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The following articles deal with the topics of legibility and readability within the field of typography for the graphic designer. They describe how type has had to grow along with the technological advancements that have been made in the past years. These articles discuss the differences within type for screen and type for print and gives specific tips on how to increase legibility and readability within your own work. It is important to understand why legibility and readability is so important. Relax and enjoy the following articles as they take you deeper within the meaning of legibility.
The essence of the New Typography is clarity. This puts it into deliberate opposition to the old typography whose aim was “beauty” and whose clarity did not attain the high level we require today. This utmost clarity is necessary today because of the manifold claims for our attention made by the extraordinary amount of print, which demands the greatest economy of expression.

- Jan Tschichold: The New Typography (1928)

**Digital Designs**

**A LOOK AT THE ROLE OF REAL TYPOGRAPHIC DESIGN IN EFFECTIVE CONTENT DELIVERY**

**BY STEVE BARTH**

**TYPOGRAPHY 101: FONTS MATTER**

The description of Typography 101 in the course catalogue says it all: “Good typography can improve comprehension by up to 500 percent … bad typography can render even the most beautifully written message incomprehensible.”

Ozcan Tekson, the Toronto graphic designer who now teaches the course at the Humber College Institute of Technology & Advanced Learning, is pretty sure the figure is an exaggeration, but he also is sure that typography “definitely and significantly enhances comprehension.”

Typography refers to the way that characters are shaped and arranged into the phrases, statements, ideas, and information that someone wants to convey to others. Graphic design changes the absorption properties of the meaning to be derived from the message. In modern parlance, Tekson says, those are choices about fonts, letter spacing, word spacing,
line spacing, and other proportions of graphic design.

Even before the invention of the printing press—or writing for that matter—knowledge was transmitted through rich media in terms of stories, songs, and performances. The ancient proportions behind our expectations for graphic design derive from those traditions and carry through on the modern page and the modern screen.

Tekson defines nine major criteria of layout: balance, dominance, contrast, space, flow, movement, proportion, composition, and coherence. “This is the visual storyteller of the layout,” he explains. “These criteria have been consciously used for thousands of years by Egyptians, Greeks, Renaissance artists, modern architects, sculptors, or painters. Even now, most of the norms we use today, such as European A4 or American Letter paper sizes stem from this heritage. Sometimes we like things, but we don’t know why we like them. The answer is mostly embedded in fulfillment of these norms.”

Today, typography comes into play whenever language is displayed: on paper, on the screen, in advertising, or in signage. For instance, Tekson points to studies made by highway workers to maximize the legibility of traffic signs. They search the maximum levels of perception by changing the typographic variables for effectiveness against driving factors such as weather conditions, speed, or distance.

Think fonts don’t matter? According to a news item carried by the British Broadcasting Corp. in 2002, an air traffic controller at a brand new £623 million control center in the U.K. directed a flight bound for Glasgow, Scotland, to Cardiff, Wales, after misreading the computer screen because the text displayed was too small. It was too difficult to distinguish between the location codes EGPF (Glasgow) and EGFF (Cardiff), according to confidential documents obtained by a computer magazine and cited by the BBC. Controllers at the Swanwick, Hampshire, control center also were misreading altitudes of some aircraft on their screens—for example, “FL300” instead of “FL360.” That’s the difference between 30,000’ and 36,000’.

LOST ART

The art, science, and craft of typography are thousands of years old. Today, more than 550 years after Gutenberg, anybody with a personal computer can self-publish, and anyone with an internet connection can be read by millions. But somewhere in the democratization of the displayed word, many of the traditional lessons of message and meaning have been forgotten. Documents have become digital and/or disposable things, and their authors neglect the ways that typography, layout, and editing affect what we learn from and what we do with the information and ideas that we read on a page or screen.

There are two significant trends at work: On the one hand, “printed” information is increasingly read on the screen instead of on the page; on the other, the “printing” is increasingly done by a knowledge worker rather than a graphic artist, in terms of both design and production.

Ellen Lupton, curator of contemporary design at the Cooper-Hewitt National Design Museum in New York, complained in an article originally published in Print magazine that there is almost a century of scientific research in various fields testing “typographic efficiency”—all of which seems to be ignored by many graphic designers practicing today. This is certainly ignored by the average knowledge worker churning out documents and data. It is definitely ignored by too many of the people designing websites, software interfaces, and longer PDF documents posted for downloading.

