

A I S C
 H Y L O
 M W G
 R U I X
 P T U K

Lithos, designed by Carol Twombly, is based on early Greek inscriptional letterforms.

HISTORICAL INTERLUDE

Printing from movable type was first invented not in Germany in the 1450s, as Europeans often claim, but in China in the 1040s. In preference to Gutenberg, we should honor a scholarly engineer by the name of Bì Sheng (畢昇). The earliest surviving works printed in Asia from movable type seem to date from the thirteenth century, but there is a clear account of the typesetting process, and Bì Sheng's role in its development, by the eleventh-century essayist Shěn Kuò.

The new technology reached Korea before the middle of the thirteenth century and Europe before the middle of the fifteenth. There it intersected the already long and fertile history of the roman letter. And there typesetting flourished as it had failed to do in China, because of the far smaller number of characters European scripts required. Even at the end of the nineteenth century, most printing in China was done by the same method used in the eighth century to make the first printed books: entire pages of text were carved by hand into wooden printing plates. Corrections were made by drilling out the error, installing a wooden plug, and cutting the new characters. It is the same technique used to make the woodcut illustrations that were often combined with printed text.

7.1 THE EARLY SCRIBAL FORMS

The earliest surviving European letterforms are Greek capitals scratched into stone. The strokes are bony and thin, almost ethereal – the opposite of the heavy substance they are carved in. The letters are made primarily from straight lines, and when curved forms appear, they have a very large *aperture*. This means that forms like S and C, which can be relatively open or relatively closed, are about as open as they can get. These early Greek letters were drawn freehand, not constructed with compasses and rule, and they have no serifs – neither the informal entry and exit strokes left by a relaxed and fluent writer, nor the symmetrical finishing strokes typically added to letters by a formal scribe.

In time, the strokes of these letters grew thicker, the aperture lessened, and serifs appeared. The new forms, used for

Shěn Kuò's account is contained in his *Mèngxi Bítán* (夢溪筆談), "Dream Creek Essays." For more information in English, see Denis Twitchett, *Printing and Publishing in Medieval China* (London, 1983), and Thomas F. Carter, *The Invention of Printing in China and Its Spread Westward*, 2nd ed., revised by L. Carrington Goodrich (New York, 1955).

inscriptions throughout the Greek empire, served as models for formal lettering in imperial Rome. And those Roman inscriptional letters – written with a flat brush, held at an angle like a broad-nib pen, then carved into the stone with mallet and chisel – have served in their turn as models for calligraphers and type designers for the past 2000 years. They have a modest aperture, a *modulated* stroke (a stroke whose thickness varies with direction), and they have lively but full and formal serifs.

A B C O S P Q R

Trajan, designed by Carol Twombly in 1988, is based on the inscription at the base of Trajan's Column, Rome, carved in AD 113.

Between the Roman inscriptions and Gutenberg's time, there were many further changes in European letterforms. Narrow rustic capitals, wide uncials and other forms evolved. Writing spread to the farthest corners of Europe, and many regional scripts and alphabets arose. Monastic scribes – who were designers, copyists and archivists as well – kept many of the older letterforms alive. They used them for titles, subheads and initials, choosing newer and more compact scripts for running text. Out of this rich multiplicity of letters, a basic dichotomy evolved: *majuscules* and *minuscules*: large formal letters and smaller, more casual ones: the upper and lower case, as we call them now.

CAROLUS MAGNUS

Caroline or Carolingian means of the time
of the Emperor Charlemagne, "Big Charles" ...

Carol Twombly's Charlemagne (above) and Gottfried Pott's Caroline (below). These typefaces are based on Carolingian majuscules and minuscules from ninth- and tenth-century European manuscripts.

Many of the old scribal conventions survive in typesetting today. Titles are still set in large, formal letters; large initials mark the beginnings of chapters or sections; small capitals mark an opening phrase. The well-made page is now what

was then: a window into history, language and the mind: a map of what is being said and a portrait of the voice that is silently speaking.

In the later Middle Ages and the early Renaissance, a well-trained European scribe might know eight or ten distinct styles of script. Each was defined as precisely as a typeface, stored like a font in the human memory, and each had certain uses. Sacred scriptures, legal documents, romance literature, business and personal letters all required different scripts, and particular forms evoked specific languages and regions.

