3—Aspects of Arabic Type

3.1. The alphabet and its structure. The Arabic alphabet, like all Semitic scripts, uses the consonantal alphabetic writing system and is read from right to left, yet the numerals are read from left to right, making Arabic a bi-directional script. It bears a strong resemblance to its direct progenitor the Syriac alphabet, but varies in some features that are characteristic to itself.

The Arabic alphabet consists of three overlapping systems for sound representation, namely the basic letter forms, the diacritic dots and the vocalisation marks. The first two (the letterforms and the diacritic dots) are the inseparable and indispensable elements of the alphabet, whereas the vocalisation marks are not frequently used and their use is restricted to specific applications and situations. The diacritic dots vary in shape and position depending on the language, since the Arabic alphabet is also used to denote other languages that carry phonetic values non-existent in Arabic, for example Urdu, Pushto, Malay, Old Turkish and Persian. In addition to the three overlapping systems of sound representation, there exists in the calligraphic texts, a fourth highly expressive uncodified system of decorative signs. These signs are artistic creations that fit within the style of each individual calligrapher. This system includes miniature letters—and even sometimes whole words—not necessarily of any meaningful relation to the text. It also includes floral motifs that are often used to separate verses or chapters in the Quranic text. Some of these decorative signs may be found as part of the character sets of a number of contemporary digital fonts. They are often used for the embellishment of titles and special texts.
3.1.1. Number of letters

The alphabet was expanded from the original 22 Syriac letters to include 38 letters (excluding the indispensable Lam-Aleph ligature and the Hamza) in order to better accommodate the Arabic language.

Its 28 letters represent the consonants only, with the exception of three letters that, depending on their context, are sometimes pronounced as long vowels—the Aleph as the vowel 'a' (or as a short glottal consonant), the Waw and He as semi-vowels.

3.1.2. The diacritics (dots and miniatures)

Like Syriac, the Arabic alphabet also uses a system of diacritic dots. These were developed in the 9th century AD, as part of a whole reform of the Arabic script during the reign of the Caliph Abdalmalek (685–705). Normalising the Arabic writing system into a clear and legible script was launched for administrative and politico-religious reasons. The Arabic Empire needed a clear script in order to secure its unity under the auspices of Islam with Arabic as the universal language; it needed to create an official version of the Quran that avoided any misinterpretation of the holy message among the conquered non-Arab nations. This system of diacritics (dots and vocalisation marks) is attributed to the lexicographer from Basra (Iraq), Al-Khalil Ibn Ahmed. These diacritic dots, are used in order to create new letters that denote sounds particular to Arabic which were foreign to the original Aramaic language from which the script was appropriated. Instead of creating totally new letter shapes, the diacritic dots are used to differentiate letters that otherwise share the same basic shape.

The abecedarion of the 28 letters can be arranged in two ways. The oldest abecedarian system followed the order used by all Semitic alphabets, using whole words to memorise the order of the letters. This mnemonic system was used for setting and memorising the numeric value of the Arabic letters (see diagram 3.3.2 In section on Arabic numerals).

The modern abecedarian system groups letters according to their visual resemblance: where letters that share the same basic shape, but are distinguished by their diacritic dots, can be arranged one after the other. This second abecedarian uses the older system as a point of departure, starting with the Aleph followed by the Waw, etc.

One unresolved confusion within the Arabic speaking countries is that of the diacritics of the letters Qaf and Fath. The earliest version consisted of one dot above the basic shape to mark the letter ‘Qaf, and no dots to mark the letter ‘Fath. With further development of the diacritic systems, a second dot was added to the Qaf and a dot below the basic letter shape was added to the Fath—this version is still used in Morocco, though it sometimes coexists with the later and final development: to keep the Qaf with two dots above and move the dot of the Fath also above the basic letter shape.
In addition to the diacritic dots used in Arabic, other types of diacritic signs were invented to denote sounds in non-Arabic languages. These follow some of the traditional principles of the Arabic writing system, reappropriated in such a way as to create new letters. The two main principles used are additional dots and miniatures letters.