Cognitive psychologists, information designers, human-computer interaction researchers, and other investigators study elements of typography against measures such as word recognition, legibility, readability, and comprehension. Lupton notes that the findings of this research break down into two ultimate evaluations: First, legibility rates how easy or difficult it is to recognize words and letters. Second, and more importantly, readability is an evaluation of how easy it is to understand the text. Readability is objectively measured as the combination of reading speed and comprehension.
Obviously, language and writing skills have a lot to do with readability in terms of prose. But in a world of structured and unstructured data and information, typography’s visual language is more and more important in terms of readability. In the language of knowledge management, it might be argued, comprehension is the key to turning data and information into knowledge to support learning, innovation, and decisions. Meanwhile, maintaining comprehension without sacrificing reading speed may be a key to productivity in modern information-intensive enterprises.

The traditional best practices of legibility and readability, though still subject to debate, are that fonts are more legible when they use serifs—the little strokes and flourishes on a character—compared to sans serif fonts. Consider two popular fonts:

Times has serifs; Helvetica does not.

Reading speed also improves when proportions of type size to line spacing are set at 120% or above, but line length also plays a part in this equation. And although most people tend to assume that fully justified text blocks look more professional, the average word processing program leaves such uneven gaps from line to line that “ragged” left-justified text is less confusing. (Experts say the “ragged” look provides visual interest to the page, but it might also provide a typography the eye can use to keep track of where it is on the page.)

PLEADING THE CASE
Consider an example of how important typography is in one knowledge-worker intensive profession: the law.

The U.S. Court of Appeals for the 7th Circuit, which has jurisdiction over parts of Illinois, Indiana, and Wisconsin includes in its “Federal Rules of Appellate Procedure” specification for formatting submitted documents including paper size, line spacing margins, typeface, and type styles to make documents more readable. The 7th Circuit published Requirements and Suggestions for Typography in Briefs as guidelines in order to assist attorneys’ compliance for producing and presenting briefs, motions, appendixes, and other papers to the judges. The guidelines, and those of other courts, cover basics such as preferred fonts (serif book fonts), headings (complementary sans serifs), white space (50%), justification (left), and emphasis (avoid underlining or all-caps):

- Judges of this court hear six cases on most argument days and nine cases on others. The briefs, opinions of the district courts, essential parts of the appendices, and other required reading add up to about 1,000 pages per argument session. Reading that much is a chore; remembering it is even harder. You can improve your chances by making your briefs typographically superior. It won’t make your arguments better, but it will ensure that judges grasp and retain your points with less struggle. That’s a valuable advantage, which you should seize.

Raymond Ward, an appellate lawyer in New Orleans who writes The (New) Legal Writer blog covering topics related to effective written communication in the legal profession, concedes: “Lawyers can learn a thing or two (or three) from other disciplines about document design. Most lawyers pay only as much attention to that as they need to for compliance with court rules.”
Courthouse guidelines also point out that if attorneys want the judge to be comfortable reading their arguments, they should compare their documents more to books than to newspapers. This means that they should rely on fonts designed for books, such as Century, rather than fonts originally made to fit the maximum number of words into a newspaper column, such as Times.

**FROM BOOK TO SCREEN**
Knowledge workers get more and more of their information and ideas from the computer monitor instead of from printed material (or from face-to-face conversations if you include the various forms of messaging).

“On-screen typography is far from being an exact science, but just like its counterpart in meatspace, it is intended to get someone with a limited attention span to grasp your message,” so argues Tomas Caspers, a freelance new media developer based in Cologne, Germany, in an article for Webpage Design for Designers. “Certain factors that can either improve or worsen the reader’s experience or success--factors that have been known for centuries and which are so basic that they apply to any medium, be it dead trees or CRTs.”

But Caspers points out that there is a significant difference in the attention span of a web surfer who typically reads 10-20% slower on the screen than when reading on paper. “It becomes obvious that text has to be set very carefully when your paycheck depends on the user’s understanding of this text.”

Many computer fonts are adaptations of traditional type designs that may be centuries old. But at a resolution of only 72 pixels per inch, the bit-mapped environment of a computer screen doesn’t have the subtlety to present most publishing fonts in their best light--resulting in fatigue for the reader. In general, Caspers suggests that screen gems need wider, more open shapes set in shorter lines with greater spacing (leading) between the lines.

