

Typeface Drawing and Design. Aesthetics and Readability

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Abstract

Since the invention of printing, typefaces simulate the appearance of two writing procedures closely linked to manual skills: the uppercase of stone inscriptions and the lowercase of humanistic calligraphy. Typography was born with an 'original sin', which numerous treatise writers take care to legitimize through rigorous geometric constructions to support the graphic design of each letter. From the Renaissance to the twentieth century, the evolution of styles and printing techniques is slow, and even the figurative avant-gardes have proceeded in small steps: typographic design is a conservative art, it prefers to emulate or refine previous experiences rather than innovate. In the sixties of the twentieth century, photocomposition dematerializes the techniques of engraving and casting, inducing some designers to experiment with shapes that are easily adaptable to the row-column system. Twenty years later, the Post-Script revolution and the spread of vector software based on spline curves bring drawing fonts closer to manual skills. By hybridizing tradition and experimentation, font design opens to the countless possibilities offered by new media.

Keywords: font, calligraphy, typography, readability, dysgraphia.

Introduction

Phonetic writing is a conventional way of fixing signs that encode sounds on a medium; the sounds, in turn, refer to concepts elaborated by the mind. Over time, handwriting has developed techniques based on rigorous procedures but with the approximations inherent in gestures and extemporaneousness. Printing, on the other hand, is based on the sequential arrangement of predefined signs (characters) whose shape is engraved in the metal according to a meticulous design.

Each writing must be legible; but being characterized by a form, it also has a figurative value and is always, inevitably, an image. These two aspects have favored the development of two opposing positions [Jury 2007, pp. 14, 70]. The first refers to a pragmatic and instrumental vision of writing; the

second considers typography an art endowed with a value that goes beyond legibility and, therefore, can express a precise aesthetic. Both positions are further divided internally between supporters of a design that refers to the tradition of Renaissance typography, in turn derived from humanistic calligraphy, and the followers of a radical renewal, capable of overcoming the sound-sign binomial and prefiguring –al ways through the control of the drawing– new alphabets.

Power to the hands: stonecutters and scribes

At the base of the design of typefaces there is manual writing, which in the West is based on alphabets

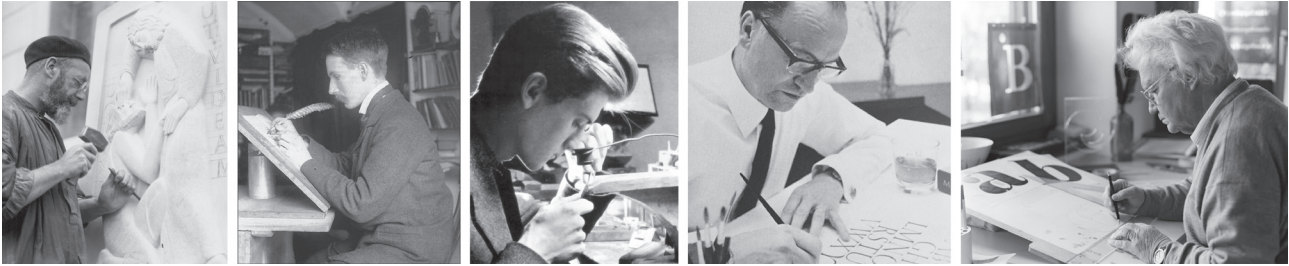


Fig. 1. Hand drawing tools for characters: chisel (Eric Gill), quill (Edward Johnston), burin (Matthew Carter), brush (Hermann Zapf), pencil (Adrian Frutiger).

that can be traced back to two families: 'archigraphies' and 'calligraphies' [Polano, Vetta 2002, p. 19]. The first group includes writings obtained by subtracting matter from a hard surface by means of a rigid instrument; the graphic result is the uppercase alphabet, which has evolved very slowly as it is linked to durable supports and exposed to view for a long time. Calligraphies, on the other hand, are obtained quickly, in an additive way, by depositing a pigment with a soft instrument on a light support; they correspond to lowercase characters. The uppercase, typical of stone inscriptions, has very differently shaped and clearly separated letters. The lowercase is typical of smaller scripts, has rounded letters and connected to each other to allow a more fluid tracing. Furthermore, the lowercase letters are very similar to each other and, to be more easily recognized, they are equipped with additional graphics (the ascending and descending strokes). Seven centuries after the invention of mechanical printing, handwriting –with its many techniques– is constantly practiced by both traditionalists and artists who are more sensitive to the charm of modernity (fig. 1).