3.1.3 The vocalisation marks—in Arabic Tashkil

In all Semitic languages (from old Egyptian, to Aramaic, to modern Hebrew and Arabic) the vowels are not written, and therefore are not represented by individual letters. In all Semitic languages there is no need to show the vowels since the consonantal roots of words are sufficient to communicate the meaning of a particular word within the context in which it is used. For example, in Arabic, the word ٌبٌبٌ is at the origin of a number of words related to writing. Depending on the context, this word can mean any number of words such as the verb to write, or written, or books, or with some minor additional letters writer, or writing. Similar to Latin and most other European languages, words that share similar meanings often stem from the same word-root, and therefore carry some resemblance to one another. In Semitic languages, these words often look identical since they are represented by exactly the same consonantal letters. Semitic scripts are in a sense economical in their use of the strict minimum essential amount of letters—since consonants cannot be omitted if we are to create words—thus creating relatively condensed texts. This writing system is in some way similar to the system of abbreviation of certain words in English (e.g. Mdg. as an abbreviation for the word building).

All writing is a code, a convention whose reading presupposes that we should know the key. This fact is greatly expressed in the Semitic consonantal languages where the writers do not imperatively mimic the spoken words, and where a lot of judgement on the sound/meaning is connected to the context. There are signs in these alphabets that, though important to the meaning, are not pronounced (such as the Sukun or the Wawsh marks in Arabic) and others that are pronounced but not written, such as the short vowel marks which are deleted from most secular Arabic texts. These short vowels are like the soul is to the body, essential for life yet invisible to the eye.

These invisible sounds are represented in the Arabic alphabet as small vocalisation marks representing short vowels, diphthongs and consonant enhancers. They are occasionally placed within a text above or below the letterforms. The shapes of the small vocalisation marks in Arabic were borrowed from the Syriac. Their shapes underwent some considerable developments from the 7th century AD onwards. They were to expand the variety of forms and positions and go beyond the original dot and stripe patterns to include a set of slightly modified miniature letters. They are mostly used to indicate grammatical functions, and to
differentiate words that share the same consonantal root. With the spread of the Arabic script and language beyond the Arab countries, these vocalisation marks became a necessity for assuring the exact reading and pronunciation of the holy text of the Quran, as mentioned before. During the reign of Abdelmalek, the use of vocalisation marks was limited to the short vowels and their shapes and positions were rather simple. The only shapes used then were dots above the letters to mark the short vowel a, inside the letters to mark the short vowel i, below the letters to mark the short vowel u, and double dots to mark the Tanwirn version of the three short vowels. In order not to get the vocalisation marks confused with the diacritical dots that mark some of the consonantal letters, a system of colour was used: black for the diacritical dots marking the consonants, and red or yellow (and seldom green) for those marking the short vowels. Nowadays, they are used in secular texts as teaching aids for foreigners and children learning the Arabic language. They are also used selectively, reduced to the strict minimum in cases where the meaning could be confusing or misleading. They are often eliminated in newspapers and most other printed matter for visual simplicity and economy of leading space.

The vocalisation marks, known in Arabic as Tashkil, consist of the short vowels, the diphthongs and the consonant enhancers. They are a total of 10 marks composed of 4 basic shapes.

1—The small stripe shape
It is often used at an angle of 30° and derives from the original shapes used in the early Arabic texts to mark the diacritics. It is used to denote four different short vowels:

1.1—the Fathah, denotes the short vowel a. It is a single stripe that is always positioned above the letters.
1.2—the Kasrah, denotes the short vowel i. It is a single stripe that is always positioned below the letters.
1.3—the Tanwirn Fathah, denotes the short vowel a. It is a double stripe that is always positioned above the letters.
1.4—the Tanwirn Kasrah, denotes the short vowel i. It is a double stripe that is always positioned below the letters.

2—The miniature Waw shape
It carries the same shape as that of the letter Waw and denotes two shorter versions of that long vowel:

2.1—the Dammah, denotes the short vowel a. It is always positioned above the letters.
2.2—the Tanwin Dammah, denotes the short vowel a. It is always positioned above the letters.

3—The miniature Q shape
It derives from the original shapes used in the early Arabic texts to mark the diacritics and is only used to mark one of the consonant enhancers, the Sukun. The Sukun denotes the absence of a short vowel, indicating a glottal pronunciation of the consonants. It is always positioned above the letters.