When the technology of movable type arrived, Europe was rich with Gothic, Byzantine, Romanesque and humanistic hands, and with a wealth of older letters. They are all still with us in some way, but the humanistic hand, based on the Carolingian minuscule, has become the central form: the roman lower case, evolving into a thousand variations, sports and hybrids, like the willow or the rose.

7.2 THE TYPOGRAPHIC LATIN LETTER

Several systems are in use for classifying typefaces. Some of them use fabricated terms such as 'garalde' and 'didone.' Others rely on familiar but vague labels such as 'old style,' 'modern' and 'transitional.' But these systems leave much to be desired. They are neither good science nor good history.

Rigorously scientific descriptions and classifications of typefaces are certainly possible, and important research has been under way in this field for several years. Like the scientific study of plants and animals, the infant science of typology involves precise measurement, close analysis, and the careful use of technically descriptive terms.

But letterforms are not only objects of science. They also belong to the realm of art, and they participate in its history. They have changed over time just as music, painting and architecture have changed, and the same historical terms – Renaissance, Baroque, Neoclassical, Romantic, and so on – are useful in each of these fields.

This approach to the classification of letterforms has another important advantage. Typography never occurs in isolation. Good typography demands not only a knowledge of type itself, but an understanding of the relationship between letterforms and the other things that humans make and do.

Typographical history is just that: the study of the relationships between type designs and the rest of human activity – politics, philosophy, the arts, and the history of ideas. It is a lifelong pursuit, but one that is informative and rewarding from the beginning.

7.2.1 The Renaissance Roman Letter

Renaissance roman letters developed among the scholars and scribes of northern Italy in the fourteenth and fifteenth centuries. Their translation from script to type began in Italy in 1465 and continued for more than a century. Like Renaissance painting and music, Renaissance letterforms are full of sensuous and unhurried light and space. They have served as a typographical benchmark for 500 years.

The earliest surviving roman punches or matrices are Garamond's, cut in Paris in the 1530s. For earlier type, we have no evidence beyond the printed books themselves. The basic structure and form of these early typefaces is clear beyond dispute,

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abcefgnop

Three twentieth-century reconstructions of Renaissance roman typefaces: Centaur (above) was designed by Bruce Rogers, Boston, c. 1914, after Nicolas Jenson, Venice, 1469. Bembo (center) was cut by Monotype in 1929, based on the design of Francesco Griffo, Venice, 1499. Adobe Garamond (bottom) was designed by Robert Slimbach, San Francisco, 1988, after Claude Garamond, Paris, c. 1540.

but in their subtlest details, all the existing replicas of fifteenth-century Italian type are hypothetical reconstructions.

Like Roman inscriptional capitals, Renaissance roman lowercase letters have a modulated stroke (the width varies with direction) and a *humanist axis*. This means that the letters have the form produced by a broad-nib pen held in the right hand in a comfortable and relaxed writing position. The thick strokes run NW/SE, the axis of the writer's hand and forearm. The serifs are crisp, the stroke is light, and the contrast between thick strokes and thin strokes is generally modest.

In summary, the characteristics of the early Renaissance roman letter are these:

- stems vertical
- bowls nearly circular
- modulated stroke
- humanist axis
- modest contrast
- modest x-height
- crisp, oblique head serifs (on letters such as b and r)
- abrupt, flat or slightly splayed bilateral foot serifs (on letters such as r, l and p)
- abrupt, pen-formed terminals on a, c, f and r
- rising crossbar in e, perpendicular to the stroke axis
- the roman font is solitary (there is no italic or bold)

In later Renaissance forms (from 1500 on), the letterforms grow softer and smoother in subtle ways:

- head serifs become more wedge-shaped
- foot serifs become adnate (flowing smoothly into the stem) instead of abrupt
- terminals of c, f and r become less abrupt and more lachrymal (teardrop-shaped)
- crossbar of e becomes horizontal

7.2.2 The Renaissance Italic Letter

Rome is located in the midst of Italy. Why is roman type a category separate from italic? It seems a question to which typographers might possess the answer. But the question has as much to do with politics and religion as with calligraphy and typography.