For example, the updated old standby font, Times New Roman, isn’t ideal either for screens or for most paper documents. Its ancestors were developed to maximize the number of words that would fit into a column on a newspaper page. Moreover, although serif fonts are generally believed to accelerate word recognition, Times serifs tend to fall off due to the bitmapped resolution of computer monitors. Compare the on-screen legibility of Times to Georgia and Verdana, two fonts designed specifically for on-screen legibility by typography icon Matthew Carter in 1996, which have become standards of Microsoft’s preinstalled font pack in Windows. (Carter was a co-founder of the digital type foundry Bitstream.) With Windows Vista, Microsoft released a host of newly designed screen-compatible fonts such as Cambria and Calibri.

In 2006, The New York Times adopted Georgia for its website. Blog writers also have shown a preference for Georgia in templates for blogging applications such as Typepad. Unfortunately, most blog readers are using RSS aggregators, which are stripping out the intended formatting.

**USING USABILITY RESEARCH**
The Software Usability Research Laboratory (SURL) in the Human-Computer Interaction (HCI) Laboratory of the department of psychology at Wichita State University provides usability research, design, and testing to corporations ranging from Microsoft to Cessna Aircraft. Its scientists studied the effect of different fonts, line lengths, multiple columns, etc., on reader perceptions and cognition.

For example, they studied how the chosen fonts change reader perceptions of the author and/or of the material. They concluded that typefaces can reinforce, conflict with, or leave perceptions unchanged. The fonts they used were Calibri, Comic Sans, and Gigi. (Perhaps not surprisingly, people got low scores for knowledge, believability, maturity, professionalism, and trustworthiness when they used Gigi in their emails.)

Another SURL study, by J. Ryan Baker, illustrates how assumptions
about printed page design translate into screen displays. Tests of reading performance and satisfaction found the following:

- Longer line lengths generally facilitate faster reading speeds.
- Shorter line lengths result in increased comprehension.
- The optimal number of characters per line is between 45 and 65.
- Paging through online text generally results in better comprehension than scrolling.
- Reading speed is faster for both single and multiple columns, but preference is for multiple short columns.
- Left-justified text is read faster than full-justified text.

Put another way, while we all learned penmanship in grade school, maybe we should have learned a little typography too. (Perhaps this can be incorporated in today’s students’ keyboarding classes.) The online reading experience continues to evolve, driven by those few sites that use readability to enhance usability. In embracing all things digital, we have to be careful not to design designers out of the process.

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In print, serifs are thought to enhance readability and legibility because they help readers discriminate the ends of letters and make the form of each letter more complex (Arditi, Cho 2005). This is why newspapers and magazines generally use serif lettering. However, with the advent of the web, new questions were raised as to whether serif font was easier to read than sans-serif font. Early evidence suggested that serifs should be avoided online. However, recent studies have shown that using serif fonts online may not be as detrimental to the online reading experience as previously thought. In fact, depending on the purpose for which a serif font is deployed, it might have some advantages over sans-serif font. In addition, recent research has shown that other factors such as x-height, may have clouded serif vs. sans serif thought. X-height often remains standard for serif but not sans-serif fonts.
In a recent study of serif legibility and readability, Arditi and Cho evaluated the use of serifs with respect to reading speed, letter recognition, and continuous reading on paper. The researchers created their own fonts with variable strengths of serifs (Figure 1). They study found that for small letter sizes, serifs may actually interfere with legibility. However, the study also found that the spacing between letters may be more important than serifs when determining legibility. On the whole, the researchers found that there was a negligible difference in the readability and legibility of serif vs. sans-serif fonts. In fact, the authors suggest that letter spacing may be more important than the presence of serifs in increasing legibility and readability (Arditi, Cho, 2005).

The role of x-height in determining font readability was studied in the context of at what fonts children ages 9 to 11 read best. The researchers found that x-height plays an important role in determining readability (Bernard, 2002). In the study, 12-point Times and Courier had the smallest x-height, while 14 point Arial and Comic had the largest. Arial and Comic were both perceived by the research subjects as being easier to read than Times. In addition, 14 point font was also seen as easier to read than smaller fonts. In the end, the researchers found that one of the perceived advantages of serif fonts, which is that serifs act as letter distinguishers, may be irrelevant on the web. In fact, the serifs may start acting as visual noise. In this study, sans-serif were preferred.