Movable type printing was born around 1450 and favored the standardization of writing styles in use at the dawn of the Renaissance. Gutenberg's 42-line Bible punches were engraved according to one of the four calligraphic styles practiced in Germany in the 15th century, called Textur [1]. Letterpress printing spread rapidly throughout Europe; at the end of the 15th century, the great printing schools had already established their own aesthetic standards. Typeface designers, rather than develop an original sign system suited to the fledgling technology, strive to reproduce handwriting. Over time, and with great opposition, the Italian

school will succeed in imposing the Latin alphabet, an original reinterpretation of the style used in classical antiquity [2]. The press, therefore, was born thanks to a formal compromise; it hybridizes archigraphy and calligraphy, allowing a series of opposites to coexist (hard and soft, addition and subtraction, uppercase and lowercase, hand and machine) [3]. Despite the rapid spread of typography, calligraphy continues to be practiced profitably by writing professionals for at least another three centuries [4].

Ethics of emulation

The close relationship between typeface design and handwriting has at least three reasons. The first is linked to communication: imitating an existing writing allows easier reading and more effective understanding. The second is ethics: recognizing the value of a centuries-old tradition. The third is economic: to prevent innovation from failing, with the inevitable economic consequences (which happened to Gutenberg himself, who was forced to sell the presses and almost all the printing material to creditors as early as 1455).

The uppercase Latin alphabet, as we have seen, has separate characters; they are based on the development and variation of three primary forms: the square, the circle, and the triangle. The circle is the static figure par excellence, an expression of maximum balance. The square is a versatile figure; it can express static equilibrium, dynamic equilibrium, or imbalance, depending on whether its axes are in the horizontal/vertical direction, inclined at 45° or generally oriented. The triangle denies the simultaneous presence of horizontality and vertical-

ity and therefore always expresses dynamism (fig. 2). But even the lay scribes made use of rigorous geometries. Especially from the thirteenth century, with the establishment of the first universities, the art of writing ceases to be the exclusive patrimony of the religious and the treatises on calligraphic technique spread, rich in illustrations relating to the ways to move the hand correctly and trace the letters geometrically (fig. 3). The clear separation of characters also adopted from lower-case in round humanistic calligraphy can be considered an anticipation of movable type.

Almost all the typographers of the past have reworked pre-existing designs, perfecting them, and sometimes adapting them to geometric constructions that refer to symbolic, esoteric, and religious values. In 1509 Luca Pacioli draws an uppercase alphabet, defined by himself *Alfabeto Dignissimo Antico*, inscribed in the square and based on the golden section (fig. 4); he will use it, among other things, for the titles and drop caps of *De Divina Proportione*.

Pacioli's contribution to typography is not limited to the use of harmonic proportions. He reduces the ratio between the thickness of the temples and their height to 1/9, giving a greater balance compared to the stone inscriptions of the Augustan period (based on the ratio of 1/10) and the more widespread calligraphic styles (which reached up to 1/12) [Spera 2001, p. 37].

The use of underlying geometries is not a prerogative of Humanism. Hermann Zapf, for example, also draws many of his alphabets according to the golden ratio. Its most famous font, Optima (1958), is inspired by the stone inscriptions of the Italian Renaissance, and yet refuses any cataloging. It is a sans-serif but looks like a serif, and this effect is achieved by carefully reducing the thickness of the temples (fig. 5). Zapf is also an excellent calligrapher [5]; to the Calabrian Giovanni Battista Palatino (known as 'the calligrapher of calligraphers' and author of the most successful writing treatise of the Renaissance, *Libro nuovo d'imparare a scrivere*), he dedicates an elegant font called, precisely, Palatine (1948).

An ancient dilemma: aesthetics or functionality?

The contrast between aesthetics and functionality in a printed text is as old as typography. Readability and form often coexist, but 'illegible' is not inexorably linked

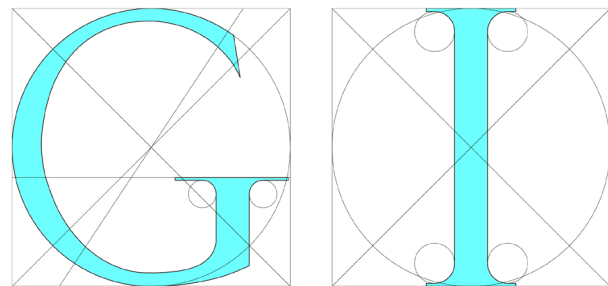
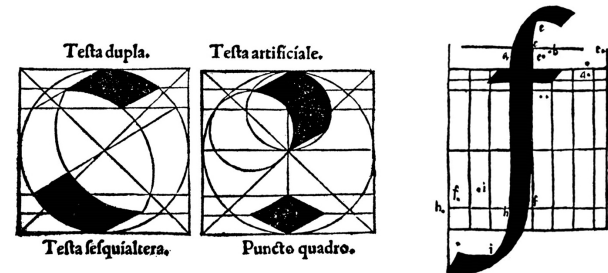


Fig. 2. Futura Bold typeface and elementary geometric shapes (graphic elaboration by the author).