4—The miniature Sin shape
It derives its shape from the letter Sin without the tail and is only used to mark one of the consonant enhancers, the Shaddah. The Shaddah denotes a stress on the consonant letter (doubling the consonant sound). It may be combined with all the short vowel marks. When coupled with a short vowel mark, the mark combines with the Shaddah in the same way and position that it would with any letter. In this case the combination of both is always positioned above the letter. Sometimes all these variations of the Shaddah, when combined with the other short vowel marks, are considered in the design of a typeface as individual glyphs.

5—The miniature Ayn shape
It derives its shape from the letter Ayn without the tail and is only used to mark the short consonant, the Hamzah. This same Hamzah mark is also used in a larger size at the end of a word in free-standing form (it can never be connected) and is then considered as a letter. It denotes a glottal stop. As a vocalisation mark, it is always combined with the long-vowel letters, namely the Alef (the a vowel), the Waw (the u vowel), and the Yeh (the y vowels). It is always positioned above the letters to denote a glottal stop after a long vowel in the middle of a word. When positioned below the Alef it denotes a short glottal stop vowel.

6—The miniature horizontal swash shape
It derives its shape from the alternate Yeh-ending swash. It is only used to mark the Maddah diphthong. It is often positioned above the letter Alef to denote an extended a sound and represent a form of inflection.

7—The miniature Sad shape
It derives its shape from the letter Sad without the tail and is only used to mark the Wazalah, which is always positioned above the Alef and has no phonetic value.
The mysticism attributed to writing is not confined to ideographic writing systems. In the Islamic tradition, the development of point to line, of light to movement and of the Aleph to the alphabet, becomes the story of creation itself. In religious texts, the calligraphic perfection that may sometimes obscure the reading of the text forces the reader to go beyond the precise meaning of the text and into the radiating beauty of the holy message. Ornamentation is designed to intricately mimic the infinity of God's creation, and to imply to the faithful believers the mirror-image concept of the reciprocal reflections between the spiritual and material worlds. For many ancient cultural and religious traditions, the world of writing is a metaphor for life; its elements are the creatures and its books the world.

The Arabic letters are at the centre of the Islamic story of creation. In the beginning, God created a point of light (like the Hamza — the very short consonantal sound represented by a tiny sign on top of the Aleph, and not counted as a full letter but as a vocalisation mark). While God looked at it, the point began to drip, becoming ink, and the letter Aleph was formed. The Aleph, the first letter of the alphabet, is the first moment of creation when non-matter (the Hamza, the point, the light) becomes matter (the Aleph, the line, the ink) in the flux of movement. This principle of point to line, of non-matter to matter can also be applied to the Arabic numbers where the point represents the zero (the incarnation of nothingness or non-matter), and the line represents number one (the beginning of all numbers, the first and simplest material form). In addition to being the beginning of life, the Aleph becomes the axis of the world. Through its infinite rotational movement around itself, it draws the circle that regulates the shapes and proportions of all the other letters of the alphabet. Through motion, it gives form to the whole alphabet, and joins non-matter (ideas) to matter (writing). The circle is another essential metaphysical concept, a symbolic way of expressing the divine philosophy of Tawhid — the divine unity of the diverse yet harmonious creation. Therefore with these three elements of point, line and circle, and the geometric structural principles that govern their inter-relationships, the whole of Islamic applied arts were unified. Encouraged by the prohibition of figurative representation in Islam, Arabic calligraphy in particular, achieved the status of spiritual art through its fusion of sacred text and aesthetics.
Innovation, between order and freedom of form. And these rules are not unfamiliar to any trained typographer regardless of the script or language they may be working in.

3.2.1. Distinction between Arabic and Latin letterforms

The Arabic and Latin alphabets are two of the most widely used alphabets around the world. Though they stem from the same origin (the Phoenician alphabet), they differ considerably, visually as well as typographically. All typography originates from handwritten script. The dissimilarity in visual appearance between Latin and Arabic handwritten script has dramatically influenced the course of their typographic development. This dissimilarity is due to the fact that on the one hand their calligraphic pens differed in shape and angle, and on the other hand, their writing ran in inverse directions. The European scribes used their pens at an angle of 90° when writing Latin text from left to right. The result of the pen’s angle and the writing direction created letters that consist of heavy vertical strokes (slightly slanted towards the writing direction), and thin horizontal strokes, the latter used to connect the letters to one another. This cursive style was later exaggerated in the form of the German Gothic style (also known as Blackletter after the overall dark colour it gave to a block of text). The thin horizontal strokes of Latin script created simple, horizontal connections between letters, thus eliminating any need for shape variations per individual letter regardless of its position within a word. When Gutenberg revolutionised printing by inventing movable type, he cut his type according to the existing Gothic style used in Germany during that period, and simply eliminated the already negligible thin strokes connecting the letters to one another, thus creating the same free-standing individual letters in use in most Roman alphabets today. By doing so, he unintentionally brought type back to the original principle of detached Roman Capitals.