In a different research paper published by Bernard (Bernard, 2003), the researchers compared the readability and legibility of Times New Roman (serif) and Arial (sans-serif) fonts by looking at typeface, size, and format. For format, the researchers compared anti-aliased and dot matrix text. Dot matrix text has a jagged, staircase look on its edges while anti-aliased text adds color contrast, usually gray, between the font and background. The major finding of the study was that people prefer 12 point Arial font. Since Arial has a larger x-height than Times New Roman, it is typically displayed at a smaller size. The participants indicated that Times New Roman felt harder to read than Arial. There was no significant difference in the readability of serif and sans-serif fonts. In terms of dot matrix vs. anti-aliased text, the researchers found that anti-aliased text may be more readable than dot matrix text at larger font sizes.

In a later study, researchers found that whether or not serif makes a difference may be tied to task. For instance, when reading long academic papers, sans-serif may be preferable (Dyson, 2001). In this study, they also found that readers showed a strong preference for Arial, a sans-serif font, over Times, a serif font. Although there was not evidence that Arial led to more effective reading, the researchers advised going with the more popular, comfortable font (Dyson, 2001).

GUIDELINES

• Pay attention to the spacing between letters and x-height when picking a font.
• Make sure the font you choose does not have an unusually small x-height.
• For larger fonts, choose anti-aliased text over dot matrix text.
• Make conscious decisions about whether to use serif or sans-serif font.
• For longer texts, use sans-serif fonts. For shorter texts, use serif or sans-serif fonts.
ENEMIES OR FRIENDS?

Typeface legibility and economy — are they adversaries or can they work together? Their relationship is filled with tension. Common wisdom says that efforts to increase legibility can reduce the amount of text on a page, whereas techniques used for efficient use of space can jeopardize legibility. Is this the real situation? This essay looks at some of the variables that affect legibility, particularly those under the control of the type designer. From this foundation, it continues with a summary of techniques used in the design of economical typefaces throughout type history and evaluates their impact on legibility. The focus is primarily on Roman text types, even though others (sans-serif, blackletter) can be quite compact and legible in their own right. Extreme experiments in legibility or economy are also not covered as they have little practical value.
WHAT MAKES A TYPEFACE LEGIBLE?

Communication through the printed page requires the reader to translate symbols into meaning. Legibility refers to how easily this critical process is performed. Ovink defines it as ‘the ease and accuracy with which a reader is able to perceive the printed word.’" Although a case can be made for using two separate terms — legibility (visual perception) and readability (comprehension) — this essay will not make such a distinction. Legibility has been studied using tests of reading speed, comprehension, ocular movement and many other criteria. The sheer number of studies on legibility highlights its importance. It has also been problematic, as each investigation redefines legibility according to a new standard. The result is broad disagreement as to what makes text legible. In reality, there are too many variables that contribute to legibility to determine a set of hard and fast rules for maximizing it. It is possible, however, to determine some general guidelines that can help to create legible text.

One area of agreement among many researchers and writers is that typeface legibility is strongly, if not primarily, influenced by choices made in typographic layout and not by typeface characteristics. It is quite easy to design a page using a generally legible typeface (such as Times Roman) and yet create quite illegible text, or text that is poorly suited to its intended purpose. Further discussion of layout and use techniques falls out of the scope of this essay but cannot be discounted.

There are some typeface characteristics, though, that lend themselves to more legible text than others. These are the areas that can be controlled by the type designer — color, weight, size, distinctive features and others. Through careful attention to these considerations, the type designer can make it easier for the typographer to create legible text.

ASCENDERS, DESCENDERS AND X-HEIGHT

It has been suggested that x-height may be the most important factor in typeface legibility, particularly in small sizes. Letters with ascenders or descenders are critical for word shape and letter recognition. Long ascenders and descenders help to distinguish characters from one another, such as h and n. Smaller x-height also increases the white space between lines and ‘emphasizes the line-image of the typeface.’ Types with very large x-heights can be slower to read, probably due to weaker word shapes.

Nevertheless, research has concluded that typefaces with larger but moderate x-heights are generally more legible at small sizes and under some reproduction methods. It seems that the increased x-height gives increased legibility like that of a larger type size. Types that differ somewhat in style, such as Times and Perpetua, can even have similar legibility if their x-heights are equalised.