Roman type consists of two quite different basic parts. The upper case, which does indeed come from Rome, is based on Roman imperial inscriptions. The lower case was developed in northern Europe, chiefly in France, in the late Middle Ages, and given its final polish in Venice in the early Renaissance. Nevertheless, it too is Roman in the larger sense. While the roman upper case is a legacy of the Roman Empire, the lower case is a legacy of the Holy Roman Empire, the pagan empire's Christian successor. It acquired its fundamental form at the hands of Christian scribes, many of them employed as administrators and teachers by the Holy Roman Emperor Charlemagne.

Italic letterforms, on the other hand, are an Italian Renaissance invention. Some of them come from Rome, others from elsewhere in Italy, and when they were first converted to type, italics were still full of local flavor and freshness. But the earliest italic fonts, cut between 1500 and 1540, consist of lower case only. They were used with upright roman caps, but not in conjunction with the roman lower case.

The characteristics of the Renaissance italic letter can be summarized as follows:

- stems vertical or of fairly even slope, not exceeding 10°
- bowls generally elliptical
- light, modulated stroke
- humanist axis

abcefgnopxyz
abcefgnopxyz

Two revivals of Renaissance italic type. Monotype Arrighi (above), is one of several Arrighis designed by Frederic Warde, London and Paris, 1925–29, after Ludovico degli Arrighi, Rome, 1524. Monotype Bembo italic (below) was cut in London in 1929, based on the work of Giovanantonio Tagliente, Venice, 1524.

- low contrast
- modest x-height
- cursive forms with crisp, oblique entry and exit serifs
- descenders serified bilaterally or not at all
- terminals abrupt or lachrymal
- italic lower case paired with small, upright roman capitals, and with occasional swash capitals; italic otherwise fully independent of roman

The last of these features has been ignored in almost all of the reconstructions. Sloped roman caps are usually supplied instead – but typographers have the option of replacing these sloped caps with more authentic upright forms, simply by borrowing them from a related roman font.

7.2.3 The Mannerist Letter

Mannerist art is Renaissance art to which subtle exaggerations – of length, angularity or tension, for example – have been added. Mannerist typographers, working chiefly in Italy and France in the middle of the sixteenth century, began the practice of using roman and italic in the same book, and even on the same page – though not on the same line. It was also during the Mannerist period that sloped roman capitals were first added to the italic lower case.

e q u b d a f f g l o p s p z
a b e f o p a b e f o p

Two recent typefaces in the Mannerist tradition. Poetica (above) is a chancery italic based on sixteenth-century models. It was designed by Robert Slimbach and issued by Adobe in 1992. Galliard (below), designed by Matthew Carter, was issued by Linotype in 1978. It is closely based on letterforms cut in the sixteenth century by Robert Granjon.

There are many fine sixteenth-century examples of Mannerist typefaces, including roman titling fonts with long, delicate extenders; chancery italics with even longer and often ornamented extenders, and text faces with short extenders but increased tension in the forms. Yet twentieth-century revivals of Mannerist faces have been relatively scarce.

7.2.4 The Baroque Letter

Baroque typography, like Baroque painting and music, is rich with activity and takes delight in the restless and dramatic play of contradictory forms. One of the most obvious features of any Baroque typeface is the large *variation in axis* from one letter to the next. Baroque italics are *ambidextrous*: both right- and lefthanded. And it was during the Baroque that typographers first began mixing roman and italic *on the same line*.

In general, Baroque letterforms appear more modelled and less written than Renaissance forms. They give less evidence of the direct trace of the pen. Yet they take many different forms, and they thrived in Europe throughout the seventeenth century and endured through much of the eighteenth.

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Three revivals of Baroque typefaces. Monotype Garamond 156 (above) is based on fonts cut in France by Jean Jannon, about 1621. Linotype Janson (center) is based on fonts cut by Miklós Kis, Amsterdam, about 1680. Adobe Caslon (bottom), by Carol Twombly, is based on faces cut by William Caslon, London, in the 1730s.