Fig. 3. Left: Sigismondo Fanti, *Effecti de penna nella costruzione di lettere*. Venezia, 1514. Right: Ferdinando Ruano, *Sette alphabeti di varie lettere, formati con ragion geometrica*. Roma, 1554.

Fig. 4. Geometric constructions of 'G' and 'I' in *Alfabeto Dignissimo Antico* by Luca Pacioli (graphic elaboration by the author).

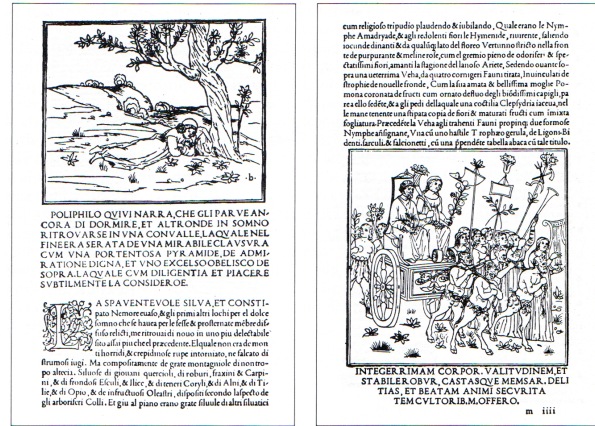


Fig. 5. Optima typeface superimposed on a grid that highlights the refined optical corrections (graphic elaboration by the author).

to 'ugly', nor 'legible' to 'beautiful'. For example, the editions of Aldo Manuzio, published at the beginning of the sixteenth century in Venice with cursive typefaces designed by Francesco Griffo were hardly legible (even for readers of the time), but formally flawless and effective from a 'corporate' point of view; the compactness of the text and the presence of numerous ligatures allowed a considerable saving of space, cheaper editions, and an extraordinary commercial success (fig. 6). John Baskerville, in the eighteenth century, is the first to argue that typefaces design and page composition can guarantee aesthetic quality to the book, regardless of the illustrations. But books are printed for reading. On this issue, designers are often uncompromising, like Stanley Morison, author of *Times New Roman* (1931), according to whom the purpose of typography is essentially utilitarian, and only accidentally aesthetic. Pleasure of the eyes is rarely the reader's primary concern; for this reason, any typographical arrangement that stands between the reader and the author is to be considered wrong [Lussu 1990, p. 76]. Beatrice Warde, head of marketing for the British Monotype Corporation, has a similar opinion: type well used is invisible as a type, just as the perfect talking voice is the unnoticed vehicle for the transmission of an idea. The more the reader focuses on letter design or layout, the worse the typography [Warde 1955, p. 13]. On the same position Lázló Moholy-Nagy, who in 1925 wrote: "Typography is a communication tool, it must be clear communication in the most effective form [...]. The legibility of communication must never undergo the paradigms of a priori aesthetics. Characters should never be forced into pre-determined forms" [Polano, Vetta 2002, p. 111]. To achieve the 'invisibility' evoked by Warde, the most effective tool is geometric control, guided by a rigorous design. If calligraphy tends to connect and tie letters, typography –as artificial writing– crystallizes the forms derived from handwriting into figures which, even from the etymological point of view, suggest the notion of 'type'.

Egalitarian geometries: the grid

In 1620, Louis XIII established a private printing house in the Louvre, which Richelieu placed under the control of the state in 1640, calling it *Imprimerie Royale*. On the initiative of Louis XVI, in 1692 the French Academy



AENE.

P abula parua legens, nidiſq; loquacibus eſcat,
E t nunc porticibus uacuis, nunc humida circum
S tagna ſonat, ſimilis medios Iuturna per hoſtes
F ertur equis, rapidoq; uolans obit omnia curru.