CONTRAST

There has been little research into contrast and its relationship to legibility. Tinker found that increased contrast did not enhance legibility. On the contrary, thin lines can actually diminish it.

Though not directly supported by research, designers have distinct opinions on contrast. Weidemann wrote that ‘Strong contrasts […] result in a choppy typographic appearance and reduce reader recognition of distinctive letter characteristics.’ Tschichold and others, though, were of the opinion that abandoning contrast would harm legibility.

COLOR AND STROKE WEIGHT

A summary of various studies showed that there is no clear difference in legibility between regular and bold weights, although readers preferred bolder faces. It has been suggested that extremes of color should be avoided and that ‘The optimal stroke width for individual letters should be about 18% of the total width or height of the letter.’

SERIF DESIGN

Why have serifs at all? Common wisdom, oft repeated, is that serif faces are inherently more legible than sans-serif ones. Many studies support...
this view, although their validity is sometimes questioned. The bulk of research, however, shows a mixed result when viewed as a whole.

The shape of serifs can influence legibility. Tinker found that long, heavy serifs (such as in slab-serif types) can decrease legibility. In certain production environments, particularly phototypesetting, bracketed serifs retain their shape best, increasing letter distinction and legibility.

DISTINCTIVE CHARACTER FEATURES
Legibility is higher in typefaces with strong distinctive character shapes. Foster recommended emphasizing features that ‘promote rapid and accurate letter discrimination.’ Because the top half and right side of letters seem to be most important for letter recognition, they are good places to highlight distinctive characteristics. One criticism of Modern style typefaces is that the design created too much uniformity of letter shape.

COUNTER SHAPE
Counters — the white spaces inside letters — are very important. Watts and Nisbet found compelling agreement among various studies that ‘the greater the relative area of the enclosed space within a letter, the greater its legibility’. For example, e can be made more legible by increasing the internal white space.

They also point out that other techniques to increase legibility (bold print, higher contrast) can actually decrease legibility if they reduce internal space. Shape is also important. Because counters give the eye important clues in letter recognition, varying their shapes can also help increase distinctivity and legibility.

FAMILIAR FORMS
The most terse comment on legibility is attributed to Eric Gill: ‘Legibility, in practice, amounts simply to what one is accustomed to.’ Although humorous, it has been confirmed by research. Familiar forms are more legible than unfamiliar ones. So it seems best to remain close to basic, familiar shapes when trying to maximize legibility.

THE NEED FOR ECONOMY
The desire — and need — for typeface economy is not new. From the very beginnings of writing symbols on media, there has been pressure on the scribe to fit as much text on a page as possible. The cost of material has always been a concern, but is joined by the desire to publish compact, portable editions. These concerns live on today as web designers seek to fit as much content as possible within one window size to minimize scrolling.

This concern resulted in interesting experiments in writing economically, first on the manuscript page and later in type itself. Blackletter scripts, for example, are a direct result of attempts to take an existing script (in this case, later Carolingian hands) and find creative ways to fit more text on a line, and more lines on a page.

Designers of Roman type throughout history have applied these and new techniques to their realm. Their concern for space conservation initially focused on vertical character alterations that allowed more lines of text on a page, but soon affected the most basic parameters of letter shape. New techniques were developed not only to make letters more compact, but to make smaller letters more legible.

SHORTENED ASCENDERS AND DESCENDERS; INCREASED X-HEIGHT
Initial attempts at economical type began with casting type of one size on the body of the next smaller size. The resulting economy was gained because lines of text were closer together and not a result of any actual changes in letter design.

Soon, the character shapes themselves became malleable. Pierre Haultin, sometime between 1557 and 1559, was the first punchcutter to experiment with enlarging the x-height of letters. His Philosophie
width relationship should be oblong, not square, and the body of the type (x-height) must not seriously encroach on the ascen-

descenders were sometimes changed to such an extent that letters took on different forms. Ionic, The first of Linotype’s Legibility Group, illustrates some of these transformations. The lower stem of p is shortened considerably. The ascender of b is quite short. The link of g is raised above the baseline, giving it a cramped and twisted look. The counter of y is shrunk both horizontally and vertically to allow enough room for the tail. Although these features aid economy, the departure from traditional shapes can actually threaten legibility when taken to such an extreme. (Figure 2)

Romaine had an x-height only slightly larger than the common Garamond of similar size, but large enough to make a difference in perception. The increased x-height improved legibility, allowing text to be set at a smaller size, yet be as readable as larger sizes of other faces. (Figure 1)
Shortened descenders, however, do not need to harm legibility. Skilled designers such as Dwiggins and Unger agree. Descenders can be designed in ways that are not quite so radical. Unger’s own Gulliver is a good example of this, and will be discussed later in greater detail.