Baroque letterforms generally differ from Renaissance forms in the following ways:

- *stroke axis of the roman lower case varies widely within a single alphabet*
- *slope of italic averages 15° to 20° and often varies considerably within a single alphabet*
- *contrast increased*
- *x-height increased*
- *aperture generally reduced*
- *further softening of terminals from abrupt to lachrymal*
- *roman head serifs become sharp wedges*
- *head serifs of italic ascenders become level and sharp*

7.2.5 The Rococo Letter

The historical periods listed here – Renaissance, Baroque and so on – belong to all the arts, and they are naturally not limited, in typography, to roman and italic letters. Blackletter and script types passed through the same phases as well. But the Rococo period, with its love of florid ornament, belongs almost entirely to blackletters and scripts. Roman and italic type was certainly used (chiefly in France) by Rococo typographers, who surrounded their texts with typographical ornaments, engraved medallions, and so on. They produced a good deal of Rococo *typography*, but no Rococo roman and italic *type*.

7.2.6 The Neoclassical Letter

Generally speaking, Neoclassical art is more static and restrained than either Renaissance or Baroque art, and far more interested in rigorous consistency. Neoclassical letterforms follow this pattern. In Neoclassical letters, the trace of the broad-nib pen can still be seen, but it is rotated away from the natural writing angle to a strictly vertical or *rationalist axis*. The letters are moderate in contrast and aperture, but their axis is dictated by an idea, not by the truth of human anatomy. They are products of the Rationalist era: frequently beautiful, calm forms, but forms oblivious to the more complex beauty of organic fact. If Baroque letterforms are ambidextrous, Neoclassical letters are, in their quiet way, *neitherhanded*.

The first Neoclassical typeface was designed in France in

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Two revivals of Neoclassical letterforms. Above, ITC Baskerville, based on the designs of John Baskerville, Birmingham, about 1754. Below, Monotype Fournier, based on the designs of Pierre Simon Fournier, Paris, about 1740.

the 1690s, not by a typographer but by a government committee consisting of two priests, an accountant and an engineer. Other Neoclassical faces were designed and cut in France, England, Italy and Spain during the eighteenth century, and some of them have remained in continuous use, throughout all subsequent changes of style and fashion.

The American printer and statesman Benjamin Franklin deeply admired the Neoclassical type of his English contemporary John Baskerville, and it is partly due to Franklin's support that Baskerville's type became more important in the United States and France than it ever was in Baskerville's native land. But the connection between Baskerville and America rests on more than Benjamin Franklin's personal taste. Baskerville's letters correspond very closely to the federal style in American architecture. They are as purely and unperturbably Neoclassical as the Capitol Building, the White House, and many another federal and state edifice. (The Houses of Parliament in London and in Ottawa, which are Neogothic instead of Neoclassical, call for typography of a different kind.)

In brief, Neoclassical letterforms differ from Baroque letters as follows:

- *uniformly vertical axis in both roman and italic*
- *slope of italic generally uniform, averaging 14° to 16°*
- *serifs adnate, but thinner, flatter, more level than in the Baroque*

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Two revivals of Romantic letterforms. Berthold Bodoni (above) is based on faces cut by Giambattista Bodoni at Parma, about 1780, and Berthold Walbaum (below) is based on designs by Justus Erich Walbaum, Weimar, about 1805.

7.2.7 The Romantic Letter

Neoclassicism and Romanticism are not sequential movements in European history. They marched through the eighteenth century, and much of the nineteenth, side by side: vigorously opposed in some respects and closely united in others. Both Neoclassical and Romantic letterforms adhere to a rationalist axis, and both look more drawn than written, but it is possible to make some precise distinctions between the two. The most obvious difference is one of contrast.

Romantic letterforms are, as a rule, distinct from Neoclassical forms in the following ways:

- *artificial modulation of stroke*
- *vertical axis intensified through exaggerated contrast*
- *hardening of terminals from lachrymal to round*
- *serifs thinner and more abrupt*
- *aperture reduced*

This remarkable shift in type design – like *all* structural shifts in type design – is the record of an underlying change in handwriting. Romantic letters are forms from which the broad-nib pen has vanished. In its place is the pointed and flexible quill. The broad-nib pen produces a smoothly modulated stroke whose thickness varies with direction, but the pointed

quill performs quite differently. The stroke of a flexible quill shifts suddenly from thin to thick to thin again, in response to changes in pressure. Used with restraint, it produces a Neoclassical flourish. Used with greater force, it produces a more dramatic and Romantic one. Dramatic contrast, which is essential to much Romantic music and painting, is essential to Romantic type design as well.