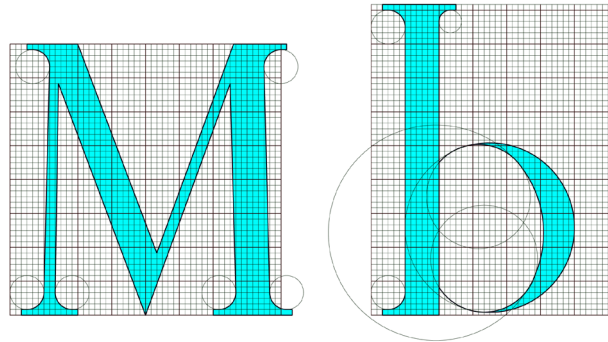


Fig. 6. Pages from *Hypnerotomachia Poliphili*, printed in Venice in 1499 by Aldo Manuzio and detail of the font designed by Francesco Griffo.

Fig. 7. *Roman du Roi*, geometric construction on a grid of the letters 'M' and 'b' (graphic elaboration by the author).

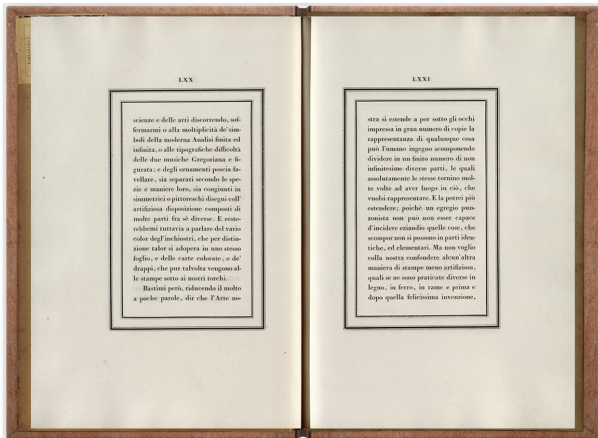
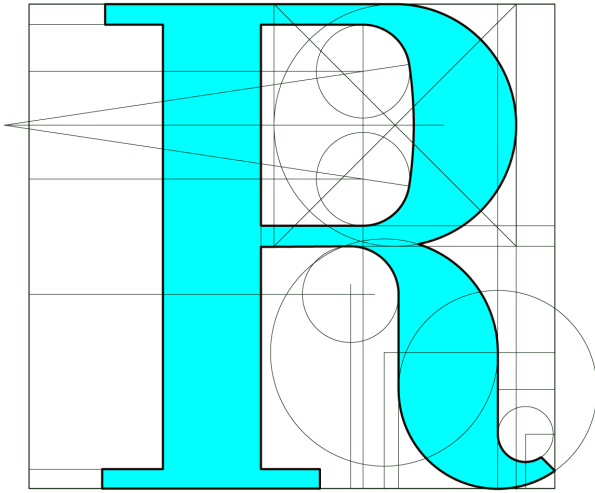


Fig. 8. Side-by-side pages of the Bodoni Manual and geometric construction of the 'R' in Bodoni font (graphic elaboration by the author).

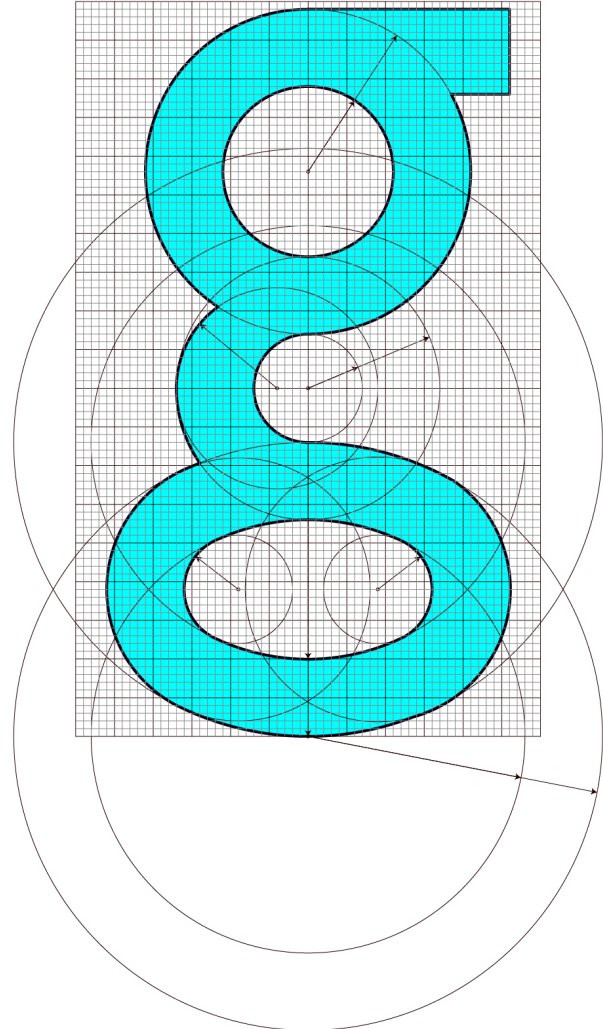


Fig. 9. Geometric construction of the letter 'g' of Eric Gill's LNER (graphic elaboration by the author).

