose at any standard type size or any size in between (Osterer 87). Since letters were exposed using light, the physical constraints of placing the type close together were gone. Without the restrictions of metal blocks, letters could even overlap to create new effects for titles and display type. Photo lettering also negated the need to have multiple cuts at different sizes like metal type. It was a clear leap forward in visual performance, but it had a disadvantage when making corrections. Rather than swapping out a single letter or scrapping a row of metal letters, the entire film exposure had to be scrapped or corrected with a knife and tape.

Phototype ushered an expansion of characters, such as bold versions of old faces, italic variations, condensed and expanded weights. Companies like Monotype converted all their metal castings into the new format, and with better machines like the 1969 Model 600, an expanded matrix case allowed for more characters to be added to a typeface (Osterer 87). This led to updated typefaces making better use of the technology. Variations in letters for optimal sizing could be built into the same matrix allowing type to be easily set at different point sizes with optimal readability. Typefaces like Herb Lubalin's Avant Garde and Adrian Frutiger's Univers "dominated the phototype era" (Meggs and McKelvey 27) due to their expanded styles and ligatures that were designed with the abilities of the machines in mind.

But computers led to the biggest explosion of character sets—a new typeface for every occasion. Computers made typography commonplace, and designers could create typefaces with ease. Matthew Carter, who has been witness to every style of typographic technology (Frutiger, too), says of computers and typography, "It was not so much the

coming of the personal computer that changed my life, but the coming of the laser printer. It's an amazing luxury" (Newsham). The earliest examples of digital type were in the form of bitmap images consisting of on or off pixels—when viewed on the screen itself—and as Adobe PostScript or Apple's TrueType files for translating the outlines of the type to laser printers (Meggs and McKelvey 28). Much of the advances in digital typography are due to the 1982 release of Apple's Macintosh computer, which deliberately featured a screen resolution of 72 pixels-per-inch to exactly coincide with the number of points in an inch—a well-established typographic measurement.

Digital typefaces are, unfortunately, bound to the properties of the screen and their methods of reproduction. Even as the technology of screens advances, type displayed on a screen will always be an approximation of its physical counterparts. Since font files are stored as mathematically defined outlines, their preservation is perfect, but screens must translate those outlines into pixels lit up on a display (Figure 12). Curves are the most difficult aspect for screens to reproduce as they must be rendered as groups of shaded squares rather than a smooth edge.

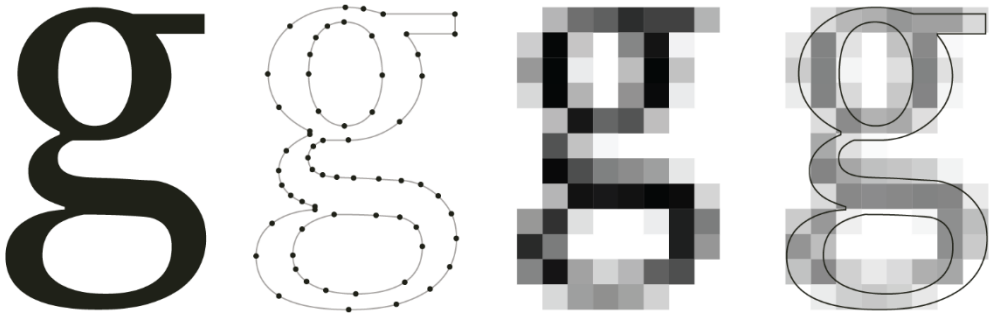

Figure 12. Digital Typeface Rendering. A Georgia lowercase g stored as mathematical outlines and rendered using pixels at 16 points in size and enlarged 10 times. The two are overlaid for comparison.

The resolution of the display as well as the hinting instructions embedded in the typeface determine how accurately the typeface is visually reproduced. Hinting is a

tedious process. It requires hours of specialized labor to test how typefaces behave when displayed at less than optimum sizes. Peter Bil'ak claims that 99% of fonts lack hinting (Lupton, *Type on Screen* 14). Matthew Carter's Georgia and Verdana are two typefaces that are properly hinted. The fact that so many typefaces are not hinted derives from a mindset that the resolution of screens will eventually surpass the ability of human vision to perceive the differences in letterforms at small sizes, negating the need to include hinting. Initially, Carter shared this same desire to avoid designing a typeface for a specific medium saying, "a typeface designed for a particular technology is a self-obsoleting typeface" (Carter). His screen-minded typefaces served their purpose for many years before display technology made them less of a requirement, and as their popularity continues, they have outperformed their own specifications.

Font file formats like TrueType and PostScript could store a huge number of characters in a single font file allowing for multiple language support and plenty of alternative style letters. These font formats were standardized and used across all computing platforms, making the format ubiquitous in nature. However, a bigger change to the expandability of digital type came with the adoption of the OpenType font (OTF) format—a joint development effort in 1997 between Adobe and Microsoft to extend Apple's TrueType format ("OpenType® overview"). This new format could store over 64,000 unique characters and became the de facto file format for fonts. All the advances in technology involving the personal computer made creating typography accessible and therefore ubiquitous, but is this pervasiveness a strength or a weakness?

Digital Proliferation

With the aid of computers, more people are designing typefaces. Since type creators no longer require elaborate training, many have stopped adhering to the traditions of typography rooted in clarity, proportion, and rationality. In that regard, weakness exists in new typefaces. Many are often incomplete and created without regard to multiple uses. Still, a strength arises for the typefaces not born from the molten type of the past. Digital type is boundless. It can stretch and warp and be infinite in size, which allows typography to grow in new directions, but is it at the expense of what old type technology teaches?

Philip B. Meggs claims in his 1989 essay *The Obscene Typography Machine*, "one reason a typeface is considered a masterpiece is because the designer achieved optical harmony in adjusting the size and proportion of the parts not mathematically but aesthetically and perpetually" (161). To understate the time and dedication required to create a full and complete typeface would be a detriment to the work of a type designer. In the digital era, does the typeface require as much effort and time in order to be considered a great work?

Meggs cites Frederic Goudy's Goudy Old Style, Adrian Frutiger's Univers, and John Baskerville's eponymous Baskerville as great works involving heart and soul—produced through countless hours by a virtuoso designer (161). Each typeface stands as a typographic achievement due to the masterful relationship between horizontal, vertical, and curved stroke in each letterform. But using these typefaces in the digital medium allows for direct manipulation over the letterforms. This makes it easy to break down the

relationships lovingly crafted by the designer by stretching and warping the typeface on the screen.

Meggs also warns that digital technology makes it too easy to create “graphical clichés” at the mere touch of a button causing the neglect of thoughtful communication in relation to the designed typeface (161). Students, amateurs, and designers infatuated with the new technology of computers let loose their sense of typographic function and break the proportional relationships built into masterful typefaces simply because the modern tools make it so easy.

When it comes to designing a typeface, does the digital era have advantages over a more mechanical past? With just a few rectangles and some curves, a designer could rough out a whole alphabet in under a day. Computer drafting techniques allow for modular type design with procedurally generated letterforms that can derive multiple cuts from a single source letter. If the outcome of the letter is indeed the same, does the method to get there make a difference? How much heart and soul should a designer put forth since programmatic design can lessen the burden of creating a typeface?

The next idea to consider is how many cuts would be needed for a modern typeface. If the software can generate bold and semi-bold weights and extended and condensed widths based on a roman design, where should the designer stop? Most users of digital type choose between the roman, italic, or bold, and sometimes bold italic combined. This audience would unlikely realize a typeface came in more varieties. If a modern typeface is intended to be successful, will the extended families aid in the pervasiveness of the typeface?

John Baskerville created his typeface in the 1750s with a single weight and a matching italic, but Monotype's updated version from 1995 boasts six cuts, adding a bold, semi-bold, and their respective italic variations (Meggs and McKelvey 41–45). The extra options speak to the usefulness of the typeface when setting the content of a book, but does the extended variation of styles make the typeface less accessible to the everyday word processor? There are times when a larger degree of hierarchy is needed on a page that make the semi-bold italic quite useful, but for the average user, the extra features go unnoticed. Surely Baskerville does not require the newer cuts to remain a staple in typography.

Univers makes a case for the other side of the argument. When released in 1957, Univers had over twenty cuts as part of the same type family (Osterer 89). It too was a product of a new technology aimed to replace costly metal type. Frutiger designed the family with phototypesetting in mind, where the cuts would be stored on a glass matrix at a single size. Univers, with its large family, was easier to distribute in the new format, which would only lend to its widespread use.

Adopting new technology goes hand in hand with new typography. As mentioned, the printing press led to metal type, the photograph led to photo lettering, and the computer led to digital type displayed on screens. In a talk about type and technology, Matthew Carter expresses, "The technology has changed a number of times since I started work: photo, digital, desktop, screen, web. I've had to survive those changes and try to understand their implications" (Carter). Designing typefaces for each new technology opens the old medium to new possibilities and gives the designer more freedom and flexibility. Limitations are lifted, and perhaps they are completely removed

in the digital era outside of display technology. Adrian Frutiger, with his experience in basically every medium of type in existence, said, “with font creation programmes and their resolution-independent Bézier curves, and with laser setting, it looks to me like our journey through the desert is finally over” (Osterer 7).

The Modern Web

From its early stages to the web’s proliferation into the default way people access information, Microsoft held a near monopoly on which browser people used to access the internet. Internet Explorer held up to a 95% share in the early to mid-2000s (“Firefox’s Share”). Anyone visiting a website was likely to be on a Windows-based computer using Windows system fonts. Those core fonts sprang from an initiative developed by Microsoft in 1996 (Hachman). The typefaces included many staples like Arial, Courier New, Georgia, Impact, Trebuchet MS, Times New Roman, and Comic Sans MS.

Microsoft commissioned Mathew Carter to design Verdana and Georgia in order to have typefaces that displayed clearly on computer monitors. Carter designed these typefaces with large x-heights and open apertures to combat the limitations in pixel density of monitors built in the 1990s. He started by creating the typefaces in a bitmap format then converted them into an outline form—reversing the method used previously by digital type designers.

While many of these typefaces are classic *in their own way*, have some of these typefaces been elevated because of their required use during the early days of web typography? Initially, almost every site used a font from Microsoft’s list because browsers could not support the loading of custom fonts. To display custom typefaces, designers relied on static images inserted into a site’s design manually instead of using

editable or selectable text. But this habit prevents websites from having searchable text in some of the most important areas, like headline tags, buttons, and navigation elements, making the web less accessible. Even worse, the text in images cannot be translated or copy/pasted, giving many people even more difficulty in using a website. Eventually, web designers made these practices unwelcome, but something needed to be done about the limited typeface options.

The world of web typography used to be a desolate place. Most of the typefaces used on the web were system fonts included with a computer's operating system. These typefaces were considered "safe" because of their ubiquitous nature and large install base. The popularity of Microsoft Office products and the bundled typefaces increased the number of safe choices.

Good practices in web design called for the use of these safe typefaces, which increased their popularity. To further combat the unlikelihood that a typeface was not available, the CSS practice of font stacks allowed for a string of backup typefaces down to a generic system font to be substituted in place of a missing typeface. Websites would declare the use of these font stacks through the font-family property (Figure 13). Common font stacks included typefaces with similar characteristics and usually of the same classification.

```
font-family: Helvetica, Arial, sans-serif;
font-family: Georgia, Times, "Times New Roman", serif;
font-family: Verdana, Tahoma, Trebuchet, sans-serif;
```

Figure 13. Safe Font Stacks. Three examples of common and safe type stacks written in CSS.

Font stacks can be quite elaborate, but they still serve a useful purpose in modern web design practices (Craig). However, no matter which stack is chosen, the system and

installed typefaces did not allow for much freedom of expression through specialized typeface usage and did not allow brands to achieve a consistent visual identity between print and web. The technology required for custom typefaces on a website had poor support and increased loading times, which meant many users would not see the custom typeface or be frustrated by the user experience, keeping brands locked to the safe font choices.

Brands with a web presence were forced to pick typefaces that were close enough to their own styles or rely on low-resolution images of type to convey a proper feel. Web designers would often circumvent missing typefaces by saving headlines or other stylized text as images, using that image in place of live website text.

Web typography took a big leap forward with the second version of CSS in 1998 (Truong). A feature called @font-face would allow web designers to upload and call typefaces from their own servers, but the specs for the feature made it easy to pirate a typeface and only Microsoft's Internet Explorer browser supported it—*sort of*. Therefore, it took a decade to become a viable option, when Apple's Safari and Mozilla's Firefox implemented @font-face in their browsers in 2008 with updated specs to prevent piracy and licensing issues. The only big issue left was compatibility, and each browser played by different rules.

The earliest uses of @font-face required as many as five font files to be uploaded for each typeface in order to cover the wide variety of browsers and operating systems. Early mobile devices wanted scalable vector graphics (SVG) versions, Internet Explorer wanted Embedded OpenType (EOT) files, and others wanted TrueType Font (TTF), Web Open Font Format (WOFF), or the newer WOFF2. Over time, WOFF became the

standard that is widely supported. The second version (WOFF2) has better compression for faster font delivery from the server to the browser.

Even with the new technology, safe typefaces remained prevalent in the early years of @font-face. Due to @font-face's lack of consistent browser support, the multitude of font files required, and FOUT, or a Flash of Unstyled Text, it wasn't always the best option. FOUT is by design, as some browsers display the text of a website as it loads, before the CSS file calling the @font-face rule has a chance to load in the preferred typeface (AmyatWired). This leads the user to see a generic or backup font from the font stack before the page flashes and loads the designer's choice. Other browsers wait to render the text until all @font-face requests are complete. This differentiation between browsers made it nontrivial to optimize a website's typography.

Newer browsers like Google's Chrome pushed the adoption of newer web standards and helped remove the stranglehold Internet Explorer held on the web design industry. Subsequently, *Google Fonts* launched in 2010. For many web designers, it became the de facto tool for adding a typeface to a website (Truong). Designers simply select the typeface and any additional family members, copy a single line of code into the html, and begin assigning that typeface to elements in the cascading style sheets (CSS) file. Google hosts the font files, keeps them updated, and serves the correct version supported by the browser, making web typography much easier to implement.

Google Fonts is not the only platform that serves hosted typefaces to other websites. Sites like *Adobe Fonts*, Hoefler&Co's *Cloud.typography*, Monotype's *FontShop*, and Web Type's *Type Network* also leverage their existing libraries into deliverable assets to improve the typographic environment on the web. These services

opened the web to a more extensive type palette, but much of the web's landscape existed in a small patch of the larger type world. While the technology to deliver typefaces is not new, its prominent use in web design is fairly recent.

The main reason web type delivery systems exist is due to Jeffrey Veen's Typekit, which came out in 2009 and simplified the process of getting typefaces to display properly on the web (Creative Bloq Staff). His work helped combat some early problems with the @font-face system and led the way to better optimization of typefaces. Now several web type companies offer services that let the designer inject a specific CSS file that contains exactly the needed @font-face rules to reduce page load and deliver typefaces optimized to the browser and operating system. Web designers still declare typefaces loaded through @font-face in their traditional font stacks, so nothing has changed in the CSS files (Figure 14).

```
@font-face {
  font-family: "Cool-Font";
  src: url("/fonts/cool-font.woff2") format("woff2");
}

font-family: "Cool-Font", Helvetica, sans-serif;
```

Figure 14. @font-face Usage. CSS declaration and use of a typeface following the @font-face rules.

As a bonus, the font files are cached in the browser, so users rarely need to redownload the font file if they downloaded it on a previous website visit (Craig). This property of caching a typeface pushes the web closer to a universal system. Web designers want all the benefits of speed and simplicity for their web projects and the best way to achieve that is by using a typeface delivery system.

While each system does pretty much the same thing, the real differences between the companies come from the selection of typefaces offered and the cost. *FontShop* offers

flat-rate pricing between $60 and $200 for a single typeface, depending on the anticipated number of page views for a site. *Cloud.typography* will deliver a typeface for $99 to $299 per year depending on the page views (Hoefler&Co). *Adobe Fonts* allows free use of its web-font library for Adobe Creative Cloud subscribers, and *Google Fonts* are free.

When it comes to ubiquity, *Google Fonts* easily wins in the availability department. The Google Font API (Application Programming Interface) has existed since 2010 and has served typefaces from its library over 28 trillion times, with the most popular typeface being Roboto—a creation by Google ("Analytics"). Next in line is Open Sans, a type family created by Steve Matteson in 2010. Google accepts submissions to its growing typeface library, but only under the conditions of open source and free distribution.

With platforms like *Google Fonts* changing the landscape of web typography, the selection of typefaces has vastly expanded beyond the old web-safe font stacks used until the late 2000s. However, those few typefaces made a lasting impression on the routines of web designers and daily computer users (Truong). Users will still find many web-safe choices appearing in font selection menus when composing emails or editing text documents.

Variable Typefaces

Variable typefaces can be a solution to modifying a typeface that is a little too bold, or a touch too wide, or its italic too slanted. With variable typefaces, adjusting the weight, set width, or slant is possible, depending on support in the design software. Variable typefaces might be the next big technology for typography, especially when it comes to setting type on screens and typeface distribution (Strizver).

A precursor to the variable type format was the multiple master font developed by Adobe in 1991 as an extension of PostScript font files (Riggs). The multiple master fonts contained a series of generated *instances* of a font within the same font file. The variations affected type proportions of width, weight, and optical size (Riggs). By using mathematical interpolation, the fonts could be manipulated to fine-tune the look and feel of the typeface. The interpolation of a typeface is not unique to modern computers. As early as the 1960s, the International Typographic Corporation (ITC) would use computers to generate many weights and styles for a newly released typeface. To sell a typeface through ITC, a designer would submit the lightest and heaviest weights of their alphabet and let a computer fill in the gaps to create the book, medium, demi-bold, and bold cuts (Jacobs 26). Adobe's multiple masters made this technology more accessible to designers and aimed to standardize the process.

Using masters can help to quickly generate approximations of cuts that can be individually addressed and perfected and sold as separate family members. Carol Twombly and Robert Slimbach were among the first typeface designers to create fonts that took advantage of the multiple master format (Riggs). While the font format was short-lived, as software did not adopt the technology and people did not really understand the potential of mutable fonts, the ability to control aspects of a font eventually made its way into an update for the OpenType format, giving new life to the concept in the form of variable typefaces. Variable typefaces offer the same process of manipulation, but the mutability continues into the output and can be applied by end users and other designers for production work, rather than simply for type creation and iteration.

Similar to multiple master fonts, the concept of a variable typefaces revolves around masters and axes. A master can be thought of as a fixed weight of a traditional typeface. When a type designer creates the letterforms with specific proportions, sizes, and weights, those letters make up a master. When two or more masters are paired, the benefits of variable type become exposed. Variable typefaces do not have a few family members, like light, roman, black, and bold, but have an almost infinite number of in between cuts that would make Frutiger's Univers feel minimal.