Romantic letters can be extraordinarily beautiful, but they lack the flowing and steady rhythm of Renaissance forms. It is that rhythm which invites the reader to enter the text and read. The statuesque forms of Romantic letters invite the reader to stand outside and *look* at the letters instead.

7.2.8 *The Realist Letter*

The nineteenth and twentieth centuries have entertained a bewildering variety of artistic movements and schools – Realism, Naturalism, Impressionism, Expressionism, Art Nouveau, Art Deco, Constructivism, Cubism, Abstract Expressionism, Pop Art, Op Art, and many more. Virtually all of these movements have raised waves in the typographical world as well, though only a few are important enough to merit a place in this brief survey. One of these movements is typographical Realism.

The Realist painters of the second half of the nineteenth century turned their backs on the subjects and poses approved

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abcefgnop

Akzidenz Grotesk (above) is a Realist typeface issued by the Berthold Foundry, Berlin, in 1898. It is the immediate ancestor of Morris Benton's Franklin Gothic (1903) and of Helvetica. Haas Clarendon (below), designed in 1951 by Hermann Eidenbenz, is a revival of an earlier Realist face, the first Clarendon, designed by Robert Besley, London, 1845.

by the academy. They set out instead to paint ordinary people doing their ordinary tasks. Realist type designers worked in a similar spirit, producing blunt and simple letters, based on the script of people denied the opportunity to learn to read and write with ease. Realist letters usually have the same basic shape as Neoclassical and Romantic letters, but they have heavy, slab serifs or no serifs at all. The stroke is generally uniform in weight, and the aperture (often a gauge of grace or good fortune in typefaces) is tiny. Small caps, hanging figures and other signs of sophistication and elegance are always missing.

7.2.9 *Geometrical Modernism: The Distillation of Function*

Early modernism took many intriguing typographic forms, but the most obvious is geometric. The sparest, most rigorous architecture of the early twentieth century has its counterpart in the equally geometric typefaces designed at the same time, often by the same people. These typefaces, like their Realist predecessors, make no distinction between main stroke and serif. Their serifs are equal in weight with the main strokes, or they are missing altogether. But the Geometrical Modernist faces seek purity more than populism. Some show the study of archaic inscriptions, and some include text figures and other subtleties, but their shapes owe more to pure mathematical forms – the circle and the line – than to scribal letters.

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abcefgnop

Two examples of Geometrical Modernist typefaces. Futura (above) was designed in Germany in 1924–26 by Paul Renner. Memphis (below) was designed in 1929 by Rudolf Wolf. The original design for Futura included text figures and many, highly geometric, alternative characters which have never yet been issued.

7.2.10 *Lyrical Modernism: The Rediscovery of Humanist Form*

*The
Typographic
Latin
Letter*

The second major phase of modernism in type design is closely allied with abstract expressionist painting. Painters in the twentieth century rediscovered the physical and sensory pleasures of painting as an act, and the pleasures of making organic instead of mechanical forms. Designers of type during those years were equally busy rediscovering the pleasures of *writing* letterforms rather than drawing them. And in rediscovering calligraphy, they rediscovered the broad-nib pen, the humanist axis and humanist scale of Renaissance letters.

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Two neohumanist or Lyrical Modernist typefaces. Palatino (above) was designed by Hermann Zapf, Frankfurt, 1948. Pontifex (below) was designed by Friedrich Poppl, Wiesbaden, 1974.

7.2.11 *The Postmodern Letter*

Modernism in type design has its roots in the study of history, the facts of human anatomy, and in the pleasures of calligraphy. Like the Renaissance itself, modernism is not a rootless phase or fad that simply runs its course and expires. It remains very much alive in the arts generally and in type design in particular, though it no longer seems the last word. In the final decades of the twentieth century, critics of architecture, literature and music – along with others who study human affairs – have all perceived movements away from modernism. Lacking any proper name of their own, these movements have come to be called by the single term postmodernism. And postmodernism is as evident in the world of type design as it is in other fields.