of Sciences appointed a commission for the study of a new typeface for the exclusive use of the Imprimerie, to be designed according to scientific principles. The commission is chaired by mathematician Nicolas Jaugeon, who suggests using a square matrix of 2304 units (48 rows by 48 columns). Philippe Grandjean thus engraves Romain du Roi, the first font built on a homogeneous grid (fig. 7).

Romain du Roi is a 'Cartesian' typeface, destined to influence typography for many decades. In the wake of the eighteenth-century French school, based on an obsessive attention to detail, the figure of Giovambattista Bodoni emerges; he made the Reale Stamperia di Parma famous and in 1790 opened a private foundry in the same city. Bodoni has skills as a draftsman, engraver, caster, typographer, publisher, and bookseller, but his fame is mainly linked to the elegance of the layouts and the typefaces he conceived, perfectly corresponding to the neoclassical ideals of balance, sobriety, and purity of the sign (fig. 8). Bodoni [6] is a modern Romain, based on the Baskerville transitional. The proportions are classic, the geometry rigorous; serifs are reduced to a completely flat and horizontal line: a refinement once unthinkable, finally allowed by the evolution of punching, casting, and printing procedures. Despite the careful design, Bodonians suffer from a problem called 'dazzle', that is, poor readability in small bodies or in case of excessive width of the text column; to get the right emphasis, Bodonians need ample white space and generous line spacing. In his *Manuale Tipografico*, printed posthumously in 1818, Bodoni suggests the canons that typefaces must respect: clarity, good taste, grace, regularity. For the first time, printed products acquire value regardless of legibility, thanks also to the refined composition and quality of the print, paper, and binding. Two hundred years after Grandjean, Eric Gill – eponym of the famous Gill Sans (1926) – also adopts the grid (in this case, graph paper) as a support for the drawing, relying on geometric constructions often based on arcs of circumference, as in the LNER (1928), designed for the London & North Eastern Railway (fig. 9). Gill is a multifaceted and controversial artist; he humbly referred to himself as a 'stone carver' and was considered an amateur printer by many colleagues. His positions are often controversial and contradictory. On one occasion he states that "lettering is a precise art, and strictly subject to tradition" [cfr. Polano, Vetta

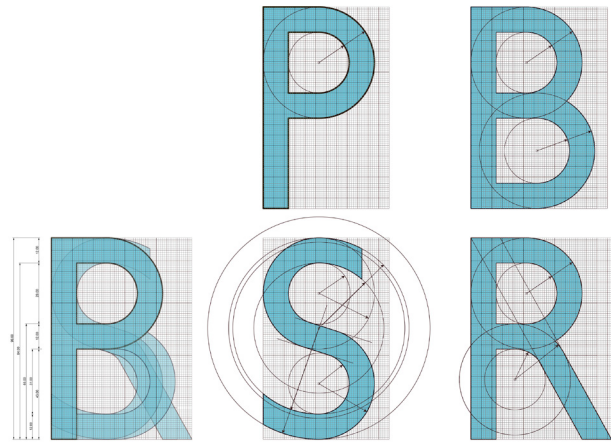


Fig. 10. Geometric construction of the letters 'B', 'P', 'S', 'R' of Gill Sans (graphic elaboration by the author).

2002, p. 162]; on the other he considers it “an entirely outworn, decayed and corrupt convention whose chief and most conspicuous character is its monumental witness to the conservatorism, laziness and irrationality of men and women” [Gill 1936, p. 121]. Tireless artist and attentive to details, he has been able to transform elementary geometries into elegant shapes. Gill Sans is a sans-serif with the typical style of serifs: the ‘g’ has the classic double eye, the ‘R’ is characterized by a characteristic foot, the ‘p’ italic has an unusual continuation of the curved line. The design is based on the utmost economy, does not concede anything to the formalisms of traditional typography and lacks the optical devices useful to ensure better readability (fig. 10). Gill is also unsurpassed in the design of serifs, such as Perpetua (1925) and Johanna (1931), whose shapes reveal his familiarity with the typical graphics of the chisel.