By simply creating a master as a light weight and a master as a black weight, the typeface can flex and alter to fill all the sizes in between. If the interpolation, or computer-generated in-between weights, fails to meet a desired outcome in the middle, a roman weight could be added as a third master to give the interpolation more accuracy. These extra weights can aid the accuracy of interpolation, but each added variation must be created by the designer, either from scratch, or by updating an interpolation. These typefaces can be given stops that conform to common weight and style names, but their power lies in the infinite spaces between the conventions. Lizy Gershenzon of Scribble Tone talks about how the work she does with Travis Kochel treats the variables as "exploring how it actually changes the design rather than specifics or details in the same design."

Typeface designers choose which elements become subject to virtual manipulation. These are the axes. OpenType specifications have a few built-in axes for width, weight, slant, italics, grade, and optical size (Jacobs). A designer can create an original axis and name it to fit the change. A common custom axis revolves around adding optional cosmetic changes for decorative purposes, like rotating or exaggerating

parts of letters. Manipulation of a custom axis could be used more structurally and dedicated to converting a sans serif to a serif and back.

Some of the variable type properties are a bit superfluous or exploratory and few serious type designers would allow an italic cut to be generated from a vertical cut—an oblique cut would work well though. One reason for italics not being a suitable axis is that many characters in an italic cut have a completely different structure, which is not easy to transfer into programmatic manipulation. A double-story "a" in a regular cut often becomes a single-story "*a"* in an italic family member (Figure 15). Morphing between the two styles of that particular letter would make for illegible in-between stages not in line with goals of adjustability. However, swapping characters within a variable font is already possible (Gershenzon and Kochel). With any new technology, the potential misuse of parameters could lead to strange manipulations by an uninformed type setter (Kurtuldu). To prevent exploitation, type designers must build in proper axis parameters.

Figure 15. Types of Lowercase a. A double-story a compared to a single-story a in Times New Roman.

Another big benefit of variable typefaces comes in the form of file size and organization. Having a single file containing a full family of weights and alternate cuts reduces the issues of installing multiple weights and searching through vast lists of typefaces. This new format helps alleviate interface bloat stemming from odd naming conventions—like how Frutiger's Univers has a separate entry for each member based on a numbering system, rather than being properly grouped as a family.

A reduction in file size also comes naturally without the need for multiple glyphs for the same letter, so a single variable type file takes up less space than multiple members in a traditional format. In fact, an experiment by Monotype showed that an 88% reduction in file size occurred when merging 48 fonts into a single variable font (Kurtuldu). This is especially useful when loading a typeface for use on the web, where having multiple typefaces can really slow the performance of a site.

An important consideration lies in how these typefaces are manipulable on the web through CSS. Browser support sits fairly strong at just above 80% with most unsupported browsers being on older mobile phones ("Can I use..."). Google, Microsoft, and other big tech companies have shown great interest in pushing the variable type format to give it universal support. The feature is an extension of the @font-face property, so altering the parameter of an axis is similar to selecting a font-weight or font-style. Also, since the setting is defined in CSS, the property can be manipulated through other CSS properties such as transitions and animations, which opens up variable typefaces for smooth or timed manipulation using the axis properties.

Variable typefaces exist outside of the realm of web typography since they also work in print situations. Creative Cloud versions of Adobe Illustrator, InDesign, and Photoshop support using variable typefaces. To use these typefaces, open the character panel, click the small flyout menu next to the cut of the typeface to reveal a series of sliders representing each defined axis. The ranges for the scale are fixed by the type designer but can be adjusted to any whole number in between.

Variable typefaces grant new freedoms to users when setting type. By microscopically adjusting the stroke thickness, the character width, or any other

predetermined axis defined for the typeface, the user can truly customize a typeface for the specific needs of a project. The applications for this customization could even be stored as user preferences, granting an individualized experience for each user. Digital roadway signs could be manipulated to compensate on the time of day, the distance to the viewer, or even based on the vision of the viewer.

Giving typefaces the ability to change removes the need for dozens of family members and makes the distribution of a typeface easier. If this format gains universal reach, many classic typefaces will likely be redesigned to take advantage of the new attributes. It also will likely spur the creation of countless amateurish, awkward, novelty typefaces aimed to test the potential of the technology.

Why So Many?

With all the existing typefaces available today for quick download, is there a limit to the number needed for written communication? Typographers and designers often fall into one of three main outlooks on how many typefaces are necessary: Just a few, at least one more, and as many as there are people in the world.

Regarding how someone builds a personal type library, Robert Bringhurst has a tenant of moving slowly and only building the library as needed. “Some of the best typographers who ever lived had no more than one roman font at a time, one blackletter, and one Greek” (Bringhurst 117). He further suggests working with the few typefaces within a family and truly mastering a typeface, learning its virtues and limitations before jumping to another. It is a modest approach shared by some of the most prominent communication designers.

Massimo Vignelli celebrated his notions of typographic restraint in his book *Canon*, by declaring his use of only six typefaces: Garamond, Bodoni, Century Expanded, Futura, Times New Roman, and Helvetica (57). He later expanded his list to include Optima, Univers, Caslon, and Baskerville. His claim for such a small library is rationalized when he says, "I still believe that most typefaces are designed for commercial reasons, just to make money or for identity purposes. In reality the number of good typefaces is rather limited and most of the new ones are elaborations on pre-existing faces" (Vignelli 54). To Vignelli, the computer age of font creation informed a new level of visual pollution that threatens the design culture.

Proponents of an expansive world of typography make the case not out of necessity, but out of variety. Veronika Burian of TypeTogether claims that "Type design is a carrier of our culture and is subject to developments and trends, even more so in this world of constant movement and change." She claims that all typography is ubiquitous, and it fulfills many roles, but the pursuit of the validation of the communication design profession requires the use of new typefaces. New typefaces are a form of freedom that aims to abolish the "visual uniformity" (Burian). Typefaces, even those that do not last outside their initial period of fashion, contribute to the evolution of the visual culture. New technologies require the advent of new typefaces that "perform well on all the different rendering devices without difficulty or adjustment" (Burian). Only new typefaces can adequately meet the challenges of the future. Burian goes on to say, "the five-typeface-credo is a mindset of designers from the 1950s and '60s that was rooted in technical limitations as much as ideological ones."

In relation to the school of thought behind having as many typefaces as possible, as well as the expanding uses of technology, the prominent design company IDEO used artificial intelligence—more specifically, machine learning—to organize the world of typography. Its system tested whether or not "a machine learning algorithm could sort fonts by visual characteristics" (Ho). This system was designed to follow traditional type categorization styles and see where over 750 fonts would align in relation to another. The results became IDEO's Font Map, which is searchable and aims to make finding alternative fonts easier for designers. In response to the Font Map, many designers saw the spaces where fonts were not present as a rationalization for new typeface designs.

V. MOST UBIQUITOUS TYPEFACES

A Brief History and Explanation

Besides Helvetica, as mentioned previously, eleven other typefaces that hold various degrees of ubiquity in relation to their most common application are used in this research. Some are popular in print and have existed for hundreds of years, while others are born for the screen and have been around less than a decade. Each is prominent and easy to find in use in everyday life—constantly seen, but rarely recognized by those outside the design industry. Their histories are arranged in chronological order, as the context of their invention necessitates their era. These brief accounts offer small insight into why they are ubiquitous in nature. Other works go into greater detail regarding analysis of their designs and practicality for specific application.

Garamond (Figure 16)—designed during the earlier part of the 1500s by Claude Garamond, this typeface is French in origin (Meggs and McKelvey 112). The serif font is one of the most popular humanist styles with a formal personality (Coles, *The Geometry of Type* 39). Interestingly, many modern versions of Garamond, including the version most used on computers, are based on a similar typeface designed later by Jean Jannon. Beatrice Warde, a famous typographic essayist and historian, discovered the mixed attribution, but the Garamond name stuck nonetheless (Meggs and McKelvey 113). The italic version of Garamond was designed by Robert Granjon, a frequent collaborator with Claude Garamond.

Garamond

Figure 16. Garamond. Sample of Garamond Regular at 56 points in size.

The roman version of Garamond quickly became the most widely used typeface in Europe and continued to be into the 1800s (Macmillan 89). Modern revisions include Adobe Garamond, designed by Robert Slimbach in 1989 (Consuegra 233). Garamond remains a principal of the printing and publishing industry.

Bodoni (Figure 17)—designed and cut by Italian printer Giambattista Bodoni in 1798, this typeface represents a stylistic change in Europe (Macmillan 52). Similar to French designs by Fermin Didot, Bodoni uses dynamically thick and thin strokes and a vertical stress in rounded letterforms. Bodoni is the product of advances in printing and inking technologies allowing for the more exaggerated letterforms with finer details (Meggs and McKelvey 55). Type historian Allan Haley says Bodoni did "not create type or typography to be appreciated by the masses…[but] meant to be looked upon and appreciated as works of art, rather than mere pieces of communication" (Meggs and McKelvey 56). Despite this, Bodoni was the best-known printer of his day in Europe (Macmillan 52).

Figure 17. Bodoni. Sample of Bodoni MT Regular at 56 points in size.

Bodoni's typeface was not immensely popular outside of Italy until it was revived by the Nebiolo Type Foundry in Bodoni's birthplace of Turin in 1901 (Meggs and McKelvey 57). Many subsequent revisions of Bodoni are based on this version, while the ITC variants are thought to be most accurate to the original design. Bodoni often graces the pages of fashion magazines and frequently powers luxury branding, which fits his

personal maxim, “I wish only magnificence and I do not work for the vulgar” (Meggs and McKelvey 54).

Futura (Figure 18)—drafted by German designer Paul Renner and released in 1927, this sans serif typeface has endured as the geometric standard typeface from its early origins in the European modernist movement (Meggs and McKelvey 113). The typeface was instantly popular with designers and artists within the De Stijl, Bauhaus, and Russian Constructivism movements. Futura embodies the modern age with an idea of form and function married into one concept. While the typeface may appear to be made from purely geometric forms, slight optical corrections exist to make it more functional. The original version was designed for use by the Bauer Type Foundry, which suggested the alterations from Renner’s original drawings (Meggs and McKelvey 113).

Figure 18. Futura. Sample of Futura Medium at 56 points in size.

Renner’s ideas on typography influenced the work of his contemporary Jan Tschichold, who later published a more influential book called *Die Neue Typographie* (The New Typography). In it, Tschichold proclaims that “none of the typefaces to whose basic form some kind of ornamentation has been added meet our requirements for clarity and purity. Among all the types that are available, the so-called ‘Grotesque’ or ‘block-letter’ is the only one in spiritual accordance with our time” (73). He continues to criticize more humanist styles of sans serif typefaces, but notes “Paul Renner’s Futura makes a significant step in the right direction” (Tschichold 74).

Gill Sans (Figure 19)—created between 1927 and 1930, Eric Gill designed one of the most enduring sans serif typefaces of Great Britain (Macmillan 90). Widely adopted in Britain, Gill Sans was used by the Ministry of Information, the Church of England, the British Broadcasting Corporation, and most extensively by the British Railways (Garfield 43–44). Humanist in nature, the typeface avoids the mechanical rigidity of geometric typefaces while maintaining a connection to 15th-century handwritten scripts (Meggs and McKelvey 147). While Gill Sans is quite similar to Edward Johnston's namesake sans serif and shares an origin for use in signage, Gill's typeface is more refined, distinctive, and overall more simplified—ensuring a lasting appeal (Meggs and McKelvey 148). Gill thought a sans serif was the obvious choice for a sign marking the entrance to "a forward-minded bookseller" and would eventually lead to the commission of Gill Sans offered by Stanley Morrison (Garfield 42).

Figure 19. Gill Sans. Sample of Gill Sans Regular at 56 points in size.

Further ensuring its appeal outside of British culture, Gill Sans is a standard inclusion within Apple's desktop operating system (Coles, *The Geometry of Type* 159). Gill designed many other typefaces throughout his career, but never really thought of himself as a typeface designer, but rather a stone carver—a rare modesty in the world of graphic design (Garfield 43). Garfield also explains the epitaph on Gill's gravestone, "which implores the visitor to 'Pray For Me' (43). People in the typographic community are fully aware of what Eric Gill did.

Times New Roman (Figure 20)—released in 1932 for use in the *London Times* newspaper under the direction of Stanley Morrison and drawn by Victor Lardent, this transitional serif became the most important typeface in the history of newspapers (Consuegra 28). Morrison, before the design of Times New Roman, directly criticized the newspaper's typography—a font called Times Old Roman, and the management of the paper asked him to improve it (Macmillan 137). Morrison wrote, "It cannot be denied that the approval of such readers will be found if it be shown that the new typography is worthy of *The Times*—masculine, English, direct, simple, not more novel than it behoveth to be novel, or more novel than logic is novel in newspaper typography, and absolutely free from faddishness and frivolity" (Meggs and McKelvey 165).

Figure 20. Times New Roman. Sample of Times New Roman Regular at 56 points in size.

A main driver of its widespread appeal not only comes from the upright and moderately contrasting letterforms, but also from its availability on both Monotype and Linotype machines (Consuegra 28). Times New Roman did not gain popularity in the United States until 1941, when a magazine called *Woman's Home Companion* adopted it for editorial spreads—leading to more onboarding by other magazine publications (Meggs and McKelvey 167). In more recent usage, Times New Roman's popularity continues to rise due to its inclusion as a core font on computer operating systems since the 1980s (Macmillan 137).

Arial (Figure 21)—designed in 1982 by Robin Nicholas and Patricia Saunders as a typeface useful for printing on low-resolution laser printers paired with computers from

the same time period (Macmillan 140). Nicholas joined Monotype's United Kingdom branch and eventually became its head of typography, perhaps in relation to the popularity of his work. The sans serif is often regarded as a clone of Helvetica and was designed to be Monotype's competitive alternative to Linotype's Helvetica (Garfield 221). In terms of global usage, Arial is more successful than Helvetica proving availability rather than originality sometimes helps a typeface gain prominence (Garfield 221). Its appearance, while similar to Helvetica, contains a few differences that make it more appealing for general use. The typeface has angled terminals and more humanist curves, yet Arial takes up the same amount of space and is virtually interchangeable with Helvetica. In a description, Microsoft says, "Arial contains more humanist characteristics than many of its predecessors and as such is more in tune with the mood of the last decades of the twentieth century" ("Arial Font Family").

Figure 21. Arial. Sample of Arial Regular at 56 points in size.

The popularity of Arial greatly comes from the preference of Microsoft, which included the typeface as a core operating system font (Macmillan 140). When Microsoft picked Arial over Helvetica, it was mostly because the typeface was cheaper to license (Garfield 222). Arial is touted as having near universal application and "can be used with equal success for text setting in reports, presentations, magazines, etc., and for display use in newspapers, advertising and promotions" ("Arial Font Family").

Georgia & Verdana (Figure 22)—Matthew Carter received a commission from Microsoft to design optimally legible typefaces for use on screens (Consuegra 104). The

results included Georgia, a Scotch-Roman typeface released in 1996 (“Georgia Font Family”) and its sans serif companion Verdana, also released in 1996 (Garfield 260). Verdana is a humanist style design with characteristics designed to fit the pixels on the screen rather than adhere to the pen or brush strokes of handwriting (“Verdana Font Family”). The generous spacing of the characters with open counters makes the typefaces quite legible on screens where resolution is lacking. An interesting feature of Georgia is that it has a true alternate form for its italic style rather than a tilted version of the regular style (“Georgia Font Family”).

Figure 22. Georgia & Verdana. Samples of Georgia Regular and Verdana Regular at 56 points in size.

Popularity of these typefaces rose not only for Carter’s design incorporating screen optimization, but due to limited font availability in the early ages of web browsers. In an interview, Carter mentions that “the mid-1990s were all about binary bitmaps: every pixel was on or off, black or white. So Microsoft put a lot of care into optimizing these typefaces for the screen” (Middendorp). Lupton states that “Before 2008, the classic web fonts Georgia and Verdana had set a narrow horizon of choice, but they were flexible, consistent, and screen-ready, meticulously designed to function on screen” (*Type on Screen* 13). Carter also mentions that this relative lack of choice led to web designers hating him for holding a monopoly on web typefaces for about 15 years (Middendorp). However, Carter’s fonts have both surpassed their original intent for screen use as IKEA, the ubiquitous furniture manufacturer, replaced its in-store and printed branding, dropping Futura in favor of Verdana. Carter, when asked by Middendorp about this

change from screen to print, replied with an anecdote about design students, “Students are interesting—they’ll say things to me like: my professor told me I cannot use Verdana and Georgia in print because they’re screen fonts, but I tried it and it looks perfectly alright. And I can only say: Thank you! Go ahead!”

Gotham (Figure 23)—a geometric sans serif designed in 2000 by Tobias Frere-Jones to commemorate his home city of New York adds to the extensive library of works in popular use (Macmillan 85–86). Frere-Jones describes his typeface as “What letters look like” (Coles, *The Geometry of Type* 139). The typeface is solid and durable with an even stroke contrast and proportions that make words appear fair and balanced. The letters can be described further as basic building blocks reminiscent of the city that inspired them (Consuegra 136). The letterforms are architectural in nature and are designed as if ready to be cast into iron forms. Although initially designed for *GQ* magazine’s logo and main body text, the specific inspiration comes from the letterforms that graced the top of the entrance to the New York Port Authority Bus Terminal (Garfield 211).

Figure 23. Gotham. Sample of Gotham Book Regular at 56 points in size.

The success of this typeface did not happen overnight but was slowly adopted in the first few years of its life (Garfield 208). The biggest break for Gotham came from its wide use within Barack Obama’s presidential campaign in 2008. Frere-Jones mentions that he found out about the usage by the Obama campaign when he noticed it on a television spot (Garfield 209). Interestingly, a few other candidates were using the same

typeface, but luckily for Gotham, Obama became the focus of attention within the Democratic Party. As inevitable as national news coverage amid a successful presidential run, the typeface that carried the messages was sure to become a mainstay in the design world. Gotham continued to find success in movie posters and branding, but its initial concept of building letters came full circle when the typeface was used on the cornerstone of the Freedom Tower (Garfield 217). Frere-Jones is often his own biggest critic, once stating he is more interested in the drawing of letters because he enjoys drawing, "not because I am going to save the world with typography" (Consuegra 134). He may not save the world with his designs, but the designs are a definite embodiment of change.

Calibri (Figure 24)—commissioned by Microsoft and designed by Luc(as) de Groot in 2007, Calibri is a slightly rounded and highly modern sans serif. The typeface was produced for Microsoft's ClearType initiative, which was a new technology for rendering fonts on screens—particularly ebooks (Garfield 330–331). Luc(as) de Groot, a Dutch typeface designer, started his relationship with Microsoft in 2002 by designing Consolas; he claims that had he "known it would have been used the way it was, [he] would have probably asked for more money" (Garfield 330). However, Calibri made much more of an impact. Microsoft describes the typeface as having "real italics, small caps, and multiple numeral sets. Its proportions allow high impact in tightly set lines of big and small text alike" ("Calibri Font Family").