Postmodern letterforms, like Postmodern buildings, ha-

bitually recycle and revise Neoclassical and Romantic forms. At their best, they do so with an engaging lightness of touch and a fine sense of humor. Postmodernist art is for the most part highly self-conscious, but devoutly unserious. Postmodernist designers – who frequently are or have been modernist designers as well – have proven that it is possible to infuse Neoclassical form, and the rationalist axis, with real calligraphic energy.

*Historical
Interlude*

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Three Postmodern typefaces. Zapf International (above), designed by Hermann Zapf, Darmstadt, 1976. Esprit (center), designed by Jovica Veljović, Beograd, 1985. Nofret (bottom), designed by Gudrun Zapf-von Hesse, Darmstadt, 1990.

7.3 MECHANICAL TYPESETTING

7.3.1 *The Linotype Machine*

The Linotype machine, invented in the 1880s by Ottmar Mergenthaler and much modified over the years, is a kind of cross between a casting machine, a typewriter, a vending machine and a backhoe. It consists of a series of slides, belts, wheels, lifts, vices, plungers and screws, controlled from a large mechanical keyboard. Its complex mechanism composes a line of matrices, justifies the line by sliding tapered wedges into the spaces between the words, then casts the entire line as a single metal slug for letterpress printing.

Typeface design for the Linotype was restricted by three

basic factors. First, kerning is impossible without special compound matrices. (The basic italic *f* in a Linotype font therefore always has a stunted head and tail.) Second, the em is divided into only 18 units, which discourages subtlety of proportion. Third, the italic and roman matrices are usually in one piece. In most faces, each italic letter must therefore have the same width as its counterpart in roman.

A number of typefaces designed for the Linotype were artistically successful in spite of these constraints. Hermann Zapf's Aldus and Optima, Rudolf Růžička's Fairfield, Sem Hartz's Juliana, and W.A. Dwiggins's Electra, Caledonia and Falcon were all designed for the Linotype machine. Linotype Janson, adapted by Zapf in 1952 from the seventeenth-century originals of Miklós Kis, is another eminent success. Many Linotype faces have nevertheless been modified in the course of digitization, to make use of the greater kerning capabilities of digital machines and restore the independent proportioning of roman and italic.

7.3.2 The Monotype Machine

In the 1890s, in competition with Mergenthaler, Tolbert Lanson created a machine that could cast individual letters in metal and assemble them into lines. The device that evolved is separated into a terminal and an output device, and in this respect it resembles most computer-driven typesetting machines. But the terminal in this case consists of a large mechanical keyboard, including seven full alphabets as well as alphabetic characters. The keyboard unit punches holes into a paper tape, like a narrow player-piano roll, by driving pins with compressed air. The output device is the caster, which reads the paper tape by whistling more compressed air through the punched holes, then casts and assembles the letters.

The Monotype em, like the Linotype em, is divided into only 18 units, but italic and roman are independent in width, kerning is possible, and because the type remains in the form of separate letters, typeset lines can be further adjusted by hand. Characters larger than 24 pt are cast individually and left for hand assembly. In fact, the Monotype machine is a portable typefoundry as much as it is a composing machine – and it is increasingly used as such, even though its unit system imposes restrictions on letterform design, and it is incapable of casting

in hard metal. Computerized front ends have been fitted to many of the machines that are still in service.

7.3.3 Two-Dimensional Printing

From the middle of the fifteenth century to the middle of the twentieth, most roman letters were printed by a technique rooted in sculpture. In this process, each letter is carved at actual size on the end of a steel punch. The punch is then struck into a matrix of softer metal, the matrix is fitted into a mold, and three-dimensional metal type is cast from an alloy of lead, tin and antimony. The cast letters are locked in a frame and placed in a printing press, where they are inked. Their image is then imprinted *into* the paper, producing a tactile and visual image. The color and sheen of the ink join with the smooth texture of crushed paper, recessed into the whiter and rougher fibers surrounding the letters and lines. A book produced by this means is a folding inscription, a flexible sculpture in low relief. The black light of the text *shines out from within* a well-printed letterpress page.