Purism and compromises

Composition based on elementary geometry is one of the basic principles of modernism, whose exponents

challenge tradition even in the field of typography. Piet Zwart argues that “if the old typography was contemplative, imitative, decorative and individual, the new one must be actively effective, plastically expressive, elementally functional and collective” [Baroni, Vitta 2003, p. 108].

The Bauhaus printing school was established in 1925 under the leadership of Herbert Bayer and, later, Joost Schmidt. They, together with Moholy-Nagy, have developed numerous projects according to the principles of geometric abstraction advocated by the school. Die Neue Typographie, published in 1928 by Jan Tschichold and adopted as a textbook at the Bauhaus, highlights the layout based on dynamic symmetry, the use of grids, the relationship between full and empty spaces, the insertion of graphic elements (fillets, bars etc.). According to Tschichold, who in the same year designed a rigorous version of Universal Alphabet (fig. 11, top), the essence of the new typography is clarity. This contrasts it with the old typography, whose goal was beauty and whose clarity did not reach the level that modern society needs. Furthermore, “the new typography differs from the old in that its primary objective is to devel-

a b c d e f g h i j k l m
 n o p q r s t u v w x y z

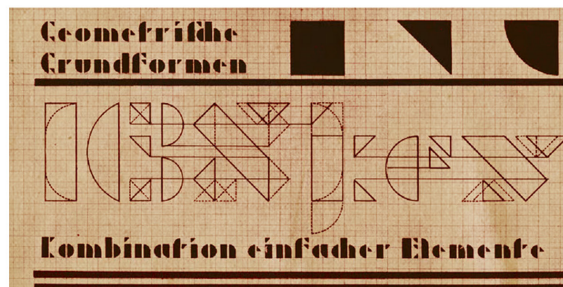
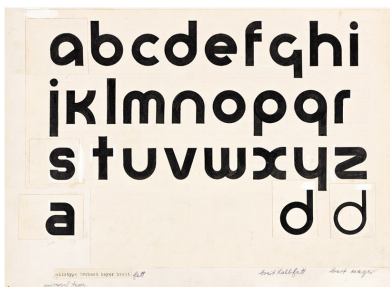


Fig. 11. Universal Alphabet by Jan Tschichold (1928), by Herbert Bayer (1925) and by Josef Albers (1926); preliminary version of Paul Renner's Futura (1924).

op its visible form independently of the functions of the text” [Tschichold 1995, p. 67]. Later, the artist will abandon these radical positions and will devote himself almost exclusively to compositions inspired by tradition and the design of serif typefaces.

The adoption of a geometric and ‘universal’ system of writing is central to the Bauhaus. Universal Alphabet, designed by Bayer in 1925 is based on a square matrix, with geometries derived mainly on arcs of circumference: “a mono-alphabet tending to the Platonic idea of writing [...] an essential, reduced writing based on elementary geometry. Each letter is constructed in a rational way, on a square grid, with vertical and horizontal segments and with circular arcs and uniform width” [Russo 2019, p. 37] (fig. 11, bottom left). Bayer’s alphabet has no capital letters, to ensure greater simplicity and readability: an even more radical choice for Germany at the time, still faithful to the Gothic characters and the use of capital letters for all nouns in the text.

Josef Albers designed his version of Universal Alphabet in 1926, relying on square, triangle, and quarter circle (fig. 11, bottom center); he also designs the capitals, but the results are questionable from the point of view of legibility. Even Albers, like Tschichold, in the 1960s will question design entirely based on the use of elementary geometric shapes and will firmly support the superiority of Roman typefaces.

The choice to consider the alphabet exclusively from a geometric point of view, regardless of the typographic tradition and its complex system of rules and details, can produce unsuccessful results; readability is partly linked to habit, and if an innovation is not supported by widespread dissemination, it is difficult for it to be successful. The design of a typeface, in addition to the

overall geometry, involves additional elements such as the management of spaces, attachments, ligaments and glyphs, the harmony of all the combinations between the letters; issues that traditional calligraphy and typography had long since resolved and which modernists have often avoided addressing.