Figure 24. Calibri. Sample of Calibri Regular at 56 points in size.

As the default typeface upon loading a new document in virtually every Microsoft program including Word, Excel, PowerPoint, and Outlook, Calibri has had immeasurable popularity since its adoption in 2007. Luc(as) de Groot describes it as, “a font that everybody recognizes—a normal font” (Arbes).

In 2017, *The New Yorker* and other sources reported on a situation dubbed, *fontgate*, in which Calibri was at the center. Suspected forgery of documents by the Prime Minister of Pakistan’s daughter dated in February of 2006 were written using Calibri, making it almost impossible for them to be authentic (Arbes). Calibri factored into another forgery attempt when the Turkish government accused hundreds of people of plotting to overthrow the country’s leaders. These plans were alleged to be written in 2003—using Calibri, a full four years before it was widely available (Arbes). Luc(as) de Groot was asked about the incident and admitted to being a little happy about it stating, “People usually take fonts for granted” (Arbes).

Luc(as) de Groot initially designed the typeface to support Latin, Cyrillic, Greek, and Hebrew character sets, but other designers expanded the typeface to include support for Arabic, Armenian, and Georgian (“Calibri Font Family”). No doubt, its universality comes from its soft, friendly features and its powerful corporate backing. Having mainstream media coverage doesn’t hurt.

Roboto (Figure 25)—a unique typeface relative to this list, it was conceived and designed entirely in-house at a technology company, rather than by commission or included in software through licensing agreements. Type and user interface designer Christian Robertson worked to create Roboto while working at Google as a user interface designer and the typeface debuted in 2011 (Marek). Roboto released with the Android

operating system version 4.0, more playfully called *Ice Cream Sandwich*. The typeface was designed to replace the previous system font Droid, an extensive family that is still quite popular for use on the web and in application design. Google describes Roboto as having a "dual nature. It has a mechanical skeleton and the forms are largely geometric. At the same time the font's sweeping semi-circular curves give it a cheerful demeanor" (Coles, *Roboto*). However, this description was hardly the initial reaction to the typeface upon its initial release.

Figure 25. Roboto. Sample of Roboto Regular at 56 points in size.

The typeface was seen as a "Frankenfont" with letterforms that felt stylistically borrowed from other popular typefaces including Helvetica, Myriad, Univers, FontFont (FF) Din, and Ronnia (Coles, *Roboto*). While drawing inspiration from typefaces is usually a great place to start, borrowing opposing styles made Roboto's initial design feel unbalanced depending on the letters required to write certain words. Robertson defended his typeface, claiming changes in the updates to "calm down some of the unruly characters" (Coles, *Roboto*).

Despite the outcry from the design community, Roboto has maintained a popular status in all things screen—serving its initial purpose. Roboto is the most widely used font from *Google Fonts*, with over 78 billion instances of it appearing on over 45 million websites ("Analytics"). This number does not reflect the number of native applications that use the typeface on Android phones, the most common mobile operating system in the world.

Another unique feature of this typeface compared to the other ubiquitous typefaces mentioned so far is the way Roboto gets updated. The project exists as a public repository on GitHub, where those inclined can submit issues and errors as well as work on their own version of the typeface. The open source nature of Roboto makes the typeface a living entity that can evolve. In contrast, Apple's default operating system typeface, San Francisco, is only licensed for use while creating official Apple-supported developer projects (Marek). Free distribution and ease of access helped Roboto become one of the most common typefaces in the world, and the heavy integration within Google makes it unlikely to go away—at least until Google decides to replace it.

Spectrum of Ubiquity

These typefaces were chosen not only for their ubiquity, but also for their common characteristics that would serve as a map to identify baseline properties for other typeface comparisons. It is important to note that ubiquity can be viewed at a macro level as well as in a more relative context. From this perspective, ubiquity can be viewed as a spectrum rather than an all or nothing label.

Websites like *Fonts In Use* maintain a list of the most popular typefaces in historical context with samples of work. *Fonts In Use* acts as a public archive that aids in typeface selection and pairing. ("About This Site - Fonts In Use"). It lists the number of entries for each typeface, which makes it more clear which typefaces see the most usage in a historical and modern context. Most of these numbers range in the hundreds of examples, but this catalog does not include how often those uses were seen in print or stores. More modern formats for buying or downloading typefaces will often generate lists of their most downloaded typefaces. These statistics are more accurate as the

numbers are more in line with actual usage by individuals, with some being able to measure how many views a typeface has on a webpage.

With this in mind, the spectrum of ubiquity ranges quite dramatically from industry to industry. It comes down to the era in which the typeface was designed as well as the needs of particular industries like interface and web design, book and magazine publishing, transportation, and general print. It can be difficult to compare a typeface like Arial, which is found on Google's homepage, to a typeface like Cheltenham used in the print versions of *The New York Times*.

VI. TRENDS IN TYPOGRAPHY

Role of Typography

Part of what makes a typeface popular involves the needs of the people using it. To figure out why a typeface meets specific needs, it is pertinent to understand exactly what a typeface does. Many typographers and typeface designers have commented on the nature of the typeface and how it relates to people's ability to communicate.

"I bring into the light of day the precious stores of knowledge and wisdom long hidden in the grave of ignorance. I coin for you the enchanting tale, the philosopher's moralizing and the poet's visions...I AM TYPE!" (Goudy 218). This excerpt, written from the perspective of the embodiment of typography, comes from a pamphlet written in 1931 by Frederic Goudy, one of the most prolific American typeface designers—notable for his masterpiece Goudy Old Style (Macmillan 93). Goudy expresses that typography is made for the transmission of ideas. However, ideas can be transmitted differently, as through speech or gesture, but printed words are much less ephemeral.

When speaking, people convey tone, urgency, and severity quite naturally and easily, but the written word needs help in this regard. "In communication, type is the visual equivalent of an audible voice—a tangible link between writer and reader" (Cheng 7). Connecting the reader and the writer involves a bit of translation, even if both understand the same language. Typography can aid in reproducing the subtle nuances of language that the words themselves may fail to communicate. Gerard Unger describes how this clarification comes with other advantages, such as the ability for editing one's thoughts—allowing for a more organized syntax in what he calls the "grammar of legibility" (*Theory of Type Design* 29). In essence, typography is a complete system for

documenting experiences in a more lasting way, while using the mechanical advantages of easy reproduction through interchangeable pieces. Type grants a lasting existence to the ideas of humankind.

"Typography exists to honor content" (Bringhurst 17). Bringhurst further elucidates the best way to honor content is by using a typeface that embodies the concept of durability in which it links "an earned or unearned interest that gives living energy to the page" (17). Durability is not permanence. A typeface does not insist that it is perfect and immune to change, and yet lasts because it does not give in to flights of fashion. Typography lives in a delicate balance between granting power to written words and being purposefully (or unintentionally) misapplied to remove any semblance of credit to an idea. To honor typography as the physical embodiment of language, how can people make sure to avoid any errors when picking the letters to best represent a written idea?

Choosing a Typeface

A main staple in any book on typography revolves around the idea of how to choose a typeface, or even more common, how to pair a set of typefaces. This can lead to people having an initial reaction that certain typefaces must inherently be better suited for particular words or types of words, such as a bold typeface for a headline. However, perhaps the idea of pairing typefaces comes from a more economic reason—designers want people to spend money on a second typeface. Despite the final rationalization for choosing a typeface, why is it such a common subject in many typographic books? Should choosing a typeface be the easier task compared to all the nuance that goes into setting a beautiful paragraph with a smooth and clean rag or kerning the right amount of space between two characters in a page title?

Many students of typography learn to select a typeface through reading the words to be set and discovering the author's attitude, eventually rationalizing their way to a typeface that embodies that feeling and message, using learned characteristics of categories and styles as shortcuts.

An essay from the mid-1920s by Charles Brodie whimsically describes a collection of typefaces offered by the American Type Founders as men and women with specific characteristics. Of the few typefaces Brodie deems worth mentioning among the thousands of specimens, he describes Garamond Old Style as, "artfully elusive and dainty enough in her appeal to warm the cockles of any advertising man's heart" (Brodie 19). Outdated verbiage aside, Brodie shows how he attributes human characteristics to a typeface without really describing its physical properties.

Throughout his essay, words like honesty and efficiency and intolerant describe more of a mood association than anything to do with weight or serif shape. Brodie's work emphasizes that a typeface carries a connotation, but these connotations are more era-specific and change over time.

If a person does not already have an eclectic knowledge of what personality a favorite typefaces possess, how would one go about selecting a typeface? Karrie Jacobs in *An Existential Guide to Type* describes a scrutiny of letterforms based on their geometric structures. She writes, "I can see the insouciant twist of a Palatino y's descender, the open, hungry maw of a lowercase Souvenir e, and the nicely tapered stems of a Bembo m" (Jacobs 21).

The nuances are also lost on most people, as long as a typeface does not have any glaringly unique characters. To her point, and the point of many typographers insistent on

transparency, a selected typeface should be a vessel for the words and not call deliberate attention to itself. Choosing a typeface for its uncharacteristic quality lends itself to those who have mastered typography, rather than people in the general population.

Beatrice Warde, who is famous in typographic circles as touting the ideals of invisible typography that does as little as possible to hinder the words on the page, is less known for her slightly more optimistic views, stated in other essays. Her views on choosing a typeface showcase that type "can be eligible and dull, or legible and fascinating" (Warde 193). She offers two generalizations about choosing a typeface: The first is that the type must be tolerable and well-made with uniform characters (Warde 196). She states quite plainly, "There are bad and good types, and the whole science and art of typography begins after the first category has been set aside" (Warde 196). The second generalization assumes that the words being set are worth the lending of a particular typographic voice. "If 'the tone of voice' of a typeface does not count, then nothing counts that distinguishes man from the other animals" (Warde 196). This is a rather extreme view that claims choosing a typeface is not worth a second thought if the type being set is voiceless and meaningless.

Another aspect of choosing a typeface comes from selecting a face with all the features needed to set the text. To create a big, bold headline, the type family must contain a bold cut. To set a book title apart from the rest of the sentence, an italic family member is needed. If an author writes lots of abbreviated names, a typeface with a working set of small caps would be a good choice.

Many users of type have become accustomed to the automated processes of scaling and bloating characters in a typeface used in software to maintain a common

feature set, regardless of the selected face. Most word processing software and web browsers will approximate a small cap or an italic if the typeface is lacking a dedicated version, so many people just assume that these are included in all type families. Without typographic training, these approximations can easily go unnoticed, making the choice of a smaller type family less impactful for the average type user.

Choosing a typeface also has a great deal to do with legibility and readability. Beier says, "typeface styles that are unfamiliar today, such as blackletter or flourishing scripts, will trouble today's reader just as much as unfamiliar typefaces troubled the reader in the past" (172). If legibility is an important factor over style and impact, designers will choose a typeface with widespread usage, so it is likely that a reader will be somewhat familiar with the typeface and avoid any struggles in reading. This method of typeface selection relies heavily on the physical shapes of letterforms and uses a quantitative approach to selection.

On the opposite side, a less scientific, but more relatable method for choosing a typeface comes from looking at the shape of the letters and associating them with a mood. Erik Spiekermann does this to an extent in his book *Stop Stealing Sheep & Find Out How Type Works*. Typefaces are examined on what kind of mood they evoke using music as an analogy for how to build a page with styles like instruments in an orchestra (Spiekermann and Ginger 109). Specific words that spell out emotions like surprise, anger, and joy give good reasons to pick matching typefaces for individual words. He also argues that this approach can be defeated once the words are placed onto the page (Spiekermann and Ginger 43). The idea that type expresses emotions based on its letterforms is far more relatable than a physical measurement.

So, with all these methods and considerations when selecting a typeface, how does a person actually select one to use? To put it literally, most people pick from an alphabetical list of typefaces without any indication of how their weights or names or cuts relate to their intended use. There is a big disconnect in typeface selection when it comes to why people pick typefaces and how people pick typefaces. Without a strong grasp of type history, the mechanics of legibility, or emotional familiarity with a specific typeface, people are simply guessing and checking if a typeface choice really lends itself to particular needs. Additionally, people might even choose a typeface without any regard to its intended purpose, potentially reassigning its meaning through new use and context.

While a designer may have these thoughts when working with type, most people will undoubtedly choose a typeface for superficial reasons or leave the choice up to the designer of the word processing or email program by sticking with the default selection. A redesign of how people select typefaces would go a long way in getting the right type in the right place at the right time.

Typeface Revivals

Typography, being a vessel of communication, has an interesting dilemma. While the designs of a letter may appear to have an infinite amount of variability and options when it comes to the choices a typeface designer might make, the letters still need to look like letters. This makes typeface design an iterative process, like all forms of design. Typography sits comfortably on its roots of tradition. It is difficult to create something new without some form of reference to the works of earlier designers.

As explored, advancements in technology have led to the need to constantly update the format of typefaces to work within the new capabilities of production tools.

Designers grow comfortable with certain ideas, and typographic choices are a particular comfort. Typographers learn the ins and outs to make a font work well for certain purposes, so why abandon it and repeat the work (and possibly struggle) to learn another? Reviving a typeface gives designers the ability to maintain the relationship with fonts as well as make iterative improvements to the design to meet changing needs. Rick Poyner comments on the lifecycle of a font explaining that, "with repeated applications in less and less appropriate contexts, the face becomes exhausted, incapable of inducing the required *frisson* and falls into disuse, until such time (it may well never happen) when it is revived" (Poyner). What makes a typeface a good candidate for a revival?

James Edmondson says the main reason for reviving at typeface is to "make it more usable. With a lot of historic typefaces, they lack the characters that we're looking for—like the € symbol or the @ symbol" (Edmondson). Adding new characters to better suit the lexicon of a modern time seems like a rational justification for reviving a classic. Early typefaces were limited in weights and sizes. Many consisted of only a roman cut with a matching italic (Meggs and McKelvey v). If not for modernization, typefaces like Garamond would fade out of favor because the initial lack of a bold version limits its scope in modern usage.

Another aspect is that trends are often cyclical, and typefaces are subject to discernment of the masses in a similar manner as the fashion industry (Meggs and McKelvey v). A designer could guess when a typeface might become more popular again, but why not design something new rather than copy a design from the past?

Before exploring the make-something-new option, it is important to understand what happens when a typeface designer revives an old face. It may not be as

straightforward as tracing an existing sample. “Should a typeface designer slavishly copy the original exemplar, including numerous imperfections and inconsistencies?” (Meggs and McKelvey v). Reviving a classic typeface demands some big decisions be made. When reviving a font designed in metal for the digital era, should the designer base their model on the form of the metal letter or the resulting ink on the page? When an inked letter is pressed into the page, the ink spreads out just a bit further than the metal shape of the letter. Ink spread is a controversial issue in the typeface design community because it is unknown which version of the letter best represents the intended outcome of the original designer (Meggs and McKelvey 19). Even from sample to sample of works printed variations exist within the typeface itself. Not every letter was perfectly cast in steel and individual pages can have numerous versions of a single letter. Which one is the best sample? It is impossible to ask the designers who lived hundreds of years ago about their intent, so debate is inevitable between typographers and historians.

Part of the reason for so many revivals is that designers draw inspiration from the classics but want to put their own stylistic rationale on top. However, revivals may be sanctioned and built in tandem with originators of the initial design, as is the case with designers like Matthew Carter and Adrian Frutiger whose careers overlapped the boundaries of multiple technologies. These designers controlled their own revivals, granting authenticity to the update. This is the best-case scenario for a revival, as the mindset of the designer is congruent with the intent of the redesign.

Yet, creating typefaces breeds competition, which is expected when multiple designers are drawing the same letters of the alphabet over and over. Who controls the responsibility for keeping the classic typefaces current? Since technology reduces the

cost designing a typeface an almost insignificant amount, why shouldn't every designer make their own version a typeface? While technology makes it possible, ramifications arise for the typeface design industry related to the constant recreation of typefaces.

Knockoffs and Piracy

While letterforms from typeface to typeface are fairly uniform—being designed for the same Latin alphabet—some typefaces are almost indistinguishable from one another. Frederick Goudy describes a typeface designer as someone who "thinks of a letter and draws a line around it" (Pankow 255). With the advent of newer technologies, older typefaces are usually the first to make the transition from one medium to another. The revivalist nature of typography naturally lends itself to repetitive designs and fierce competition between foundries claiming ownership of a traditional typeface.

Paul McNeil says the most enduring typefaces are the most likely candidates for repeat interpretations and, because of the limitations of the current technology, similarities from one typeface to another are common (7). These issues of originality in typeface design can lead to the bigger issue of plagiarism, no matter the technology used to create the original works.

An early and noteworthy case of typographic plagiarism (due to its publicity in typography and printing journals) dates back to the late 1920s when Rudolf Koch, a German type designer, accused the American Type Founders (ATF) company of selling a slightly modified version of his typeface Koch Antiqua under the name Rivoli (Pankow 239). Another American company, Continental, was created to distribute European typefaces and acquired the rights to sell Koch Antiqua under the name of Eve, which became its most popular typeface imported from Europe. With Continental's success,

ATF lobbied for an increase in tariffs on imported type to stifle the sales of Eve, as well as brought up issues of the piracy of ATF typefaces by German type foundries. ATF admitted that Rivoli was a direct copy of Eve but justified it in response to typefaces copied first by a German foundry.

After much letter writing, Henry Bullen, who represented ATF, later claimed that they could not have copied Eve, since Koch copied his original design from a calligraphic manuscript *Libellus valde doctus*, originating in 1549 (Pankow 248). Bullen argued that a typeface derived from a historical document made the letterforms public art, which could be copied by anyone. In fact, Bullen claimed that the German foundry Klingspor had previously been in a lawsuit regarding the ownership of Eve with another European foundry (Pankow 253). This seemed to settle the matter, and further shows how the defense of plagiarism often stems from a sense of fair use from a historical reference. Regardless of numerous issues of legal ownership of a typeface in history, very little protection for typeface designers and their creations exists in the current day.

Herman Zapf, famous for typefaces like Optima and Palatino, points out that typeface designers are not protected through copyright law to the same extent as musicians or writers, and alphabets are often viewed as part of the public domain and can be copied to any extent. Zapf also claims that typeface designers are thought of as altruistic creators, only working for the betterment of mankind and are not interested in monetizing their months and years of hard work (Zapf 34). Finally, Zapf claims that his only method to protect his works is to surround himself with a big company, the ITC, to dissuade any attempts to steal his work (Zapf 35). However, even the most prominent typeface companies engage in the theft of intellectual property of type designers.

A few countries such as the United Kingdom, Germany, and France have rules to protect the abstract shapes of type designs with industrial design patents, but the United States has no such protections. The reasoning for not granting copyright protection to a typeface comes from a 1978 decision by the Copyright Office stating that the utilitarian nature of the alphabet prevents original authorship when designing letterforms (Zapf 34).