Renaissance typographers reveled in the physical depth and texture they could achieve by this method of printing. Neoclassical and Romantic printers, like Baskerville, often took a different view. Baskerville printed his sheets by letterpress – since he had no other method – but then had them ironed like laundry to remove the sculptural tinge.

With the development of lithography, at the end of the eighteenth century, printing moved another step back toward the two-dimensional world of the medieval scribes. Since the middle of the twentieth century, most commercial printing has been by two-dimensional means. The normal method is photolithography, using the offset press, which converts a photographic image into ink and lays it flat on the surface of the page.

In the early days of commercial offset printing, type was still set with Linotype or Monotype machines. Proofs were pulled in a letterpress, then cut, pasted and photographed. Type designers, of course, saw their letterforms changed by this process. Most letters designed to be printed in three dimensions look weaker when printed in two. But other letters prospered: geometric letters, which evoked the world of the draftsman rather than the goldsmith, and flowing letters recalling the heritage of the scribe.

7.3.4 Phototype Machines

Light flashes through the image of a letter carried on glass or photographic film; the size of the letter is altered with a lens; its target location is fixed by a mirror, and it is exposed like any other photographic image onto photosensitive paper or film. Machines that operate on this principle are the natural children of the camera and the offset press. They were in use for setting titles and headlines as early as 1915, but it was not until the 1960s that they came to dominate the trade.

Just as the sophistication and subtlety of handset type seemed at first to be swept aside when composing machines appeared, so the sophistication slowly achieved with Linotype and Monotype machines seemed to be swept aside by this new technological wave. The phototypesetters were fast, but they knew nothing of subtle changes in proportion from size to size. Their fonts lacked ligatures, text figures and small caps. American-made fonts lacked even the simplest accented characters. The choice of faces was poor....

Phototypesetting machines had only begun to answer these complaints when digital equipment arrived to replace them. Some excellent faces were designed for phototype machines – from Adrian Frutiger's Apollo (1962) to Bram de Does's Trinité (1982) – but in retrospect, the era of phototype seems only a brief interregnum between hot metal and digital composition. The important innovation of the period was not, after all, the conversion of fonts from metal to film, but the introduction of microcomputers to edit, compose and correct the text and to drive the last generations of photosetting machines.

7.3.5 Historical Recutting & Twentieth-Century Design

New typefaces have been designed in vast numbers in the twentieth century, and many old ones have been resuscitated. From 1960 to 1980, most new types and revivals were designed for photosetting, and since 1980, almost all have been planned for digital composition. But most of the older faces now sold in digital form have already passed through another stylistic filter. They were recut in the early twentieth century, either as foundry type or as matrices for the Monotype or Linotype machines. Typography was radically reformed between 1920 and 1950, through the commercial reinvention of typographic his-

tory. It is worth looking back at this process to see something of what went on, because its legacy affects us still.

Two separate companies – one based in England, one in America – rose up around the Monotype machine and followed two quite separate development programs. The English company, advised during its heyday by a scholar named Stanley Morison, cut a series of facsimiles based on the work of Francesco Griffo, Giovanantonio Tagliente, Ludovico degli Arrighi and other early designers. It was Morison who conceived the idea of turning independent Renaissance faces into families by mating one designer's roman with another's formerly self-sufficient italic. The fruits of this enterprise included Poliphilus & Blado (one of Griffo's romans mated with one of Arrighi's italics), Bembo (another of Griffo's romans with one of Tagliente's italics), and the brilliantly successful shotgun marriage of Centaur roman (designed by Bruce Rogers) with the Arrighi italic (designed by Frederic Warde).

American Monotype made several historical recuttings of its own, and issued many new and historically based faces designed by its own typographical advisor, Frederic Goudy. The English company, meanwhile, supplemented its large historical program by commissioning new faces from living designers such as Eric Gill.