There is a limit to the economic effect of these transformations. Unger comments that ‘too often a large x-height requires extra leading, thus nullifying most of the saved space’. Harry Carter agrees: ‘Several contemporary 12 point types fail because their ascending and descending strokes have been shortened until there is not enough white between the lines, and leading only accentuates their deformities.’ This was written in 1937, during the great popularity of the Legibility Group.

There is clearly a need for balance when adjusting x-height, ascenders and descenders to both maximize economy while retaining legibility. Watts and Nisbet suggest that this balance can be attained by shortening descenders and lengthening ascenders. This is, in fact, exactly what Linotype did with Ionic’s very popular successor, Excelsior. (Figure 3)

Along with the x-height, most of Excelsior’s lower-case letters (those without ascenders or descenders) were reduced, resulting in greater overall economy. Alphabet length was reduced from Ionic’s 139 points to 132 for the 9 point size. Excelsior also seems more legible and pleasant to read.

CONDENSED FORMS
Excelsior was not the final word in economical, legible typefaces. Early criticism of the first Legibility Group faces was that the large, wide, lower-case forms worked against economy, especially in narrow column widths, driving newspapers to desire more condensed forms. This desire was nothing new.

The use of condensed forms as an economic design element began in the eighteenth century and reached its peak with the Didots, where narrow forms became standard. Since then, narrower forms have been used in faces from many typographic traditions, commonly for the sake of economy. This is not Olympian, a series from Mergenthaler, a true design departure, traditional only in its legibility under newspaper conditions. This is Olympian, a new series from Mergenthaler, a true design departure, traditional only in its legibility under newspaper conditions.

Figure 6. Corona and Olympian 9 pt. compared.

Figure 7. Unger’s Demos.

Figure 8. The Times New Roman 6 pt., 12 pt. and 18 pt. faces shown enlarged to similar size.

Figure 9. Monotype Plantin 110 and Times Roman 327 compared.

Figure 10. The ‘M-formula’ as used directly in Dwiggins’ Experimental No. 223 and indirectly in later typefaces, Tracy’s Telegraph Modern and Carter’s Charter.

Clark, an independent when it comes to politics, is not alone in his skepticism. As George W. Bush and Al Gore argue over who has the better plan for dealing with the huge surpluses that experts say are coming,
“All these features work together to create a pleasant, readable face with no strong sense of compression.”

of economy. The effect of condensed forms on legibility has not been objectively studied, but Weidemann suggests that extreme compression can cause ‘characteristics of individual letters [to] fade into sheer verticality’. An example using Slimbach’s Minion typeface makes this clear. (Figure 4)

Minion was designed specifically as digital type and produced with Adobe Multiple Master technology. Width is adjusted not by brutal mathematical compression, but according to parameters set by the designer. Here, the width axis of the font is set to the minimum allowed (about 87% of normal). Despite Slimbach’s impressive efforts to give his old-style face a successful condensed version, it still begins to show some ‘sheer verticality’.

So how does one design condensed forms successfully? In early 1942, during the time of conservation efforts due to World War II, W. A. Dwiggins began a series of experiments toward the design of a highly economical face. At the same time a request was made for a face with a Spanish flavor. The two projects became one, and the result was Eldorado. (Figure 5)

Dwiggins was not new to the idea of economical types, but here he focused more attention to economy through condensed forms, unlike the vertical adjustments common in newspaper types. Although never very popular, Eldorado illustrates some useful concepts in economic design.

The greatest danger in condensed design is to compress everything Dwiggins, on the other hand, carefully chose which letters to compress. Those letters which naturally respond well to compression — a r s t — are thinned to the extreme, without diminishing critical features. Note the strong form of a and the sharp shoulder on f. Letters with counters, however, such as b d g o p q are given generous space. The diagonal strokes on v w x y are steep, making them narrower. He is also careful not to let the internal space of m and n get too small. All of these features work together to create a pleasant, readable face with no strong sense of compression.