Despite the typefaces themselves not having claims to copyright protection in the United States, the font files and comprising code that generate those shapes will often fall under the jurisdiction of protected software. But this does not help the majority of typefaces created before the era of software and computer typography.

As a weak countermeasure to the problem, the names of typefaces can be granted a protectionary trademark, but the name does not protect the letterforms from copying or piracy; it just prevents one company from using the same name for a typeface, like any brand or company name.

The piracy and plagiarism of typefaces has been a particularly difficult battle for typeface designers, and no real solution exists except to grant typefaces protection under copyright law, so that legal action can be taken when piracy occurs.

The small protections gained from font patents in the age of digital typefaces hardly prevent the of piracy of typefaces, even from current type foundries and distributors. Rudy VanderLans claims, “the new or surviving foundries and distributors have only one goal: to sell as much type as cheaply as possible without concern for the quality, use, conservation or development of typeface” (154). This notion highlights the idea that copyright protection is not a priority for current typeface companies, and also speaks to the notion that quality typeface creation holds less value than the quantity of

type created. Many companies sell typefaces that are obviously copies of famous works and simply rename them.

Creating a copy of a typeface has become easier in the digital era. With any typeface editor, a person can open a font file on their computer, change a little piece here and there (or change nothing at all) and save it as a unique typeface void of meta tags and traceable data. This leads to many typefaces being distributed as look-alikes aimed to avoid paying for an existing typeface. It is also easy for a new type design to piggyback off an existing typeface, negating the need to spend as much time in the development process, yet undermining the effort put into the original typeface's creative process.

However, when it comes to existing typefaces, which typeface is the original? Many companies have a cut of Garamond or a modern Bodoni or Didot, so how would a type user determine which is the most authentic to its source material? Is it necessary to use an original? Most typeface revitalizations are copies of copies with incremental changes aimed at solving an issue deemed acceptable when originally produced for an older display technology. In an article written by Steven Heller, he quotes type designer James Montalbano as saying, "Every designer should have their version of the little black dress, the three-piece suit, formal wear, casuals, etc." This idea of every foundry having similar offerings shows how a typeface can easily be re-created with slight modifications and sold as an original. With revisions consistently filling the specimen books from type foundries, it is no wonder why Frederick Goudy also jokingly said, "The old guys stole all our best ideas" (Heller).

Piracy is not a problem to be solved by campaigning against its practice. People will always to take the easiest route when using typefaces. Going to a free typeface

website like *DaFont* or *Google Fonts* and not having to worry about licensing and distribution issues is a simpler process for most people. While free typeface sites like *DaFont* are filled with copies of stolen typefaces, *Google Fonts* is cleared from this accusation, but not completely blameless. By searching something along the lines of "which Google font is closest…" will yield forum results and top 10 lists on which free typeface to use instead of licensing a paid original. A real solution must come from how paid typefaces are distributed and licensed for use, which companies like Adobe and Fontstand are starting to address.

All in all, plagiarism and piracy continually make it difficult to be a typeface designer, no matter the era. While digital distribution makes it easy to create perfect copies and steal typefaces en masse, type designers can still push for originality and a better ease of use for typefaces to keep their industry viable in the future.

Why People Make Typefaces

"Perhaps one of the most obvious reasons is a personal interest in letterforms and the desire to experiment with them" (Burian). Written language relies heavily on typography, so creating a typeface can be a natural inclination for those who study visual communication. As a pure design tool, typography is an elemental pillar. Typographic design is an endeavor with the impact to expand far beyond one's own personal reach and outlast any trend or era as designers continue to use the tools created today in future works.

For others, the global aspect of typeface design comes first. "Creating a typeface in several languages at once is a monumental task and needs the contributions of designers who are native users of each script to maintain authenticity" (Riechers). This is

the case for a typeface released just over a year ago by Typotheque called Ping. Peter Bil'ak notes his contributions to the typeface with massive language support, "There are way too many fonts available for Latin only, and I see a real value in having truly international projects that explore new ground across cultures" (Riechers). For Bil'ak and the numerous designers involved in the fruition of Ping, they use type design to extend a means of communication to as wide an audience as possible.

Matthew Carter offers a simple explanation to why people make typefaces, "The letters are different because the designers are different. That's all...End of story." He further adds that in "times of technical innovation, designers want to be pushed into exploring something new" (Carter). Typographers get a front-row seat in the world of changing technology, which will undoubtedly be an endless source of excitement. A complete understanding of typography, if possible, comes from learning about the history, researching underlying characteristics of letters and language, as well as the practice of making letters.

VII. EXISTING RESEARCH REVIEW

To inform this study, existing studies and literary works specifically pertaining to the relationships between typography and emotions have been examined. While there are a few studies that contain elements of both, none of the studies focus on the most common and popular typefaces or how their physical properties can be measured to look for consistencies in emotional response and form.

Typographic Emotions

A study by Andrew Johnson of Aetherpoint focuses on how emotions are accessed through type and image. This study tests compositions of type alone, image alone, and in combination to gauge an emotional response. The images are geometric and abstract in nature, while the type is an uppercase sampling of ABCD using six different font styles. Johnson's study tests the emotions of alert, excited, enthusiastic, happy, contented, serene, relaxed, calm, bored, sluggish, depressed, sad, upset, stressed, nervous, and tense. The emotions are placed on a coordinate system of activated/deactivated in the y-axis and pleasant/unpleasant in the x-axis.

The results showed "the combination of typography and image imparted a wide range of effects on elicited emotions" (Johnson). It was also clear that the results showed more "activated" responses than "unactivated", especially in the combination images, meaning the complex nature of graphic paired with type is more than the sum of individual components.

Downsides to this study are the non-isolation of individual variables and an inconsistent use of color when applying the type to the graphic image. Also, the typefaces varied in scale and were nonrepresentational of particularly common fonts. Two of the

four test images use letters that are almost unrecognizable as letters without the context of the others.

The Aesthetics of Reading

The Aesthetics of Reading by Kevin Larson and Rosalind Picard focuses more on how layout and typeface selection affects moods positively or negatively rather than how individual letterforms generate an emotional response or have perceived traits. This study aims to research how on-screen reading experiences can be improved with various font technologies such as Microsoft's ClearType and how the page is designed using quality typographic conventions. Many of the measured results of the study were based on increases or decreases in reading speed and comprehension and how they relate to paragraph indentions, justification, image placement, hierarchy of headers, ligatures, kerning, small caps, and other OpenType font features. The study looked at how an uneven stroke weight or inconsistent or poor kerning would affect readers.

The study found that few people noticed subtle differences, but generally preferred the better designed page layout. The results were gathered using a Likert scale to assess participants' preferences as well as an estimate for how much time the readers thought they had spent completing the task. The study also notes that participants benefited from the subtle features of the good typography once they had been pointed out (Larson and Picard 5).

Other results include that people with the good typography underestimated their time taken for reading to a greater degree, which would indicate that they are in a better mood and more receptive to completing the activity. The Likert scale also indicated a greater engagement for readers with the better page layout.

Emotional responses only focus on whether people are having fun, thus underestimating the time taken—or in a good mood caused by the typography. This study does not look for differences in font styles since it uses the same font for each test, just with manipulated spacing and character sets. Another issue with this study is that readers were not all reading the same material, as they each chose to read different articles. The study does not take into account any other aspects of mood more specific than good or bad mood, which is a limited scope of the range of emotions people have.

Quantifying Perceived Differences in Type Styles

In a marketing study, John Tantillo, Janet Di Lorenzo-Aiss, and Richard E. Mathisen designed an experiment to determine if type style is an influence on affective responses in printed materials regarding serif or sans serif type styles. The study cites that the choice between the two is often selected based on the experience of a designer, the medium of communication, and the intended audience but picked while lacking empirical evidence (Tantillo, et al.).

Six different type styles were selected, three serifs and three sans serifs. The serifs were Century School Book, Goudy Old Style, and Times New Roman, while the sans serifs were Avant Garde Gothic, Helvetica, and Univers—all apparently at their regular or roman weight. The 250 study participants were all college students enrolled in business schools in the United States.

Each typeface was graded on 28 different adjective pairs from 1 to 7 including attributes such as beautiful or ugly, calm or agitated, charming or not charming, loud or soft, new or old, young or old, rich or poor, smart or not smart, etc. Few emotional pairs

exist, but include happy or sad, emotional or not emotional, and interesting or boring. Measures were taken to prevent bias by having the adjective pairs randomly sorted.

The results of the study showed that serifs show more personality, freshness, quality, vitality, and legibility; the sans serifs lean more toward powerful, smart, readable, and louder (Tantillo, et al.). There also seems to be a wide range of results, with the lowest average being 1.82 and the highest being 5.11 within the scale of 1 to 7. The results also compared the typefaces to the others within their style group. Within the sans serif styles, there exists a great deal of differentiation between 20 different characteristics when regarding Avant Garde Gothic. Goudy Old Style also showed significant differences, but only in 8 characteristics relative to the other serif typefaces. The most relevant outcome is that differences between the sans serif and serif groups only appeared to be distinct in 18 of the 28 characteristics. This shows that certain characteristics of a sans serif might be more closely related to a serif than to other styles of sans serif. The study makes the case that more quantifiable descriptive data would be the next logical step in the research process.

One issue with the study is how the scores of each typeface are calculated using the average value for each number, rather than a more distributive method for calculating variations within the distribution of responses, such as the median. This study also reported findings in readability from testing a singular group of capital letters reading NRESTA. The use of all capital letters and a non-word is hardly the best case for testing certain aspects of font personality, but at least it was consistent in the delivery of the letterforms from one typeface to another. The final assumption of the survey is that people are forced to score the typeface for each adjective pair rather than having an

option to only pick qualities that apply. This gives a false result at the ends of the spectrum as all choices will score at least a 1 or 7. The study is notable for using opposing pairs to set the ranges in the spectrum.

Perception of Fonts

A study by A. Dawn Shaikh, Barbara S. Chaparro, and Doug Fox aims to find if participants can consistently attribute certain personalities to typographic classifications when presented on screens rather than print. The study also attempts to determine what uses the studied typefaces would have in a digital setting.

Participants in the study numbered above 500 and consisted of approximately 60% full-time students, 72% females, and 45% between the ages 20 and 29.

Conducted in two parts, 20 fonts were chosen to represent the categories of serif, sans serif, scripted/fun, monospaced, and display/modern. Many of the fonts tested are found in Microsoft's ClearType lineup, including Cambria, Constantia, Corbel, Candara, Calibri, and Consolas. The first part showed participants a sample specimen consisting of the full uppercase and lowercase letters, numerals and common punctuation presented as a static image. The participants then rated the typefaces using a four-point scale using 15 adjective pairs including stable or unstable, flexible or rigid, conformist or rebel, sad or happy, polite or rude, cuddly or coarse, masculine or feminine, and practical or impractical.

The second part of the study used pangrams such as the phrase "The quick brown fox jumps over the lazy dog" at both 12- and 24-point size. Participants were asked to check a box for each use they would personally find for the typeface. These included

options, like website textual content, business documents, online magazines, email, assignments, and computer programming.

The results of the study are a compilation of the personality traits into a ranking based on the average personality score for each font. The study found that sans serif fonts did not score extremely high or low on any personality traits (Shaikh, et al.). These were determined to be an all-purpose style that could be used in many situations. The more playful typefaces such as Gigi, Kristen, Monotype Corsiva, Rage Italic, and Comic Sans were categorized as happy and creative. The bold typefaces like Impact and Rockwell were labeled as assertive. Serif typefaces were placed into a category of traditional, while monospace resulted in a plain category.

More results showed which use case was more aligned to each style of typeface with serif being most appropriate for business documents and sans serif for website text and email. Scripts were picked for digital scrapbooking.

Further, typefaces were charted according to the top 3 performers in each personality trait. The typeface most represented on the chart was Impact followed by Kristen, Gigi, Times New Roman, and Courier New.

The discussion of the results expressed that data from prior print surveys found similar results and that these results could be helpful in aiding designers in choosing the right category of typeface for particular design needs.

A few issues arise with this study like the scale picked for demonstrating the characteristics of the typefaces. Font sizes on screens usually default to 16 point or more, so that would have been a more reasonable lower threshold for showing the sample letters

rather than 12 and 14 point. At such a small scale, the script and display style typefaces are unclear.

The survey also uses an alphabet sample for determining the personality traits, which makes for an uneven comparison relative to the pangram. The Likert scale only uses four points of choice, which would artificially compress the results. Finally, the advantage of ClearType over the other fonts is lost when the images are shown as static images, which made it unclear if this was a big factor in why the particular typefaces were picked for the survey.

Why Fonts Matter

Sarah Hyndman's *Why Fonts Matter* consists of findings from performing "Type Tastings" in which designers and non-designers can learn more about how typography affects the emotional response in relation to how type is displayed and what style words and messages are written especially in packaging design.

The book consists of exercises and games that can be played at workshops to evoke an understanding of how the typeface enhances the messaging. However, the aspect concerning this study is the published results of an online quiz showcasing how the manipulation of letterforms can favor a particular mood.

Hyndman based her experiment on a 1933 experiment by Poffenberger and Barrows that explored line styles such as zig zags, sloping lines in different directions, and curving lines, and how people associated those with moods. The typefaces were arranged in a similar structure and the results were compared. The survey consists of 14 different questions like, "Which looks the happiest?" followed by three manipulations of the same typeface at the same size. The manipulations involve rotating letters, shifting

the baseline to an angle and italicizing or reverse italicizing the letters. Occasionally, the questions have three different typefaces all set the same way.

The tests looked at emotions and traits like excited, most angry, calmest, funniest, saddest, most scared, sarcastic, hiding a secret, most deceptive, or most tense. The questions often repeat with different typefaces as answer choices.

The results are based on over 1,900 responses from non-designers from the United States and the United Kingdom. By interpreting the results graphic, a few conclusions can be drawn about which properties are best represented by certain type manipulations. Correlations can be drawn between type that is angled up and to the right with positive emotions and unaltered text with calm emotions. Italics range from funny to scary. Many of the choices carried a 40% or more majority showing a great deal of consensus within the data. Sadness and tension were the two emotions without clear winners from the choices, with 39% and 35% for the winning option, respectively.

Problems with this study are in the nature of the typefaces picked. There is little variety with many of the questions featuring Georgia, Cooper Black, Futura, and Footlight. This indicates that the study is more concerned with how the letters are manipulated rather than how the letterforms themselves are perceived in their own design style. The order of the answer choices also consistently places the most neutral or least altered option in the middle, which could generate selection bias when asking questions regarding which choice is at the end of a range, such as funniest. The results of the questions only have two middle choices winning the votes.

Another reason to question the results is this survey is part of a workshop business model for the surveyor, which could potentially involve a conflict of interest when

presenting the validity of the results. Little discussion of the results are presented within the book.

VIII. RESEARCH METHODOLOGIES

Designers often pick a typeface to match the voice or tone of the written content, while many non-designers or inexperienced designers select a typeface out of popularity or leave it set to a default in the software. With this in mind, this research study aims to test various physical properties of type within a specific family of typefaces to minimize variables that might go into a user's outlook on a specific font. Finding a reliable method for determining which characteristics are more prominent in the minds of people who have not spent time professionally designing typefaces became the initial step in tracing how material measurements translate into non-physical properties and emotions.

An anonymous online survey was set up with two separate sections—one devised to check type measurements like slant, weight, contrast, x-height, width, roundness, and geometricity—and another to find emotional responses to individual popular typefaces. The survey simulates a card sorting exercise, where the participants are free to associate the type examples with any of the characteristics to incremental degrees. The difference between the survey and a traditional card sort is merely the interface of the questions rather than the type of data collected.

The survey asked an initial question to weed out anyone who had professionally designed a typeface to make sure the data received only came from designers less experienced with typography and people outside of the design profession. Of the 112 people surveyed, 59 yielded valid results. The results represent the people who completed all the questions of the survey.

A-B Testing and Results

The first section A-B tests two typefaces that are as similar as possible except for one difference in a measurement. Each pairing would only be marked with a set of letters to avoid creating bias from name recognition. Also, certain demo words showcase a wide variety of letters while making sure that progression through the survey is obvious to help avoid anyone accidentally skipping a question due to question similarity. For instance, the survey alternates through Hamburgefonts, Penultimate, Videospan, Resonance, Adhesion, and Handglovery, all at 60 points in size (Figure 26).

Figure 26. Penultimate. Example of an A-B test comparison type sample.

Whenever possible, a ubiquitous typeface is used to keep a lack of recognition from becoming a potential distraction, however, the isolation of a single variable outweighed the need to use a common typeface. These A-B comparisons tested the font pairs in five different categories using a slider value of 0 to 10, where 5 was neutral (as well as the starting value) (Figure 27). Careful consideration was used when assigning each word in the pair to one end of the scale or another to try and avoid dissonance in choosing one side of the scale as *better*. Users were allowed to slide the scale in 1 integer increments. The categories were human traits including:

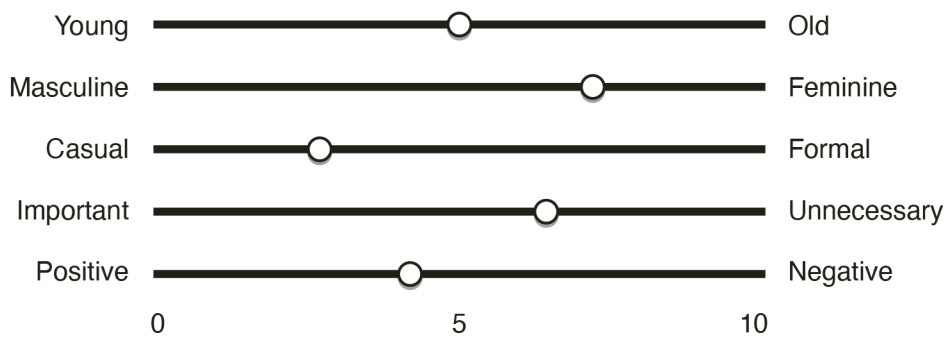

Figure 27. A-B Test Sliders. Example of how users submit responses to the A-B category choices.

These traits would be a baseline for comparing other typefaces in future tests, or for predicting how measurements affect perception in similar typefaces. This would allow for the creation of a low-level spectrum for each trait in regard to typeface design.

When transcribing the data into the following formats for general analysis, cues were taken from Edward Tufte's *The Visual Display of Quantitative Information* on how to best present the data for consumption. His concept of data-ink explains that the core of a visualization of graphics should showcase the data-information and remove all superfluous lines (Tufte 93). The result is the representation of the data using a series of box-plots that would help to show extremes, medians, and reasonable quartiles of how the data skews. This approach is paired with a simple histogram to show individual results as well as to help others visualize the distribution without the interpretation of the box-plot (Figure 28). The histogram also shows statistical outliers for each typeface outside of the extremes.