The larger surviving typefoundries – including ATF (American Type Founders) in the United States, Deberny & Peignot in France, Enschedé in the Netherlands, Stempel in Germany and Grafotechna in Czechoslovakia – continued ambitious programs of their own, lasting in some cases into the 1980s. Revivals of faces by Claude Garamond, Miklós Kis and other early designers came from these foundries during the twentieth century, along with important new faces by such designers as Hermann Zapf, Jan van Krimpen, Adrian Frutiger, Oldřich Menhart and Hans Eduard Meier. Zapf's Palatino, which is the most widely used (and most widely pirated) face of the twentieth century, was cut by hand in steel and cast as a foundry type in the ancient way, in 1949–50, while phototype machines and early computers were humming not far off.

The earlier history of type design is the history of forms made by individual artists and artisans who began their careers as apprentices and ended them as independent masters and small businessmen. The scale of the industry enlarged in the seventeenth and eighteenth centuries, and questions of fashion

increasingly superseded questions of artistry. By the end of the nineteenth century, commercial considerations had changed the methods as well as the taste of the trade. Punches and matrices were increasingly cut by machine from large pattern letters, and calligraphic models were all but unknown.

The twentieth-century rediscovery of the history and principles of typographic form was not associated with any particular technology. It occurred among scholars and artists who brought their discoveries to fruition wherever they found employment: in type foundries, typesetting-machine companies, art schools and their own small, independent studios.

Despite commercial pressures, the best of the old metal foundries, like the best of the new digital ones, were more than merely market-driven machine shops. They were cultural institutions, on a par with fine publishing houses and the ateliers of printmakers, potters, weavers and instrument makers. What made them so was the stature of the type designers, living and dead, whose work they produced – for type designers are, at their best, the Stradivarii of literature: not merely makers of salable products, but artists who make the instruments that other artists use.

7.3.6 Digital Typography

It is much too soon to summarize the history of digital typography, but the evolution of computerized bitmapping, hinting and scaling techniques has proceeded very quickly since the development of the microchip at the beginning of the 1970s. At the same time, the old technologies, freed from commercial duties, have by no means died. Foundry type, Monotype and letterpress remain important artistic instruments, alongside brush and chisel, pencil, graver and pen.

Typographic style is founded not on any one technology of typesetting or printing, but on the primitive yet subtle craft of writing. Letters derive their form from the motions of the human hand, restrained and amplified by a tool. That tool may be as complex as a digitizing tablet or a specially programmed keyboard, or as simple as a sharpened stick. Meaning resides, in either case, in the firmness and grace of the gesture itself, not in the tool with which it is made.

SHAPING THE PAGE

A book is a flexible mirror of the mind and the body. Its overall size and proportions, the color and texture of the paper, the sound it makes as the pages turn, and the smell of the paper, adhesive and ink, all blend with the size and form and placement of the type to reveal a little about the world in which it was made. If the book appears to be only a paper machine, produced at their own convenience by other machines, only machines will want to read it.

8.1 ORGANIC & MECHANICAL PROPORTION

A page, like a building or a room, can be of any size and proportion, but some are distinctly more pleasant than others, and some have quite specific connotations. A brochure that unfolds and refolds in the hand is intrinsically different from a formal letter that lies motionless and flat, or a handwritten note that folds into quarters and comes in an envelope of a different shape and size. All of these are different again from a book, in which the pages flow sequentially in pairs.

Much typography is based, for the sake of convenience, on standard industrial paper sizes, from 35 × 45 inch press sheets to 3½ × 2 inch conventional business cards. Some formats, such as the booklets that accompany compact discs, are condemned to especially rigid restrictions of size. But many typographic projects begin with the opportunity and necessity of selecting the dimensions of the page.

There is rarely a free choice. A page size of 12 × 19 inches, for example, is likely to be both inconvenient and expensive because it is just in excess of 11 × 17, which is a standard industrial unit. And a brochure that is 5 × 9 inches, no matter how handsome, might be unacceptable because it is too wide to fit into a standard business envelope (4¼ × 9½). But when the realm of practicality has been established, and it is known that the page must fall within certain limits, how is one to choose? By taking whatever is easiest, or biggest, or whatever is the most convenient standard size? By trusting to blind instinct?

Instinct, in matters such as these, is largely memory in disguise. It works quite well when it is trained, and poorly other-