With respect to Arabic, the writing pen used may vary in size and shape from one calligrapher to another, but when compared to the pens used in Latin calligraphy, they are invariably cut at a much steeper angle, and the writing runs in the opposite direction of Latin script. These two facts led to an opposite effect on the construction of the Arabic letterforms. The letters in Arabic consist of thin vertical strokes and thick horizontal strokes. The thickness of the horizontal strokes which form the connections between the letters, gives them an important presence, and creates a complex system that governs the way the letters can be connected to form a word. These complex connections are the result of the possibility of making not only horizontal but also vertical connections. This complexity is visible in certain calligraphic styles, and exaggerated in others. The complexity and importance of the connections between letters in the Arabic script explains the need for shape variations of individual letters in relation to their position within a word. It also accounts for the difficulty of separating or disconnecting the letters. This fact has been responsible for confusing the development of the Arabic script to its original cursive nature. This cursive nature has made Arabic typesetting, up until very recently, a costly investment and a complex task. But with the digital possibilities of recent computer software applications, this issue is almost obsolete.

The most basic unit of the written text in the Latin script is the letter, whereas in Arabic, the basic unit is the word. As a type designer, it is imperative to go beyond the proportions of each individual letter, taking into consideration the shape variations per letter, and the connections of letters to one another.
3.2.2. The basic proportions of individual letters

A child of his times, Ibn Muglah based his design parameters for the cursive styles on geometric proportions using the three basic elements: the rhombic dot (measured by the pen stroke thickness), the Aleph (the measuring stick of the alphabet), and the circle (the diameter of which is equal to the height of the Aleph).

His principles for the construction of letterforms were later used and slightly modified to accommodate other calligraphic styles. This principle of the pure geometry of letterforms may have inspired European scholars and artists in the Renaissance. In 1519 a.a., Geoffrey Tory wrote a book on typography entitled *Champ Fleury*, wherein he discussed letterforms in terms of geometry, perspective and proportions of the human body. We can detect an uncanny resemblance to Ibn Muglah’s principles when Tory states in poetic terms that the two letters from which all the letters of the alphabet are born, are nothing less than the capital letters A and I—the circle and the vertical straight line.

Based on the measuring parameters of the three basic elements, the calligrapher first decides on how many dots must be used as a measure for the Aleph. Then, based on that measurement, the diameter of the circle is set. Finally, within this circle the rest of the alphabet is made to fit, each according to its specific rules of design and dot measurements.

The proportions of the most important letterforms in their free-standing position is configured within the circle as follows:

1. The Aleph equals the diameter of the circle and it is built at a proportion that varies between 1:5 to 1:8 depending on the calligraphic style and calligrapher—being the thickness of the dot made by the pen, and 5 or 8 being the amount of dots that form the stroke length of the letter. In Naskh style for example, the Aleph is about 1/7 (5 dots high).

2. The Baw’ (the width of which approximately equals the length of the Aleph) is basically the Aleph rotated to 90°. In Naskh style for example, the Baw’ is about 1/7 (5 dots wide, with 2 dots for both of its side strokes).

3. The Seen (and Heth) is a combination of a horizontal shape that opens up as a slanted eye (sometimes open and sometimes closed) on the top and moving downwards forms a big open circuinal shape. Its circular shape equals 3/4 of the circle, and its top part is equal to the length of 4 dots.