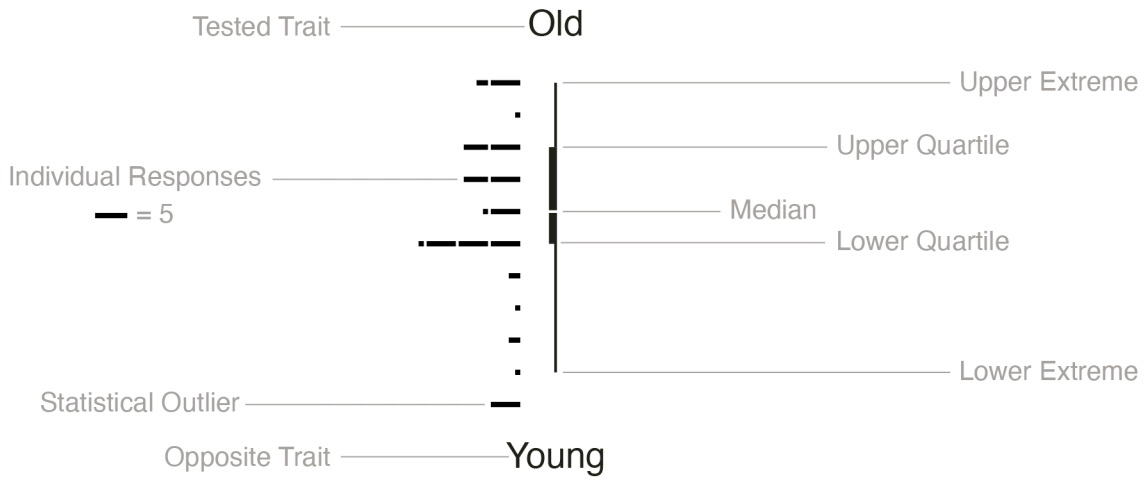

Figure 28. Box-Plot Sample. Legend for how to interpret a box-plot with integrated histogram.

For testing slant, Times New Roman Italic is compared to the regular cut (Figure 29). A traditional serif italic was picked over an oblique cut of a sans serif because true italics are more common in typeface usage. Times New Roman Italic also has a more angled slant than most typefaces to make the difference stand out more from the regular cut. Prior to the study, a hypothesis was generated assuming italics would skew more in the older, feminine, and formal, but be neutral in the other categories.

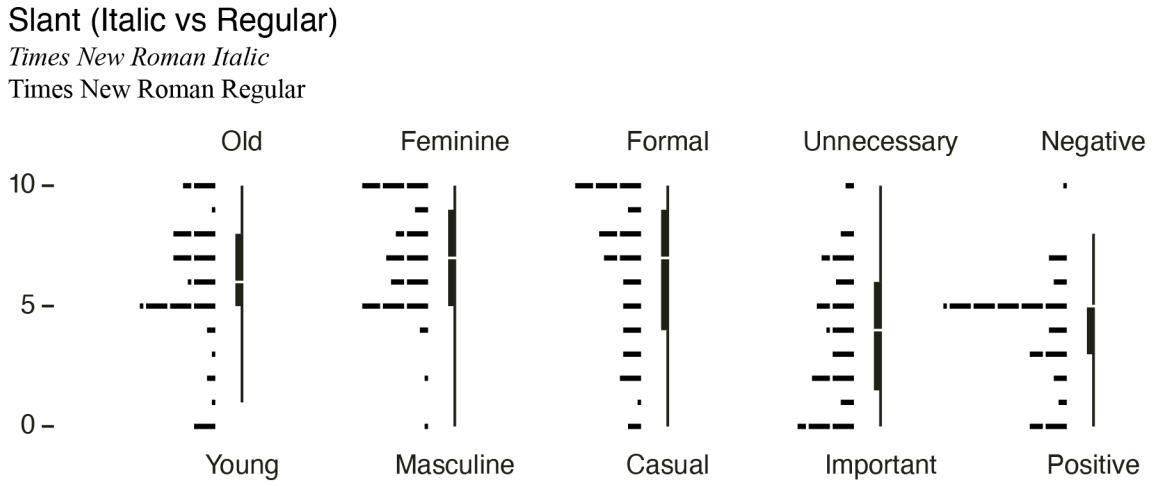

Figure 29: Slant Test Results. A-B test results for slant between Times New Roman Italic and Times New Roman Regular.

For weight, Helvetica Light was paired against Bold (Figure 30). These two weights are commonly found on modern device interfaces and carry a good degree of separation without altering other spacing characteristics. A prediction that bold would show mostly neutral results except for a heavy leaning in importance was determined before results were gathered.

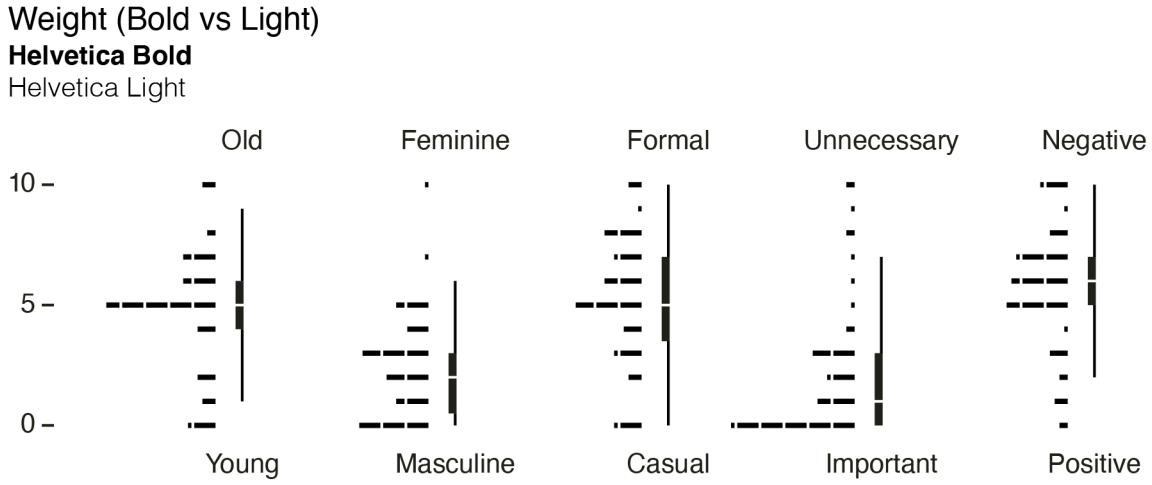

Figure 30. Weight Test Results. A-B test results for weight between Helvetica Bold and Helvetica Light.

Contrast was a bit trickier to test, since it required a family that had various levels of stroke weight. Using a family called Questa (Figure 31) by Martin Majoor and Jos Buivenga made for a single variable test. Questa has similarities to Bodoni LT, but has a unique Grande cut that has all the same proportions as the regular weight, but with thinner secondary strokes. Typically, Questa Grande (Figure 31) would be reserved for display purposes above 72 points in size. Typographic knowledge would assume contrast would favor formality and perhaps importance.

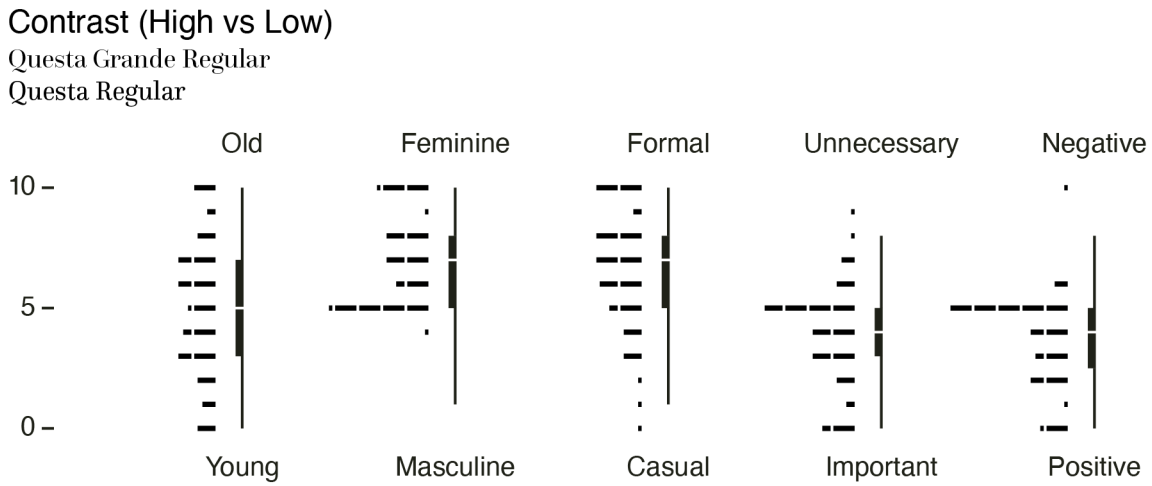

Figure 31. Contrast Test Results. A-B test results for contrast between Questa Grande Regular and Questa Regular.

X-height is difficult to test without using different type families, as few typefaces have a version with a modified x-height in the same family. However, Zuzana Licko's popular Mrs Eaves OT Roman typeface comes in a standard and an Mrs Eaves XL Serif OT Reg variation (Figure 32) where the x-height and ascender/descender proportions are adjusted. The only step was to kern each letter to have equivalent spacing. Since Mrs Eaves is a modernized version of Baskerville, it also works well in terms of recognizability. A general hypothesis about x-height concludes a larger x-height will lead to people viewing the font as more casual.

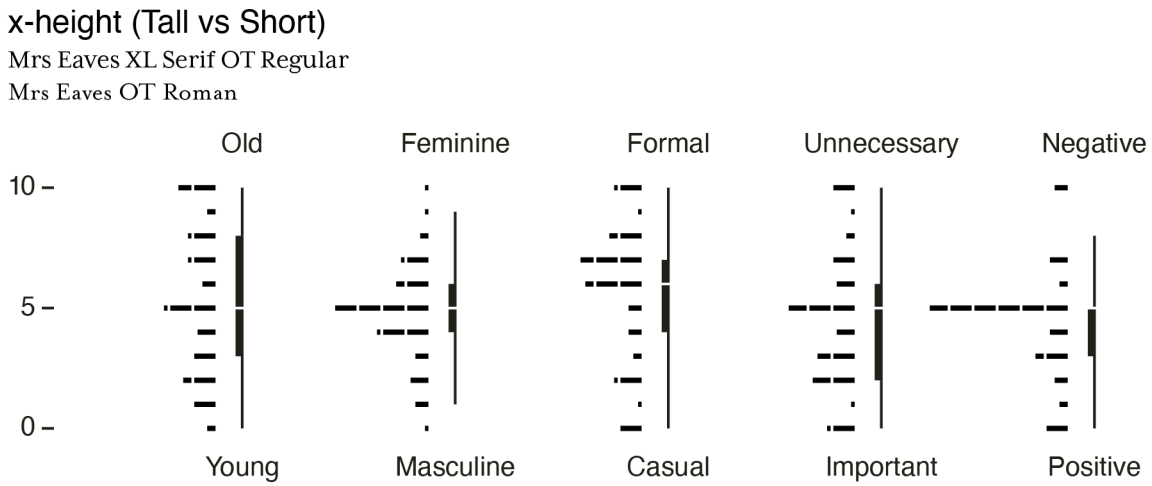

Figure 32. x-height Test Results. A-B test results for x-height between Mrs Eaves XL Serif OT Regular and Mrs Eaves OT Roman.

Width is easily tested with Adrian Frutiger's Univers as it contains many widths within the same weight class of the font family. The survey uses the extreme ends of width by comparing Univers LT 57 Condensed to Univers LT 53 Extended (Figure 33). The presumption is the extended width will lean more masculine, more important, and more positive.

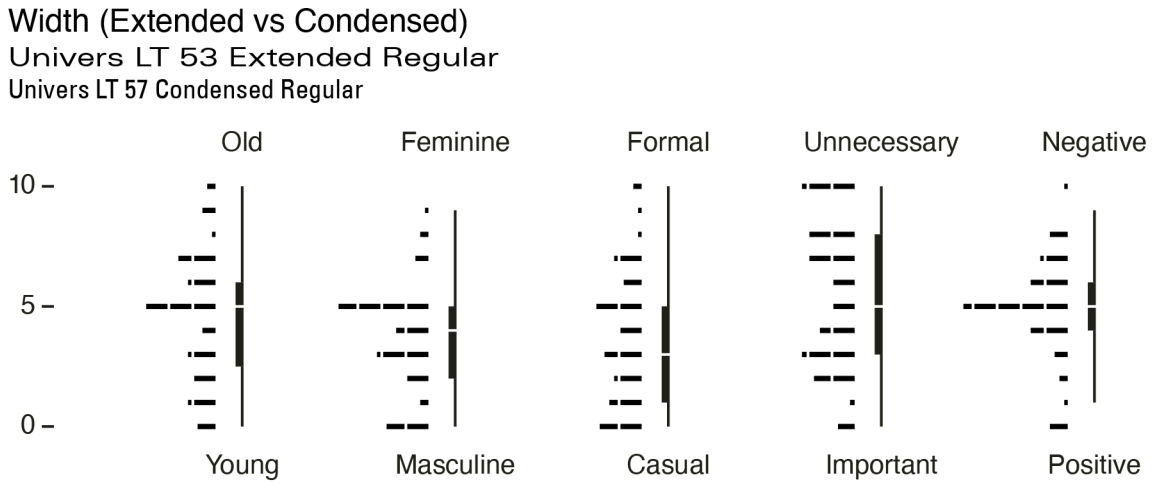

Figure 33. Width Test Results. A-B test results for width between Univers LT 53 Extended Regular and Univers LT 57 Condensed Regular.

Roundness can typically be found in sans serif families, and, for this test, Gotham Medium Regular and Gotham Rounded Medium were chosen (Figure 34). Despite their slightly different naming systems, they have exact proportions other than the rounded terminals on the strokes. Helvetica also has identical but rounded variants, and this would also have been a good choice, but it was important to not repeat any typefaces to avoid confusion between questions in the survey. Roundness, as hypothesized, will showcase responses for casual and young while being mostly neutral for other categories.

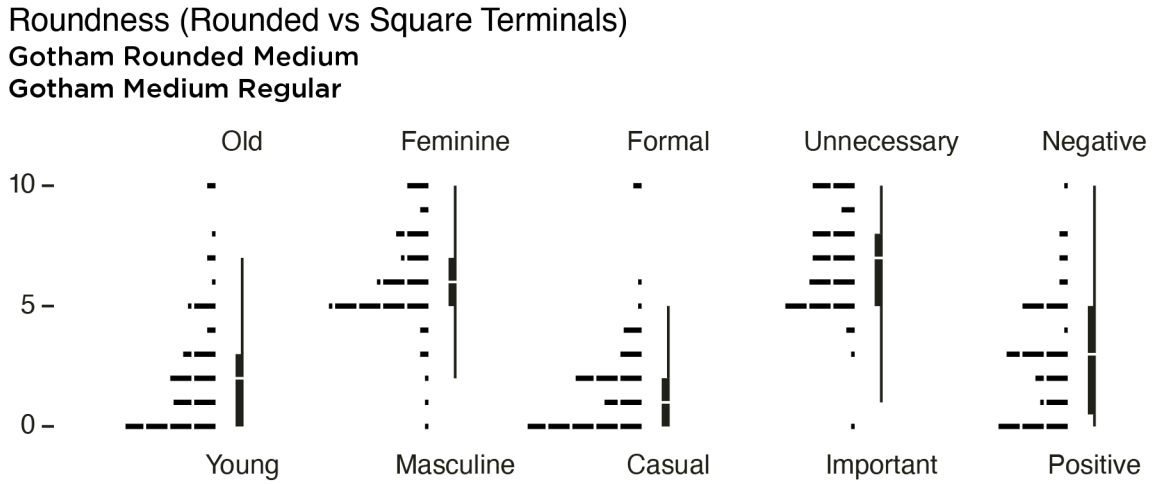

Figure 34. Roundness Test Results. A-B test results for width between Gotham Rounded Medium and Gotham Medium Regular.

Finally, geometricity, or the quality of being formed from pure geometric shapes, was tested using typefaces with similar proportions, but different amounts of variation in strokes. This survey specifically chose Futura LT Book Regular (Figure 35) as Futura is often cited as a prime example of perfect geometric form, but the specific version from Linotype at this weight better matched the available weight of the other font in the comparison. When measuring the circularity of its upper and lowercase o, it scores exactly 1, or a perfect circle. It also has perfectly vertical strokes and squared terminals. For comparison, it is paired against Optima Regular (Figure 35), a highly humanist sans

serif by Herman Zapf with strokes that narrow in the center and flair out near the terminals with an inverted radius. Optima is about as close to a serif typeface as a sans serif gets with many design choices taken from traditional calligraphy. These are the least similar in terms of family within the survey, but the proportions and measurements are close in order to isolate only the geometric differences in the typefaces.

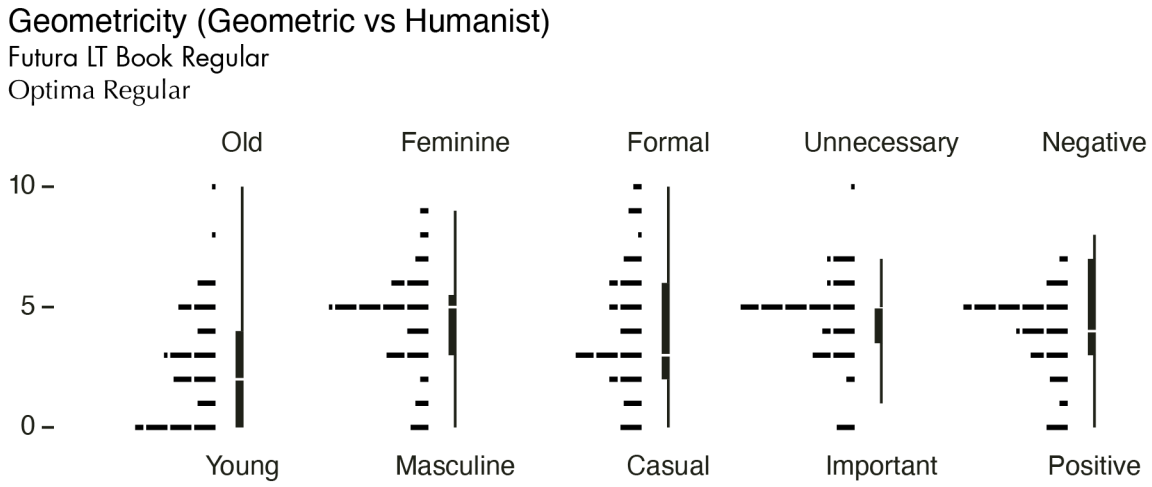

Figure 35. Geometricity Test Results. A-B test results for width between Futura LT Book Regular and Optima Regular.