Although they can help, condensed forms are not absolutely necessary for economy. Corona, one of Linotype’s most successful newspaper types, has a condensed appearance. A later face, Olympian, based more on an old-style model, feels open and relaxed. Yet it is just as economical as Corona, if not more so. Other economical techniques can substitute for condensed forms. (Figure 6)

**HORIZONTAL STRESS**

Old-style forms with angled stress do not easily handle compression. In his typeface Demos, Gerard Unger chose to give all characters a horizontal stress. One effect of this is that the forms can then respond more gracefully to both careful condensation and raw mathematical compression. In his article describing Demos, Unger listed other consequences of this design: ‘Such an effect also results in wide open counters, giving the typeface a large look and allowing for a choice of type size one or even two sizes smaller than is possible with most current designs.’

It is also possible to mix the two types of stress and benefit from both the openness of the horizontal and the distinctiveness of the angular. This was common in some Garamond designs and can even be seen in more recent types such as the Olympian example. (Figure 7)
**SMALLER, LIGHTER CAPITALS**

Demos is also illustrative of another technique for economy — smaller, lighter capitals. They are slightly shorter than the ascenders, are similar in weight to the lower-case letters (but not quite as light), and are narrower than most capital designs. The visual effect is smooth. Stuart Gluth described a similar effect in his typeface Roxane: ‘The capital letters […] are narrow, the letter often being only as wide as is necessary to carry the profile, and light, barely stronger than the lower case, so as not to interrupt the reader’s eye.’ While this is a pleasant touch with a minor effect on economy in English, it is particularly economical with German texts, or any that use capitals widely.

**TECHNIQUES FOR SMALLER SIZES**

Until the days of phototypesetting, type could only be used at the sizes for which it was cut. Designers created type for a particular size. Economy was increased by using smaller and smaller type. To make this successful, designers found ways to make smaller type more legible. Harry Carter described these well in his article on ‘Optical scale in typefounding’.

Some of these techniques can be seen in the design of The Times New Roman — a profoundly economical and legible face. By comparing the 6, 12 and 18 point sizes, the techniques used for the smaller sizes become clear. Note that the smaller sizes are actually less economical in width. Economy comes from the ability to set smaller type more tightly yet certain legibility. Plantin, the type used as the primary model for Times, is also shown for comparison. (Figure 8)

- **Wide forms** in smaller sizes provide more space for the important characteristics of each letter, especially the counters so critical for legibility.
- **Increased letterspacing**, as seen here in the 6 point Times, has been used since the days of Haultin to make smaller sizes more readable.  

**Reduced contrast** was a hallmark of most newspaper faces during the early twentieth century. Fine hairlines (as can be found in larger sizes of Times) did not reproduce well in most printing environments of the time. The thickening of thin strokes gave the letters a stronger, more durable image. Although it has generally strong contrast, even Times illustrates this technique in its smaller sizes. Note the thicker shoulder and crossbar in the a, the bottom of b and the right diagonal of y. **Stronger overall color** is quite common for smaller types. This is quite evident in the 6 point Times Roman and is reminiscent of Plantin.

- **Solid, magnified serifs** were also an element of Plantin, but one that did not carry over into Times, except only slightly in the 6 point size. (Figure 9)

**FOCUS ON DISTINCTIVE FEATURES**

In Eldorado, Dwiggins highlighted distinctive features with great success. Carter calls attention to other specific examples of this emphasis and argues that “The eye reads only the distinguishing features of the letters, and so the distinguishing features should be stressed in proportion to the difficulty of reading.” This is essentially a legibility issue, but the type designer may need to make compromises when designing economic faces, and it is important that distinguishing features not be lost in the process.

The ‘M-formula’ was a specific technique developed by Dwiggins that highlighted distinctive features. It fooled the eye into seeing curves that did not exist by accentuating features with strong, almost angular lines. When highly reduced these angles produced the effect of curvature. It was most effective in 7 point or smaller type, but at 10 point or larger the strong features became too jarring. Although a full implementation of the formula in a face was never completed, its influence lives on in faces such as Telegraph Modern and Charter. (Figure 10)
Are legibility and economy adversaries? No, they do not need to be so. Techniques used to improve legibility, such as the use of wide forms, can actually encourage economy by allowing smaller sizes to be used. Economical techniques, such as condensation of certain forms, can make text easier to read when applied judiciously. The key to harmonizing the two is balance.