4. The Nun (and all the letters with the same lower part; the Sin, Sad, Kaf, Lam and Yeh) equals 1/2 of the circle.

5. The Kaf (and all the letters with the same lower part; the Mewem and Waw) equals 1/3 of the circle.

6. The Dal (and Thau) is an equilateral triangular shape, made to fit in an area equal to 1/4 of the circle.

7. The Hah (and the same lower part of the Lam-Aleph ligature) equals 1/8 of the circle.

In the cursive calligraphic styles, these geometric proportions are loose guidelines, leaving the final decision on the shape and proportion of each letter to the optical adjustment and taste of the individual calligrapher. These principles of geometric proportions and measurements are not sufficient nor absolutely conditional for designing an Arabic typeface. In Morocco, for example, the traditional way of learning Arabic calligraphy is not based on strict measurements but rather on the copying of good existing texts until the apprentice learns to master his art. The aim is to create letters that are homogeneous in their stroke weight and proportions, letters with smooth connections that harmoniously suggest a clear reading direction.
3.2.3. The variations of shapes per letter

The Arabic alphabet bears a strong visual and structural resemblance to its direct descendant, the Syriac script. Its letters are connected to each other in order to form words. This system of word units is totally rooted in the calligraphic writing tradition. The words are not only separated by clear word spaces, but often end with swashes that may run under the following word. This characteristic feature helps in clearly identifying individual words within a sentence. This method of writing has led to shape variations per letter, whereby one letter may have up to four shapes depending on its position within a word and its relation to the letters following and/or preceding it. Unlike the Latin script, the connections between letters are not strictly horizontal nor do all the letters sit on the same baseline; some letter connections are done vertically where letters are stacked on top of each other, creating a series of sloping multileveled baselines. This can be seen in old manuscripts written with the original Kafi style; it is clear to see in the Naskh and Kufic styles and is totally exaggerated in the Nasta’liq style. Arabic writing has a strong linear direction that gives the script its even flowing reading trajectory.

The shape variations per letter are as follows:

1. Arabic type consists of one set of characters; unlike Latin, it has no capitals and no special italic characters.

2. Of the 29 letters, 19 have four shape variations (initial, medial, final, and free-standing); 6 letters have only two shape variations (medial and final); and 2 letters have two extra variations that carry their own name and come in only final and free-standing shape variations (the variation on the Aleph is the Aleph Mecca, the variation on the Teh is the Teh Mecidiyyah), and the small letter called the Haraz which varies in size (bigger when free-standing, and smaller when used as a vocalisation mark above or below other letters).

3.2.3. Khamsah Teheran, is the third principle of the Teheran system for being used only within a specific line using similar parts for different letters.
1—In addition to the 29 letters of the Arabic alphabet, there is one indispensable ligature that is considered a separate character and that plays a key role in the design of a typeface. That character is called the Lam-Aleph, and it is basically the ligature of the two letters indicated in its name.

4—For an alphabet of only 29 letters, Arabic needs a basic set of 130 glyphs.

In addition to the set of shape variations per letter used in Arabic, there are additional ones that were invented to allow for denoting sounds in non-Arabic languages that use the Arabic script. These follow some of the traditional principles of the Arabic writing system, but then reappropriate them in such a way as to create new letters. The two ways used to create a new letter are to modify the rules governing the connection of each particular letter within a word, and to use the alternate shapes of certain letters.

1—Modifying the rules of connecting letters within a word.

In the traditional Arabic writing system, each letter is governed by specific rules that dictate how many shapes variations an individual letter needs and how it should be connected, or not, to other letters within the same word. These rules of connections, which lead to shape variations for the individual letter, do help tell certain letters apart that are otherwise similar in shape. For example, they help differentiate the letter Aleph from the letter Lam in words such as Aam and Alam. This same principle is used in non-Arabic languages, by changing the rules of connection used in Arabic in order to create from the existing shape variations of one letter, new representations for sounds that are nonexistent in Arabic.

2—Using the alternate shape variation to create a new letter. In the tradition of calligraphic writing, some letter endings can be moderately varied in order to aesthetically enhance a text. This is not unusual in the Latin scripts (e.g., the Zapf Renaissance font) and quite common in the Arabic calligraphic tradition. This principle of alternate shape variations for one letter are used in non-Arabic languages not for aesthetic reasons but in order to denote new sounds. For example, the optional swoosh variation of the final form of the letter Yeh in Arabic becomes a totally new letter in some non-Arabic languages.