The results of the A-B testing section were quite dynamic, but still adhered to initial hypotheses for the most part. Very few of the results had outliers on either end of the scale and most were distributed evenly across the neutral position.

Emotional Profiles and Results

The second part of the survey aimed to create profiles of ubiquitous typefaces based on emotions or feelings (Figure 36). The selections were based on 27 emotions researched by Cowen and Dacher. The emotions were modified to have opposites, which would help determine if people were arbitrarily choosing emotions or finding a consensus within their responses. If a typeface scored equally in an emotion and its opposite, then

that data would show mixed feelings and possibly prove the need for more complex testing.

☐ Delight	☐ Sadness
☐ Excitement	☐ Boredom
☐ Satisfaction	☐ Annoyance
☐ Certainty	☐ Confusion
☐ Relief	☐ Anxiety
☐ Desire	☐ Disgust
☐ Empathy	☐ Indifference
☐ Novelty	☐ Nostalgia

Figure 36. Emotional Choice Pairs. Emotions and feelings paired as opposites for open-ended selection.

While each pairing is not exactly an opposite, each does its best to convey contrary feelings that would unlikely exist at the same time. Users were allowed to choose as many or as few of the emotions as preferred.

To remove any bias, each sample of the typeface used the same word at 60 points in size—Hamburgefonts (Figure 37), which showcases a wide variety of letter types to give a good overview of the font. Also, each typeface was labeled with a letter rather than its name to keep each font anonymous and avoid any name recognition reactions. The samples are the twelve most ubiquitous typefaces described previously.

P

Hamburgefonts

Figure 37. Hamburgefonts. Example of Bodoni MT Regular at 60 points in size for the emotional profile survey question.

To showcase the results, a simple histogram was created that put the opposite emotions on the same row—the same way they were presented during the survey. This way they could easily be compared.

The first profile is for Arial (Figure 38) which shows the most responses for indifference and satisfaction. The profile for Bodoni (Figure 39) shows the most responses for satisfaction, certainty, nostalgia and novelty. Bodoni received the most responses out of any of the typefaces in the survey and was the highest-ranking result for satisfaction, desire, novelty, nostalgia, and certainty. Calibri (Figure 40) was the typeface that received the least amount of total responses with its highest category being indifference. It was also one of the lowest scoring typefaces for nostalgia and novelty. Futura (Figure 41) averaged on the positive side of the chart and took the highest spot in excitement. It was also the only typeface to not have anyone select empathy as one of its traits. Garamond (Figure 42) was a very indecisive typeface as it received counts quite equally in opposite emotional choices. Its main responses included novelty and nostalgia, with nostalgia being slightly favored. However, Garamond was the only typeface to receive two votes for sadness. Georgia (Figure 43) scored well in satisfaction and boredom as well as having zero responses for confusion. Gill Sans (Figure 44) did not stand out in any category but did score well in satisfaction. It also tied for first in empathy. Gotham (Figure 45) is noted as the most delightful of the typefaces tested as well as scoring second best in excitement. It was also one of the lowest picked for anxiety, and the results lean overwhelmingly on the positive side of the choices. Gotham tied with Gill Sans for the most empathetic typeface. Helvetica (Figure 46) ties Bodoni for certainty while it easily received the most responses for indifference. However, it also

received the least number of disgust responses with zero, making it seem like a soft indifference. Roboto (Figure 47) can be noted as the most boring of the typefaces. It just edged out Helvetica by one. Roboto also scored high in indifference. Times New Roman (Figure 48) tied with Helvetica as the least exciting typeface as well as tying Gotham for lowest anxiety. Verdana (Figure 49) was a low response typeface but that did not stop it from gathering a fair number of votes for indifference. Many responses were fairly equal between opposing emotions.

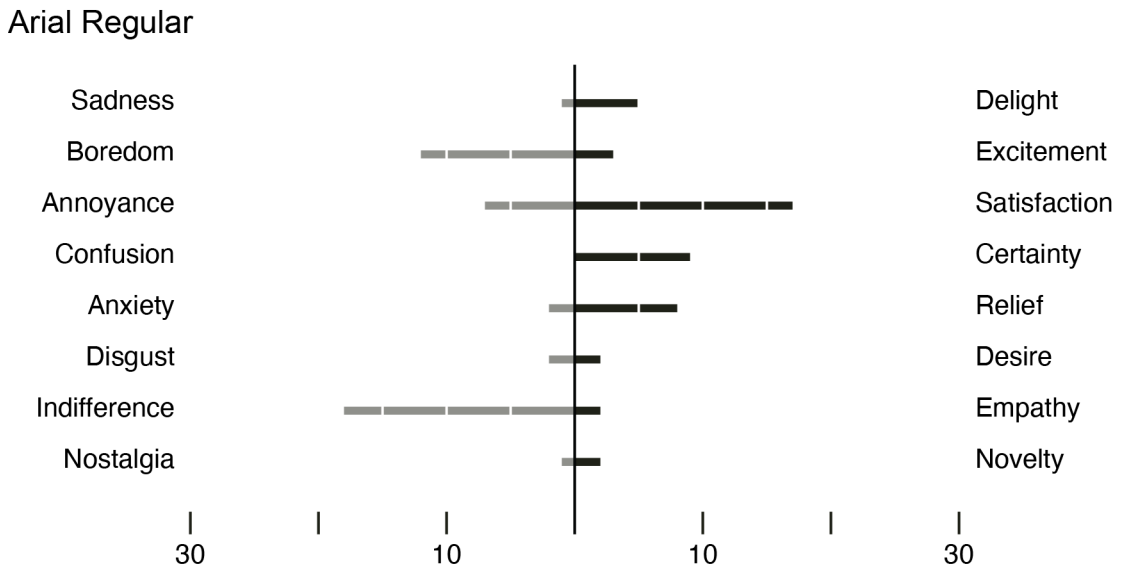

Figure 38. Emotional Profile of Arial. The compiled results of the emotional profile section of the survey for Arial Regular.

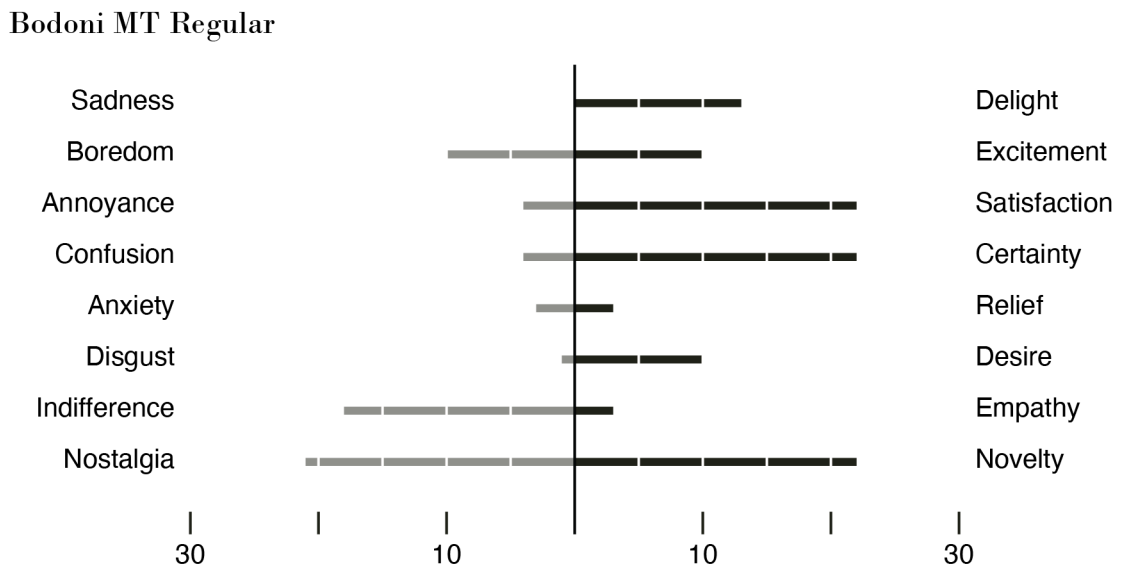

Figure 39. Emotional Profile of Bodoni. The compiled results of the emotional profile section of the survey for Bodoni MT Regular.

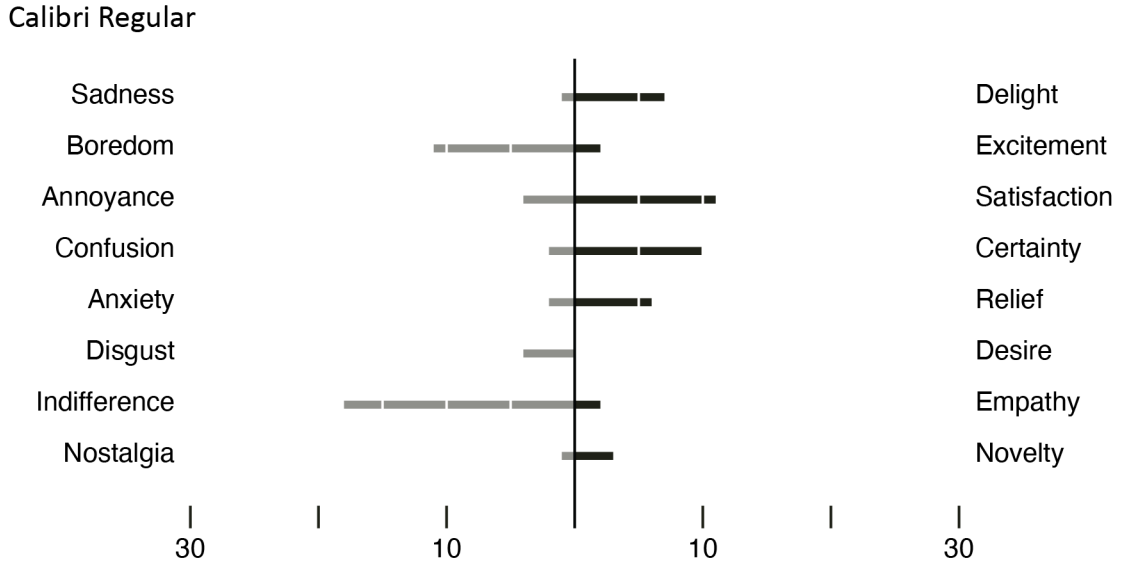

Figure 40. Emotional Profile of Calibri. The compiled results of the emotional profile section of the survey for Calibri Regular.

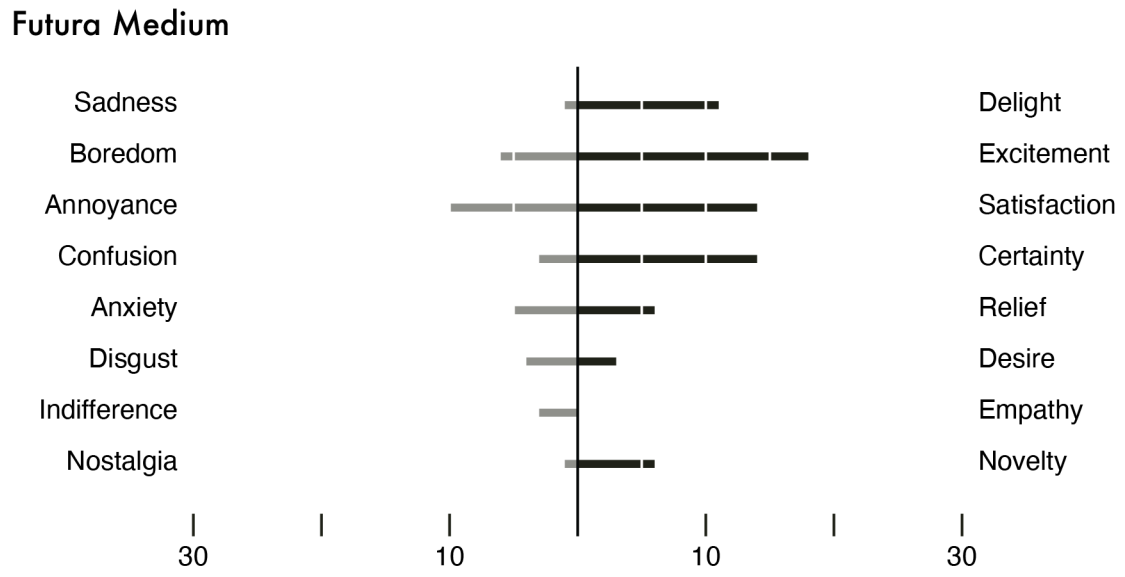

Figure 41. Emotional Profile of Futura. The compiled results of the emotional profile section of the survey for Futura Medium.

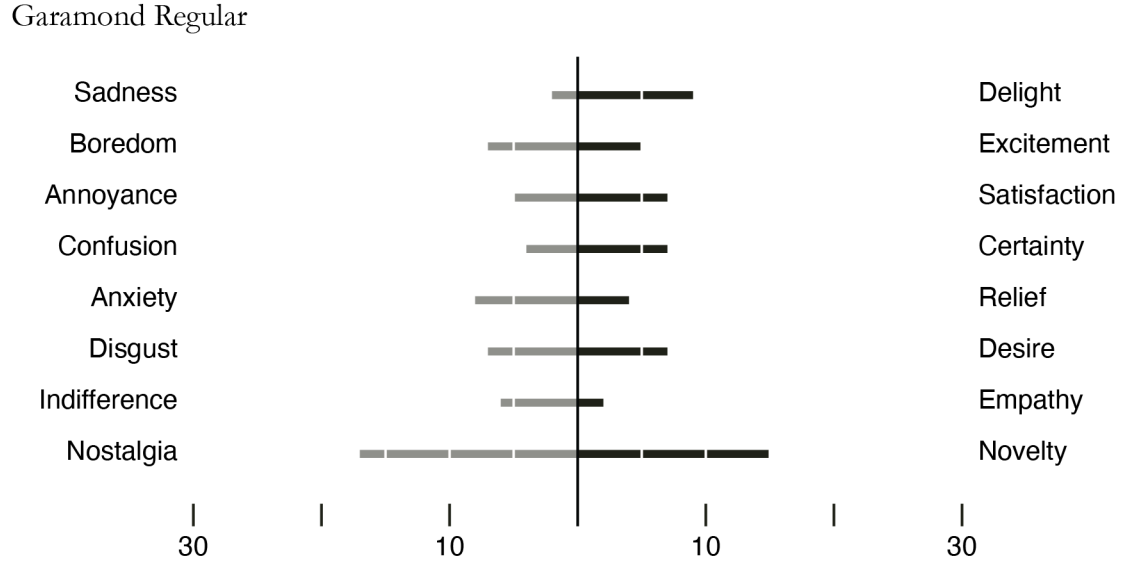

Figure 42. Emotional Profile of Garamond. The compiled results of the emotional profile section of the survey for Garamond Regular.

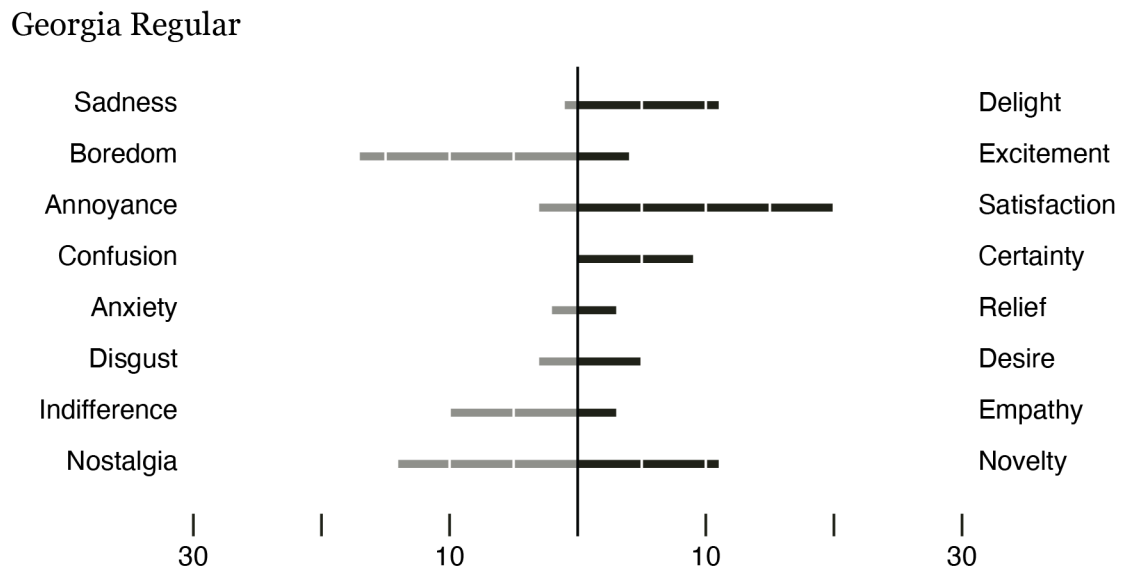

Figure 43. Emotional Profile of Georgia. The compiled results of the emotional profile section of the survey for Georgia Regular.

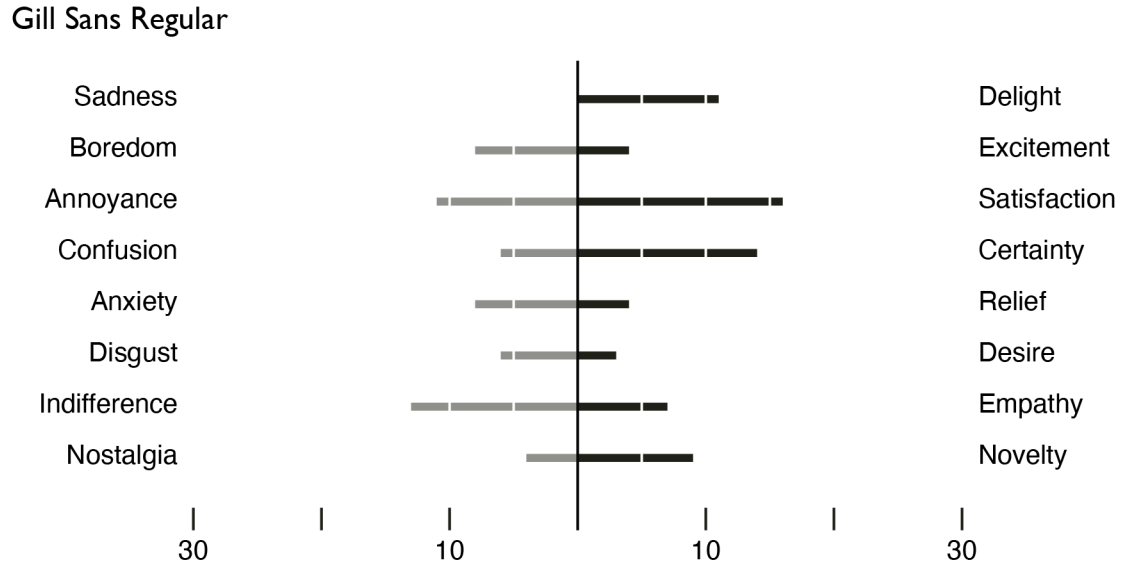

Figure 44. Emotional Profile of Gill Sans. The compiled results of the emotional profile section of the survey for Gill Sans Regular.