Paul Renner was not part of the Bauhaus, although he was strongly influenced by it. The first, radical versions of his Futura are affected by the same problems as the works of Bayer and Albers (fig. 11, bottom right). The compromise, and the consequent success, come thanks to the designers of the Bauer Type Foundry in Frankfurt; in 1927 they engrave a specimen that hybridizes the rules of classical typography with the pure geometries suggested by its creator. The enormous commercial success of which Futura and its numerous imitators (such as Avantgarde and Century Gothic) still enjoy today, demonstrates the fact that the best figurative results, especially in a sector full of rules such as typography, almost always derive from the mediation between innovation and tradition [7].

Experiments and dysgraphies. Back to calligraphy?

The digital revolution and the coding of the PostScript language (1985) have allowed the digital redesign of all characters engraved in the past, as well as countless experiments. When foundries and metal characters finally leave the scene, the English term ‘font’, derived from the medieval French ‘*fonte*’ (which means ‘fused’), spreads in Italy. The ancient and heavy typography limited the realization of graphic ideas; thanks to the perfect correspondence between the image on

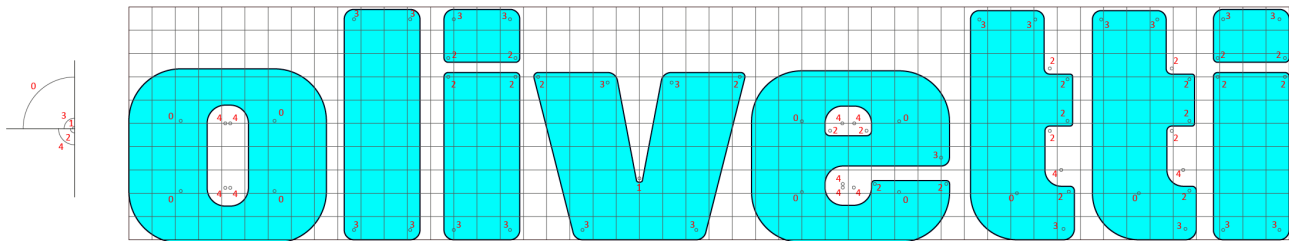


Fig. 12. Graphic construction of the Olivetti logotype (graphic elaboration by the author).

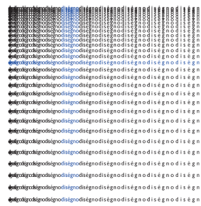
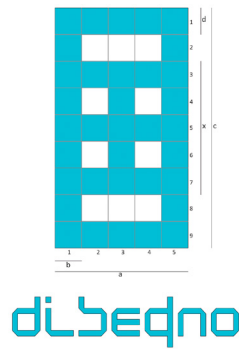


Fig. 13 Left: cover of New Alphabet [Crouwel 1967]. Right: the basic form on which New Alphabet is based and the five variables that allow modifications (graphic elaboration by the author).

Fig. 14. Digital disgraphies applied to form; to proportions (on Gill Sans); to kern and interlining (su Gill Sans) (graphic elaboration by the author).

the monitor and the print, condensed in the acronym WYSIWYG (What You See Is What You Get), the possibilities offered by software and technology develop more rapidly than graphic research. The first electronic fonts are based on a grid of points, the most common of which is the 5 x 9 point grid. In the 1960s, almost all designers tried their hand at drawing characters in pixel cages, sometimes reinterpreting traditional forms, other times concentrating on experimentation and neglecting aspects related to legibility. All the graphics of the following two decades are influenced by these researches, such as the Olivetti logo designed in 1970 by Walter Ballmer (fig. 12). Wim Crouwel's New Alphabet (1967) is also based on a 5 x 9 point matrix, but the rigidity of this configuration is only apparent. The shape of each character derives from five variables which, interacting with each other, allow for countless variations [8]. Each letter is marked with a five-digit code, corresponding to the value of the same number of variables that define its shape (fig. 13). It is a meta-design principle, which develops the one conceived by Adrian Frutiger with the 21 declinations of Univers (1957). A further feature of New Alphabet is that it rejects the hypothesis that the reader's attention is focused on the areas of the lowercase letters that contain the most distinctive features, namely the upper and right sides. Experimentation must always deal with legibility. It has been shown that lowercase letters are 13% more legible than uppercase [Tinker, Paterson 1928; 1939] and in general we rely more on intuition rather than actual reading because we tend to perceive not so much single characters, but the whole word or even the whole sentence. At the beginning of the last century, ophthalmological studies have verified that an average reader perceives 10 letters at a time in a time ranging between 1/4 and 1/3 of a second, with a pause of 1/40 of a second. The eye stops three times on each line, and always in the same points [Javal 1905].