In general, the Arabic letters do not have an x-height, and most letters have open shapes towards the top. Consequently, what helps in differentiating one letter from the other is the height of each individual letter rather than its clearly distinct shape. This feature contributes to the sinuous line quality of Arabic texts, but leads to the difficulty of creating distinct character shapes, making the task of ocr (Optical Character Recognition) software almost impossible. Because of its heavy horizontal lines, Arabic text often looks like a series of line strips with a few nibs sticking out, either towards the top or the bottom. This effect is strongly visible in some type styles. In order to remedy the emptiness and gaps caused by this strong horizontal linearity, vellum marks and decorative motifs are sometimes added as fillers to give an overall balanced color to the text.
3.3. The non-alphabetic symbols. The alphabetic writing system depends on the construction of language; it is an intricate system of transparency where almost all we can pronounce can be written and vice versa. Although writing is a visual translation of spoken language, like any translation, it is imperfect and leads to some distortions. In written as in spoken language, it is the combination of elements that constitutes the meaning beyond the words; readability does not depend solely on the clarity of the letter forms, but also on the relation of those to each other as well as to a whole set of non-alphabetic signs used to complete the meaning. With the concern for transcending language beyond mere words, and for including the inflections and intonations that constitute the music of spoken language, a few non-alphabetic signs needed to be added to the set of letters. These began with the punctuation marks, and were later expanded to include other abstract and typographic signs representing whole words or concepts.

The non-alphabetic symbols may be classified under the following categories:

— the punctuation marks (i.e. period, comma, colon, semi-colon, quotation mark, question mark, exclamation mark, bracket, parenthesis, dash, etc.),
— the numerals,
— the symbols (mathematical and scientific symbols, stylised abbreviations that stand for commercial and legal logograms, silent typographic signs such as the asterisk or the dagger, and symbols relating to various specific professional diagrams, charts, maps and notations of all kinds).

3.3.1. Punctuation marks

Punctuation is the set of abstract silent signs that note typographically the reading rhythm of a text and bring order and clarity to the meaning. They regulate the tempo by marking the intonations, the logical pauses, and the divisions between words and sentences. They give back to text its spoken quality, for when reading silently we continue to hear the text. Although writing seems to silence the spoken language, it does give free rein to the inner voices of readers through punctuation marks. Punctuation marks represent the perfectionism of written language. They choreograph typography, moving words in proper timing and emphasis along the lines of text. Punctuation marks cannot be used independently; they usually accompany alphabetic letters (except in some illustrative situations).

With the advent and widespread use of e-mail, punctuation marks have developed into an expressive form of symbols called emoticons that are used to complement the written text by representing emotions through facial expressions.

The old alphabetic writings were continuous texts that did not use any non-alphabetic marks. The first non-alphabetic mark to be used in Roman texts, was the dot (or punctum in Latin, from which the term punctuation originated). It was originally used to separate words, then was later used to mark a word break at the end of a line of text. The first attempt at devising a normalised punctuation system was put forward around 260 AD, by Aristophanes of Byzantium, the librarian in Alexandria. He created a system of dots to mark logical segments of a text. He used a dot in three different positions: 1. the dot centered in the middle of the capital height was called the comma; 2. the low dot sitting on the baseline was called colon; 3. the low dot under the baseline was called periodos. The change of the position of the dots was sufficiently visible since Greek was written only in capital letters which had the same height and sat on the same baseline. Although the name of these punctuation marks remains, their shapes have changed over the centuries. The shape of the dot however, has survived in the form of the bullet or mid-point which is used for lists and other typographic purposes. In the 4th century AD, the punctuation system of Aristophanes was revived by the Roman grammarian Donatus. Many other punctuation marks came to appear in medieval manuscripts, but neither their shapes nor their functions were standardised then. They are believed to have been marks for referencing and cues that regulated the rhythm of reading aloud. It was the Benedictine monks who later played an important role in normalising the conventions of punctuation marks.
Under the influence of medieval scribes and onwards to the Renaissance typographers, punctuation became more complex as writing became more used for silent reading. After the invention of printing, punctuation became directly linked to grammatical structure. Since the invention of the printing press, many humanist typographers throughout Europe were preoccupied by these silent signs and made considerable contributions to their development and modification. From the beginning of the 15th century up to this day, punctuation remains linked to a combination of grammatical logic and reading rhythm, and the conventions governing the use and the forms of punctuation marks have been set. With the worldwide spread of printing, a variety of writing systems around the world adopted the punctuation system used by the Latin alphabet. However, each culture created its own variations concerning the shapes and conventions relevant to its language.