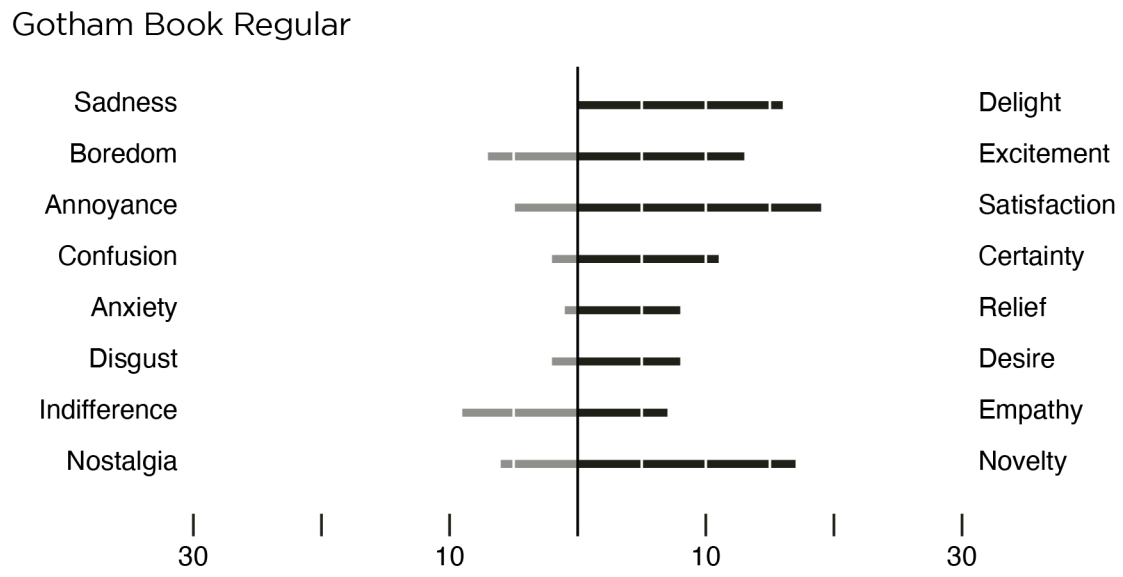

Figure 45. Emotional Profile of Gotham. The compiled results of the emotional profile section of the survey for Gotham Book Regular.

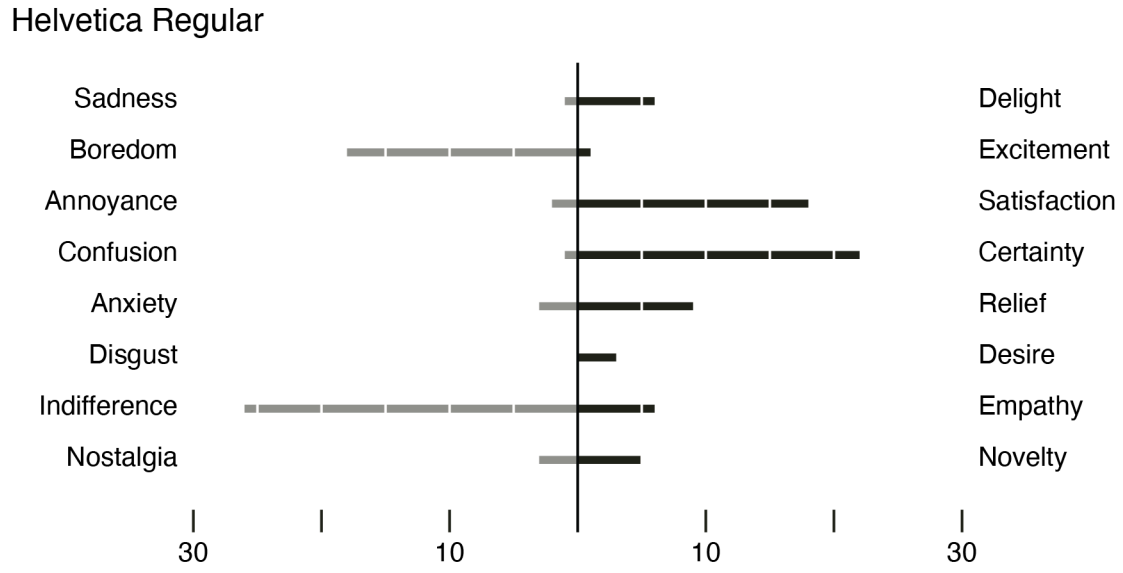

Figure 46. Emotional Profile of Helvetica. The compiled results of the emotional profile section of the survey for Helvetica Regular.

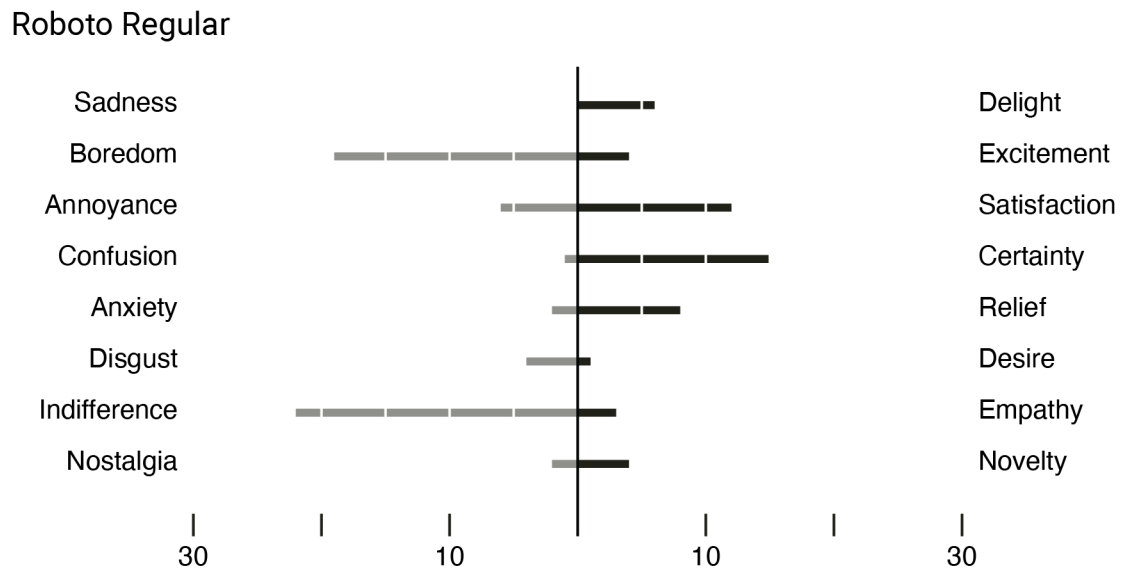

Figure 47. Emotional Profile of Roboto. The compiled results of the emotional profile section of the survey for Roboto Regular.

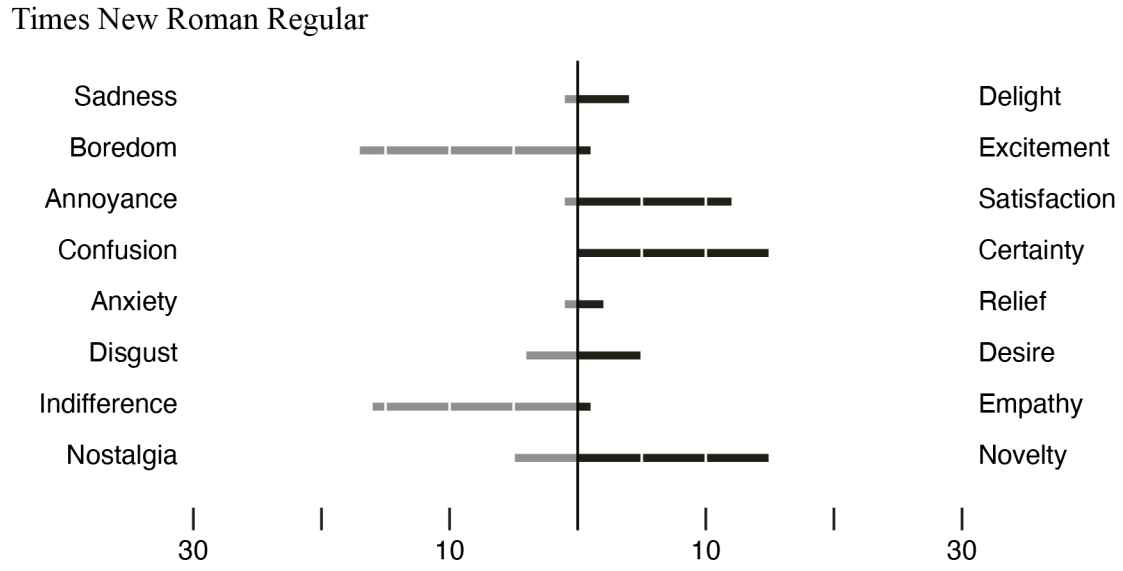

Figure 48. Emotional Profile of Times New Roman. The compiled results of the emotional profile section of the survey for Times New Roman Regular.

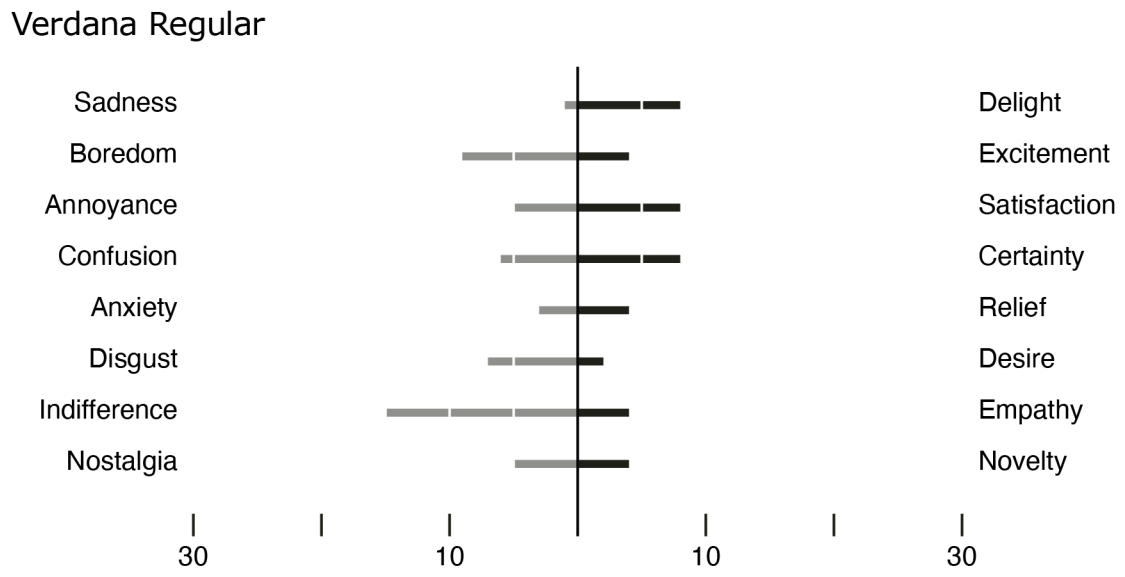

Figure 49. Emotional Profile of Verdana. The compiled results of the emotional profile section of the survey for Verdana Regular.

The results are surprising when comparing how wide a spectrum many of the typefaces covered. More definitive results for each characteristic was to be expected, but not ultimately found. A few correlations appeared between emotions like boredom and indifference as well as between satisfaction and certainty. Many of the typefaces showcase opposing emotions in similar counts, which leads to the conclusion that there is little consensus on what properties translate to emotions for a typeface.

Gerard Unger mentions that typefaces often have polarizing effects on people when he wrote, “Reactions to typefaces are finicky. What some people consider out-of-the-ordinary, to others comes off as totally pedestrian, and vice versa” (Unger, *While You’re Reading* 125). This is clear from the research, but there are some sparks of consensus, especially between typefaces designed to similar specifications.

A good comparison to showcase a bit of consensus is the graphs between Helvetica and Arial. These two typefaces are the most similar in style, and for the most

part, they trend for similar emotional features. The main difference is Helvetica was a little stronger in each category and Arial showed a lesser extent of certainty. Perhaps this only provides more fuel for the fire that Arial is just a lesser copy of Helvetica—a common anecdote in typographic circles.

Emotions like sadness, confusion, disgust, and anxiety showed very little results, which leads me to conclude that these emotions do not apply to how people think about typography—at least when it comes to popular typefaces.

Relating the A-B testing to the emotional profiles would allow for the creation of a spectrum of typography, especially when compared with physical measurements to find even more relationships.

Physical Measurements

Since typefaces are used at many different sizes, the first question in deciding how to measure them would be at what size should they be measured? With digital typefaces, the scale does not affect the design, but using larger samples would be better for accuracy while using the digital software. Each typeface was sized at 72 points for baseline measurements. This is arguably much larger than most typefaces are usually displayed, but it allows for accurate selection of lines and nodes without working at too close of a zoom. Adobe Illustrator and Glyphs 2 software were used to take measurements. A combination of transform tools, point snapping, property info panels, and custom scripts were used to gather all the raw measurements to an accuracy of a ten-thousandth of a point.

The specific sizes of the measurements are not terribly important when it comes to analysis of the data, as much of the comparisons will be converted to unitless ratios agnostic of initial physical scale.

Measurements were collected for all 14 typefaces from the A-B testing section, as well as the 12 ubiquitous typefaces from the emotional profile tests along with their italic and bold family members. Finally, more measurements for regular, italic, and bold members of some of the most prominent typefaces used by designers as well as typefaces that are ubiquitous to a specific industry were collected for comparison. Examples of this include the works of Univers LT, Avenir, and Frutiger LT created by Adrian Frutiger, Interstate and DIN 1451—which are popular for road signs in the United States and internationally, Impact—the most common typeface in online memes, and Open Sans—a widely used typeface in web design.

The measurements included standard classifiers like slant, weight, stroke width, x-height, cap-height, ascender and descender lengths, and terminal radius. The data is based on a few specific letters that would best approximate the styles of all letters in the font set. O and H in upper and lower cases were selected since they are often symmetrically balanced with clear nodal points and average in width for the character set. The O and o are a good representative of curved shapes and would allow for calculations of optical compensation, geometricity and circularity, and axis slant. The H and h are fair representatives of vertical and horizontal letterforms making them useful for measuring stroke weight, slant, width, serif proportions, cap-height, and ascenders. The capital H is also used for the measurement of the uppercase crossbar and terminal radius.

Other measurements included a lowercase p for descenders, an x to find the x-height, and a lowercase e to find the crossbar for lowercase letters. Properties of specific letters often used as identifiers by typographers when trying to recognize typefaces were considered while gathering measurements. This included the structure of the lowercase a and g, as well as the angle at which the bowl of the e terminates. Also noted was the shape of the dot of the lowercase I, specifically if it is rounded or squared. All of these letters and characteristics were generated by writing “OHhipmaxgoe” to make a consistent sample for measurement (Figure 50).

Figure 50. OHhipmaxgoe. Sample text used for measurement with marked examples of how measurements were taken.

These base measurements allow for the calculation of other properties that are rarely numerically expressed in books on typography. Seemingly these measurements are obsessed over by type designers, but their exact measurements are rarely communicated to general designers and everyday people. These calculations include actual numbers on stroke weight as a percentage of letter height, the percentage of the x-height relative to the overall size of the letterbox, contrast expressed in terms other than low or high, and the actual height of the font compared to the expressed point size.

These measurements are an important step in being able to find trends within the survey data and how the tested properties relate to what makes a typeface ubiquitous or at least well-suited for a particular application. It is also important to note that these

measurements could show that there is no correlation with certain attributes and can be written off as embellishments allotted to the designer of the typeface for stylistic purposes.

In order to compare, charts were created of the variations between different properties to show trends within the world of typeface design. These charts cross-reference both the physical properties rankings as well as the surveyed levels of emotional response. The measurements of lowercase letters were used as they are more frequently used in writing and in the samples used in the surveys. As a general rule with uppercase and lowercase letters, their actual measurements are different, but their proportional relationships are consistent from typeface to typeface. The information was visually represented for the six emotional categories with the most responses. These include weight (Figure 51), contrast (Figure 52), x-height (Figure 53), and width (Figure 54). The emotional rankings of slant, roundness, and geometricity were not visualized, since the emotional profiles only feature two typefaces that display any significant difference from the others.

Figure 51. Physical-Emotional Relationships for Weight. Results for how each physical measurement ranks for the most selected emotional choices.

Figure 52. Physical-Emotional Relationships for Contrast. Results for how each physical measurement ranks for the most selected emotional choices.

Figure 53. Physical-Emotional Relationships for x-height. Results for how each physical measurement ranks for the most selected emotional choices.

Figure 54. Physical-Emotional Relationships for Width. Results for how each physical measurement ranks for the most selected emotional choices.

After reviewing the charts, there appears to be no correlation between any of the physical properties and the emotions measured in this survey. Ideally, the charts would

have either an ascending order or descending order to the measurements of each line. The short vertical lines to the left of each chart indicate entries that held the same count, so no real thought should be put into their order. Looking specifically in the complete data set for examples where the lowest and highest values were at the ends of the scale, none were found. A few examples were close, possibly indicating a correlation between contrast and nostalgia, optical compensation and empathy, the width of a capital H and certainty, and circularity and annoyance. However, more data would need to be collected to have any level of certainty as these are likely coincidences.

One reason for gathering this data and painstakingly measuring type properties by hand was to gain insight into how to design a typeface. All these measurements can be a gateway for new typeface designers to better understand how letters are constructed as well as the wide array of choices needed to create a professional typeface of lasting quality.

Another reason is that a standardization for which properties should be measured could be established with these initial measurements. However, automation akin to IDEO's Font Map could greatly increase the quantity of fonts measured as well as paint a broader picture of the letterforms that make up the whole font, rather than focusing on just a few characters. Perhaps when more letters are measured and more emotions are tested against those measurements, the data will start to show correlations.

Potential applications of this automation could include a way to better protect intellectual property surrounding typeface design as well as discover new ways manipulating font properties. The automation could query a database and detect typefaces

that are potentially identical or too similar to enforce copyright laws if they should ever be fully enacted to protect typefaces.

By analyzing some of the most widely celebrated and useful typefaces in the world, insight can be gained about the minds of the designers that created them. Designers like Adrian Frutiger and Matthew Carter construct their letters with much more meticulous standards, with angles of exacting degrees consistent from letter to letter and to each type family member. On the other hand, designers like Erik Spiekermann perhaps include anomalies to give their typefaces a more relaxed feel to accentuate their humanist origins. Typeface designers have always been an important source for the rationale behind the typefaces, as they are often their strongest advocates and biggest critics.