The type designer needs to understand the effects of every decision on both legibility and economy. Questions need to be asked: How much can I shorten these descenders before the letters become misshapen and distracting? Will this really allow lines to be set more closely? Or will the color become too heavy and require extra leading? The answers are heavily dependent on eventual usage. Techniques appropriate for 6 point type do not apply to a book face. The publishing environment, including paper quality and reproduction process, may make certain requirements on the typeface. There are no simple guidelines for legibility or economy that apply in every case.

Gerard Unger, in his Gulliver typeface, manages to deftly balance legibility and economy. He also does so in ways that are appropriate for the intended purpose — newspaper production. (Figure 11)

This example shows Gulliver in use, mathematically compressed and tracked tightly. The x-height is large but reasonable. Capitals are thin, short and blend smoothly with the lower-case. Descenders do not immediately seem short, but are actually in the same range as other newspaper faces. Ascenders allow enough white space and are balanced well with descenders, making the whole typeface appealing to read.

Color is even and strong, but without great contrasts. There is, however, enough contrast to give character and distinction to individual letters. Stress is primarily horizontal and survives compression quite well. Remnants of angled stress in letters such as c d e p make them more distinct. The letterforms are somewhat condensed, but not obviously so (although this compressed version enhances that aspect). Counters are open, as are the forms of a g c e. The first two of these letters also retain familiar two-story forms.

Unger also highlights important characteristics of other letters. The design of t emphasizes the curve at bottom. There are strong terminals on the ends of y r f. He also uses a thin form for s that aids economy without sacrificing legibility. Serifs are wedge-shaped and hold up well in reproduction, but are not too long. All of these characteristics make Gulliver a successful face for newspaper production and one that attracts the reader.

With Gulliver, Unger has proven that balance is possible and successful. Through careful experimentation and a thorough understanding of the issues and techniques, a type designer can create a typeface that is highly legible, yet economical. Kurt Weidemann, in his essay on Biblica, eloquently summarizes the experience of designing such faces:

“When the opportunities of an enlarged x-height and a condensation of the letterforms have been carried beyond a safe point, ease of reading and recognisability of character forms decreases rather than increases. To reach that limit without transcending it is the art of the contemporary type designer.” 52
Endnotes

3 Watts and Nisbet, p. 13.
7 Watts and Nisbet, p. 31.
10 Herbert Spencer, Linda Reynolds and Brian Coe, The effects of image degradation and background noise on the legibility of text and numerals in four different typefaces (London: Readability of Print Research Unit, Royal College of Art, 1977), p. 1; Poulton, p. 158.
11 Spencer, The visible word, p. 25.
13 Jan Tschichold, Of what value is tradition in type design? in Typographic Opportunities in the Computer Age, ed. by John Dreyfus and René Murat (Prague: Typografia, 1970), pp. 52–55 (p. 52); Watts and Nisbet, p. 30.
14 Spencer, p. 31.
16 Ole Lund, 'Why serifs are (still) important', Typography Papers, 2 (1997), 91–104.
17 Spencer, p. 25.
18 Weidemann, p. 7.
20 Watts and Nisbet, p. 37; p. 33.
23 Spencer, p. 11.
24 Watts and Nisbet, p. 33; p. 38.
27 Ibid.
28 Types 29 and 26 of Christopher Plantin's Index Characterum 1567, in Hendrik D. L. Vervliet and Harry Carter, Type specimen facsimilies II: reproductions of Christopher Plantin's Index Sive Specimen Characterum 1567 & Folio Specimen of c. 1585, together with the Le Bé–Moretus Specimen c. 1599 (London: The Bodley Head, 1972).
33 p. 31.
34 Linotype news faces, p. 2.
35 Gürtler and Mengelt, p. 136.
36 Morison, pp. 25–38.
37 p. 8.
39 p. 11.
41 'The design of a typeface', p. 141.
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"Legible" by Gerard Unger
"The Legibility of Typefaces for Readers with Low Vision: A Research Review" by Elizabeth Russell-Minda, Jeffrey W. Jutai, J. Graham Strong, Kent A. Campbell, Deborah Gold, Lisa Pretty, and Lesley Wilmot

COLOPHON

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