The new media have questioned some of the rules of typography; culture and visual sensitivity have changed, and with them the notion of legibility. The software that allows you to design fonts and format texts are accessible to anyone [Carter 2000, pp. 24-57]. Digital typography returns to approach the manual skills of engraving and calligraphy: a light manual skill, favored by the elasticity of digital paths. And just like handwriting, typography can be affected by disorders and dysgra-

phies (fig. 14). Erik Spiekermann argues that the loss of humanity and warmth, which were once guaranteed by the fusion of characters, must be compensated by the design of deliberately defective fonts [Garfield 2010, p. 192]. Adrian Frutiger does not have the same faith in dysgraphies: “readers remember the outlines of syllables and words, as if they were a skeletal form; the details that determine the typographic styles are perceived as ‘resonances’ that do not disturb the reading process if the general design respects the basic rules” [Frutiger 1996, p. 168].

The software saves us the trouble of drawing the letters, engraving them, punching them, melting them, composing them; it is not so much the artisan dimension of the craft that disappears, but a conception of

design which, before producing visually verifiable results, requires consequential and controlled actions. The alphabets should be radically rethought; it is no longer necessary to draw the letters as separate entities because they could finally be linked into groups of phonemes. But typography, as Alan Fletcher likes to repeat, is a straitjacket imposed on the alphabet, and its conservatism always tends to reappear. The research on forms is incessant, we need to express ourselves in new ways; nevertheless “typefaces design always remains linked to the great tradition of calligraphy” [Zapf 1954, p. 3] and it seems impossible to design new fonts that differ from the shapes of the past: their quality continues to depend on the level of imagination and feeling we put into reinterpreting tradition.

Notes

[1] In addition to Textur, Rundgotisch, Schwabacher and Fraktur were widespread in Germany. Textur is characterized by letters in straight lines and sharp edges that make the printed page resemble, when viewed from a certain distance, the warp and weft of a fabric.

[2] The Italian typographic school adopts as a reference the humanistic writing, soft and rounded, derived from the Carolingian minuscule (also called ‘Roman’ or ‘Antiqua’). Poggio Bracciolini and Niccolò Niccoli formalize the ‘*round humanistic minuscule*’ (which they themselves defined as “*littera antiqua*”), supporting the correspondence with that used in the classical era. In it, the letters are detached from each other, the lines well-spaced, the composition sober and elegant. The humanistic minuscule spread rapidly throughout Europe, except for the countries of the German area, which continued to prefer Gothic until the 1940s.

[3] The typographic glossary is also linked to manual skills and anthropomorphism. Just to limit ourselves to the typeface, the terms in use are *occhio/eye/œil*, *braccio/arm*, *corpo/body/corps*, *spalla/shoulder*, *orecchia/ear/boucle*, *collo/neck*, *gamba/leg*, *piede/foot/leg*, *coda/tail/queue*.

[4] The stonecutters use only capital letters and take into high consideration the aesthetics and the rules of composition of the text. Merchants and bankers, animated by essentially practical and autograph purposes, practice inhomogeneous and careless styles. The copyist monks apply the writing techniques used in the monastery they belong to. The scribes develop a style of cursive calligraphy called cancelleresca, similar to the humanistic one but more com-

pressed and inclined to the right. The cancelleresca was born in Italy and spread throughout Europe; even today, the term that universally denotes cursive writing is italic.

[5] Zapf writes: “Anyone who is fascinated by the art of typography will never experience boredom, for their entire life. The practice of calligraphy offers us the opportunity to express the many aspects of human emotion. [...] Although a large part of my time is engaged in the complicated and rigorous work of designing alphabets for electronic composition, my love is still the cut-off nib; there is always a drop of our heart in the ink we use” [Lussu 1990, p. 85].

[6] Bodoni is not a single font, but a family of typefaces with slightly different versions from each other.

[7] This is also confirmed by Helvetica, probably the most used font in the second half of the twentieth century, designed by Max Miedinger in 1957. Despite the rigorous geometry and the absence of serifs, it represents a return to tradition hybridized with modern style. It is a neutral typefont, based on the 1896 redesign of Akzidenz-Grotesk but with the introduction of measured formalisms, such as the curled leg of the ‘R’.

[8] The basic form on which the 5 variables act is shown in figure 13. They are: *a*. variable number of vertical units (odd progression); *b*. variable number of lines per vertical unit (200 to the cm); *c*. variable number of horizontal units (odd progression, at least: x -heights + 4); *d*. variable number of lines per horizontal unit (200 to the cm); *e*. variable number of the x -height (odd progression).

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