Interviews with Typeface Designers

Typeface designers converse through the most basic elements of communication. The creation of letters requires an eye for details, a taste for systems, and an ear to the ground of history. Typeface designers often build upon the work of past designers, slowly evolving the profession and trends of typography. As Gerard Unger put it, "Type designers have experience as readers and their recollections range from carefully scrutinized letterforms to fleeting shapes seen in passing" (*Theory of Type Design* 21). However, typeface designers are rarely well-known. Despite working at an almost atomic level of communication design, typeface designers get little recognition or credit outside the design community.

In conjunction with the survey data, a few typeface designers were interviewed, some being international success stories and others working at the forefront of typeface technologies. These interviews serve as a contrast to the survey results to help showcase

how ideas about the type world exist in various forms simultaneously. These experts, working as professionals, can give insight to the current state of typography.

The typeface designers were asked about the business side of typography and how often works are commissioned, self-released, or more for recreational purposes. Erik Spiekermann states that it's "Never recreational purpose. What would that be? I am a designer and work for a living, so designing type is not my hobby" (Spiekermann). He also adds that his work is mostly client-based as is the case for many of his most successful typefaces. Lizy Gershenzon and Travis Kochel of Scribble Tone state that commissions often disappear after prices are discussed but can come from websites like *Google Fonts*. They are passionate about providing a more sustainable platform for typeface designers, which led them to create *Future Fonts* with Ohno Type Co. The *Future Fonts* platform allows typographers to sell works in progress to help fund the process of making a complete typeface.

Contrary to this, Jackson Cavanaugh of Okay Type and Richard Kegler of P22 state that they have far fewer commissions for typefaces, but their work is still commercial in nature. For both of them, recreational designs serve a commercial purpose, even if they are not expected to get further than an exploratory phase. James Edmondson of Ohno, also makes mostly recreational typefaces, with "about two commissioned typefaces a year" (Edmondson). Coming from a more practical approach, Spiekermann simply puts, "I would never just spend time designing something just for the fun of it. Certainly not a typeface."

When regarding an intended audience or use for a typeface, their answers were a bit polarized. Edmondson claims to be more interested in expanding the genres of

typography rather than designing for a specific use, but mainly has created display styles. He also notes that he does not create with a user in mind. Kegler seconds this notion by saying, “The user or use may not even be the top reason. Sometimes it is to fill a void where a font does not exist, and we want to see it out in the world.” Kochel claims the idea for the target audience and usage needs to be clear for a typeface to “create a personality for typeface.” Spiekermann holistically notes that “It is impossible to predict who will use a type, but necessary to design it for a problem, process, or brand.”

To find out how typeface designers test their work and at what stage they bring testing into their process, the designers were asked to speak about their user testing. Cavanaugh mentions that he doesn’t “involve third parties until late in the process.” He will ask for specific kinds of feedback but notes how difficult it can be to find useful beta testers. Regarding the idea of usability testing a typeface design, Edmondson uses *Future Fonts* to help beta-test new typefaces. Tests are held with trusted people or self-tested. Kochel also uses *Future Fonts* and speaks to using the comments section. Gershenzon claims “we don’t do a ton of user testing” but they do show the typeface to friends. The larger design community is the main source for user testing and revolves more around adding features for language support or new characters. “The fonts aren’t crashing” Gershenzon adds, so unlike software they do not need as much testing regarding files. Spiekermann shares a similar idea, and the font files are tested for technical issues, but the designs are not tested during the design phase.

One of the most important questions in the interview regards how typeface designers measure success within their work and field. Edmondson claims it is hard to measure, but perhaps lies somewhere between revenue and more importantly a

"sustainable interest in his career." Spiekermann doubles on the metric of sales, explaining that his typefaces FF Meta and ITC Officina have sold well for over 30 years. However, he also notes that his typeface Fira is widely used because it is free on *Google Fonts*. Another metric he uses is the high visibility of fonts he designed for Deutsche Bahn (German Railways) as well as redesigned fonts for Mercedes Benz to use inside cars. Cavanaugh answers more humbly, "Am I happy with the way it looks?" Peter Bil'ak of Typotheque measures his typeface success through their actual impact and if they serve their intended purpose. His typeface Fedra Sans, "exists in various language versions, which reach small linguistic groups around the world." He notes that multi-language support of Latin, Devanagari, and Arabic characters allows his most popular typeface to have usage in Europe, India, and the Middle East.

Designers are quick to point out typefaces they find to be of poor quality. Many typefaces are considered faux pas when used on a *serious* design project, but to find the opinion of the interviewees, they were asked to consider what percentage of typefaces in the world would be considered good. Edmondson says, "95% because I am glad they exist, but good quality, or usable, well-designed typefaces—in the neighborhood of 2 or 3%." Gershenzon, could not think of a percentage, but expressed concern that older typefaces do not make the transition into digital. Kegler has a more generous response saying, "in free fonts—about 10%, in commercial fonts about 40%." Spiekermann casually states, "Not very many." He does express that *good* is a debatable term and likes to think more in terms of success, or if they become part of the Zeitgeist.

Finally, typeface designers were asked to name a favorite font outside their own work, as well as which typefaces they use most. Edmondson uses Arial most due to its

selection for writing emails but said Eames Century Modern is his favorite typeface in recent years. Spiekermann also mentions Eames Century as a favorite but notes Lyon Text, FF Hertz, and Walbaum MT, the latter for use at tiny point sizes. He particularly notes that he likes "using typefaces designed by friends...and [has] a personal relationship with their work." Gershenzon notes that for default fonts she will look at Verdana and Georgia for basic web design or Roboto for typing in Google Docs, but mostly uses typefaces from *Future Fonts* as does Kochel. Dante is a favorite of Kegler's, but cites Lucida Grande as the most used, due to its default selection in the Apple Mail app. A similar notion comes from Cavanaugh, who primarily interacts with San Francisco, the default font for the interface on his computer.

As one would expect when interviewing people at different stages and focuses in their careers, the typeface designers had a wide variety of answers. A few of their personal philosophies overlap, but as Edmondson uniquely stated during his interview, "the answer to every question in type design is, it depends."

IX. NEW FONT CLASSIFICATION

As a conclusion from survey results and designer interviews, an overhaul to the typeface classification system would improve the connection between the intent of typographic design and how users perceive and use typefaces. Gerard Unger warns of creating typographic theories on design that are too specific to a particular way of working, as typeface designers may have many reasons for drafting and designing letterforms (*Theory of Type Design* 11). But from the responses of professional typographic designers, it is somewhat clear that typography does not fully involve the user during the design process—a standard occurrence in product and interactive design.

As technology grows, typefaces, in their natural state of evolving with it, must embrace the idea that they are becoming more technical and advanced in their design. Font files are no longer static, but versioned and living. Typefaces should respond to user preferences to help make them better rather than be the product of a few close associates or the indulgences of their creators. While this is not always the case for all typeface designs, it is especially true for typefaces that hope to gain global importance as a vessel for language.

Typography cannot be a club for the highly trained when it clearly holds such an importance in the very fabric of communication. As previously addressed, typography has barriers of terminology and history that are difficult for those not devoting their design practice or education to understand. To help aid the removal of this barrier, a new classification system that helps make typography more accessible to non-designers as well as making the user a more central component of the design doctrine surrounding typeface design and theory could be conceived.

Proposed New System of Classification

Jonathan Hoefler writes, “If there is a Holy Grail of typography it is surely the Omniscient Typeface Classification System, which will organize and index the complete typographical output of mankind” (201). Many attempts have been made to redesign the classification system, including the archival works of Central Lettering Record, a database from the era of the CD-ROM, that “involves using conceptual underpinnings...and a plane, formed by the intersection of a time-line on the one axis, and a list of identified typographic models on the other axis” (Hoefler 208). While this system sounds much more comprehensive, its usability feels like it requires advanced degrees to operate.

The Holy Grail of typography is a lot to strive toward, but a new classification system based on emotional rather than physical characteristics, countries of origin, and time periods would give typography a new accessibility as well as alleviate the problems with the current system involving overlapping categories.

Hoefler argues that “assigning type to discrete time periods also intimates that historical styles are visual explorations that have long since been completed” (205). To avoid the creative stifling of the existing system, typefaces could be classified as joyous, surprising, sarcastic, upsetting, satisfying, indifferent, or certain. Old standard physical terms like regular, bold, italic, or monospaced, extended, and condensed would no longer be needed as typeface designers will understand how these traits can be imbued within the design. Classification systems based on whether the typeface has serifs, and to what extent do they become pointy, leave the untrained person out of the loop when picking a typeface.

People use typography every day, but they are not aware of how to use it properly. This new system would give them a better understanding of what characteristics translate into the intended purpose of their use. Instead of choosing a typeface that looks pretty or is bold, they would choose a typeface that expresses formality, sympathy, or relief. Why should typographers force a layer of interpretation onto the users of fonts? Typefaces lack instruction manuals, but this system would adhere to the usability principle of recognition over recall and let users make informed choices when selecting a typeface by evoking universal emotions.

Many users experience typeface choice as a single dropdown menu of preloaded fonts and through semi-obscure interface elements like the ubiquitous B *I* U menu in their word processor or email programs. Occasionally a choice of individual weights is offered through an extended menu, but these choices lack the ability to convey the purpose of those designs. An interface that replaces the weight names and allows the user to pick from a range of emotional qualities instead would help the user express the content of their message or understand what they are reading. Changing the interface would not be too difficult to implement as it just restructures the options. Even the B *I* U menu could use a pictorial system to show common emotional expressions in the same way emojis and emoticons do. For users that desire more control over how much of each emotion a typeface could express, a system of ranged sliding inputs could make for easy adjustments (Figure 55).

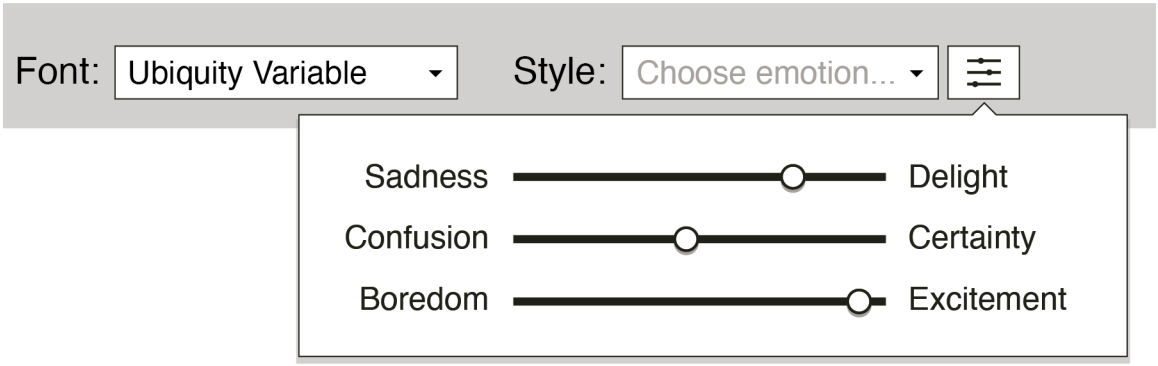

Figure 55. Emotional Typeface Selection Interface. Proposed interface for selecting typefaces on a sliding emotional scale within a common text editor.

This new classification system also would give more control to the user in terms of typesetting. Certain emotions may be best addressed using the space between letters rather than manipulating the letterforms themselves. For instance, designers will often increase the tracking or letterspacing to make words appear more formal or give them a better sense of hierarchy. Many word processing programs do not easily allow for this adjustment, but if it was designed into the style of the typeface the user could access the feature.

Foreseen issues with this system include more technical applications of typography. Some typefaces have alternate styles in order to maintain legibility depending on the color and size of the design. These completely physical differences exist to give better contrast when using a typeface on a dark background or to grant a subtle boost to hierarchy without changing the mood or feeling of the work. While the current classification system caters to the subtle typographic changes needed by professionals with extensive typographic understanding, most users of type have few concerns over page texture and hierarchy during daily use.

Another issue could be the potential for sending mixed signals while communicating when users fail to choose a typeface that matches their intended writing tone. As useful as it might be to include that intent through a font style, users may feel obligated to avoid neutral settings and oversaturate their writing with numerous fonts for every type of emotion expressed. The use of too many fonts in one work can make for a poor reading experience and shows immaturity in current communication design practices. Despite the potential downsides, the upside of having the general population more conscious of their decisions when communicating with type would add a positive awareness to typeface design profession.

A Typeface Prototype

The real change would come from the way typefaces are designed to support the range of emotions. The format with the most potential to support a typeface that would be easily operated by the user and allow for the nuance needed to express a wide range of emotional styles would be a variable typeface. Each axis of the typeface could house transformations that would align to the opposite emotions used in emotional testing in this and other examined research.

This typeface system can only be proposed at this time due to the lack of consensus on which emotions are expressed by certain typographic features. It would also be quite a design challenge to juggle all the variables that may have overlapping qualities. Does the x-height need to increase or decrease to increase the feeling of joy, and what if the feeling of surprise required the opposite effect applied to the x-height? Certain moods and emotions will undoubtedly be incompatible and variable typefaces would need a considerable overhaul in logic to prevent disastrous mutations of the letters.

However, variable typefaces can allow for specific changes on an individual character level. Through extended testing, results may yield that some letters are more amenable to perceived emotions than others, so only those certain letters may need to be manipulated to achieve the desired emotional response. Each character could be designed to respond to the axes in the variable typeface in different directions or to different degrees.

Another reason variable typefaces would be an ideal choice for an emotion-based type system is their ability to have mutable characteristics that are not completely on or off. Users would be able to dial in the amount of joy or sadness in their selected typeface without being completely at one end of the scale or the other. This would allow for subtlety in expression and give control back to the user to best match their tone of voice with the words they compose.

While a single typeface that could convey all the emotions would be ideal, this ideal is likely unachievable in practice. Robin Kinross discusses the idea of a universal typeface saying, "A typeface that meets all needs: of composing and printing techniques, of legibility, of aesthetics, of phonetic and semantic representation. At one stroke—or with a series of rationalized strokes—all special requirements would be solved. We could stop the endless, uneconomic devising of new forms" (*Unjustified Texts* 233). Like the way typefaces of similar style are grouped into type families, the emotional typeface would likely need multiple family members as well or even multiple distinct variations more akin to classification styles currently in existence. This would be a good way to prevent conflicting styles from overlapping as well as avoid any unsightly character designs that could occur when morphing from one emotional phase to another. Another

potential upside would be in keeping the fonts files more manageable as each family member would not need as many design nodes or points to adjust. Regardless of the exact format this font or family would take, the user remains at the center.

X. CONCLUSION

It is still unclear from this research if typefaces manage to possess intangible characteristics based on measurable attributes, but it is not coincidence that certain typefaces reach the highest levels of ubiquity. As typography and ubiquity are concerned, there are many factors that account for how popular a typeface becomes. Ubiquity comes from availability, prescription, affordability, economy, ease of use, globalization, and to some extent, user apathy.

While a deep understanding of typographic terms is not required for people to use typography, it is important to make typography more accessible if typeface designers do not always want to be the only stewards of their profession. The typefaces people choose are not a random act, but a conscious or unconscious decision influenced by the history of typography and the technology surrounding it.

Technology and typography move in parallel, and technology plays an essential role in making a typeface ubiquitous. Without repeatability, automation, and digital proliferation, typefaces would not have been able to change the way people visually communicate verbal language. New technologies will always push typography forward and trends will arise jostling the interests of typeface design.

Typographic trends often inform the way letterforms are designed. Understanding these trends help designers realize why certain typefaces can maintain a useful and popular status in the design community as well as in everyday use by the general population—even after the trends have changed. Trends help to explain why typefaces are both a powerful force in design movements and how the mistreatment of their revitalization can lead to negative impacts on the profession.

With emotional response as a basis for typographic design, it is still unclear if a comprehensive conclusion can be drawn between how letters make people feel and how they are shaped. Only with more testing can a definitive answer be determined.

Future Research

This study is only a foundation for developing the proposed classification system based on emotions, a comprehensive data set of typeface measurements, and a testable prototype for a variable typeface informed by user needs. Further research would include conducting more extensive emotional survey testing to try and find typefaces that stood out in individual categories so their physical properties could potentially be isolated for comparison, including testing different combinations of letters as another variable. Erik Spiekermann suggests, “The more characters in a word, the more chances there are to find the right letterforms to express its meaning” (Spiekermann and Ginger 47). The more typefaces that can be tested against their physical measurements, the higher the possibility of making concrete connections between the two.

A public database of collected measurements that is continually updated with the creation of new typefaces could serve two purposes: one being a way for designs to become more protected for copyright law through comparative analysis against existing entries, and the other would be to serve as an interface for typeface designers to anticipate emotional responses to their work. Once enough data is collected, a predictive algorithm could be developed to allow typeface designers to find out if their design will likely be interpreted in terms of emotion and mood. Further research could be conducted in ways to automate the measuring process of the typefaces, rather than relying on manual measurements.

Once a more meaningful connection has been developed between emotions and physical measurements, a prototype variable typeface could be constructed that utilizes the emotional slider interface to control forms of the letters. Testing this typeface would require a similar approach to the A-B testing method for popular typefaces but would instead consist of versions of the prototype against itself. If the outcomes match the predicted emotional responses, then the prototype could be considered successful. Until then, this research serves as information on how typeface designers might consider involving users directly in the design process.

How Can Typeface Designers Use This Information?

"Type designs carry all kinds of messages on top of their primary function" (Unger *Theory of Type Design* 20). This research and writing aims to also serve another purpose than its primary function. Taking a deep dive into the ubiquitous nature of typefaces can inform not only personal work, but the works of other typeface designers, either practiced or aspiring. More so than trying to convince others into a way of thinking, this research aims to contribute to the ongoing conversation about how typography impacts the world in ways that other areas of design are ultimately not widespread enough to cover. Typeface design, despite its ancient origins, is a relatively small area of formal education. The more time and effort designers spend on learning and understanding the consequences of produced work, the more interest will be generated from those outside the discipline.

Looking in depth at the physical properties of some of the most widely used typefaces aids in the understanding of their construction, even if their emotional properties are not readily apparent through measurements alone. Very rarely when people

see a typeface, do they see the individual components that make up the final design of the letterform. Once a font has been generated and distributed, all the information regarding its creation is solidified into a single mass, making it difficult to reverse engineer the exact method of construction. Hopefully and with careful measurement and analysis, a bit of the type designer's rationale can be extracted when it comes to understanding the feelings and emotions a font represents when applied to language.

Finally, it may feel like ubiquitous typography is somewhat elusive and stems from a matter of timing and circumstance. While this is very likely true, it should not be a disheartening fact. If anything, a popular typeface can come from anywhere as long as it keeps the reader or user in mind. A typeface designer should study the acclaimed typefaces, read the criticism and release notes, and learn from typographic successes and failures in order to create something worthy of embodying the language of the world.

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