Punctuation marks fall under three categories:
1—signs for opening and ending sentences, such as the period, the question mark, the exclamation point, and the ellipsis.
2—signs for logical breaks and juxtapositions within a sentence, such as the colon, the comma, the semi-colon, and the dashes.
3—signs for sequences and editorial purposes within a sentence, such as the parentheses, the square brackets, the quotation marks or guillemets, and the virgule.

The punctuation system used in Arabic has had a similar development to that in Latin. It also started with a system of dots in the form of rosettes and floral motifs used to separate the Quranic verses and paragraphs. Their development into the present day marks, must have occurred part as in Europe, during the period of typographic developments brought about by the early printing industry. Since the first cut and printed Arabic type was done in Italy in the 16th century A.D., it is logical to assume that the same sorts used for Latin were adapted for Arabic type. Therefore, Arabic punctuation marks in use today are simply a mirror image of their Latin counterpart, facing in the opposite direction towards the text that runs from right to left. They mostly follow the French punctuation system and conventions of use. They carry minor variations in their direction and shape. Only the most basic punctuation marks are available in Arabic fonts (with the exception of the ellipsis).

1—Signs for ending sentences

1.1. The Period. It is the first and most basic punctuation mark ever invented. It consists of a dot placed on the baseline. It marks the ending of a thought or statement.

1.2. The Question Mark. It consists of an upright squiggly shape like a hook above a dot and stands on the baseline like a regular letter. Its size is about that of the Aleph. It is always facing right towards the direction of the text as if to mark a visual break in the reading flow. It indicates a direct question.

1.3. The Exclamation Point. It consists of a vertical stroke above a dot and stands on the baseline like a regular letter. Its height is about that of the Aleph. It indicates an interjection or exclamation, or denotes a strong utterance or feeling.

1.4. The Ellipsis. It consists of a set of three consecutive dots positioned on the baseline like a Period. The dots are the same size as a Period. In Arabic fonts this punctuation mark is not to be found as a separate character, though it should. It indicates mostly a rhetorical pause. It is also used in the middle of a sentence to indicate an omission of words that are thought to be understood or of redundant information.

2—Signs for logical breaks and juxtapositions within a sentence

2.1. The Colon. It consists of a set of two dots placed vertically one above the other and positioned on the baseline like a Period. The dots are the same size as a Period. It is basically used for grammatical purposes and was inherited from the medieval scribes. It is mostly used for directing attention to specific textual matter that comes after it in a sentence (i.e. as an explanation, a list of items, or a quotation). It has many other functions in other fields in linguistics as a mark of prolongation, in mathematics to indicate ratios (i.e. 4:1 reads four to one) or proportions (used in single and double form, i.e. 2:1 or 2:4 reads two is to one as eight is to four), in numerical representation of time separating hours from minutes and seconds (i.e. 12:30 or 11:30), and in bibliographical reference (i.e. Nation 150:20).
2.2. The Comma. It consists of a tall dot, positioned on the baseline like a Period. Its shape is likely to have originated from the Roman stone inscriptions. When the Roman calligraphers lettered their texts before carving them in stone, they used a flat brush that produces modulated strokes. This brush, when twisted to create a dot, would naturally result in a small tail-ending pointing diagonally towards the bottom and extending slightly below the baseline. This mark was later used by the medieval scribes and became part of the standard set of punctuation marks in the 19th century. The Comma used in Arabic script is not only a mirror image of its Latin counterpart, but its tail is also turned upwards in order to avoid any possibility of confusing it with the Dammmah, a short vowel mark. It indicates a juxtaposition of two short clauses within a sentence. When used in the same direction as in Latin script, it is called a Decimal Comma and is strictly used for numerical notations that run in the same direction as in European notations (from left to right). In Arabic, the Decimal Comma is used to mark a decimal point in numerical notations, whereas the thousands are separated by a space (in line with the European conventions for numerical notations).

2.3. The Semi-colon. It is a hybrid between the Colon and the Comma; it is composed of a Comma placed vertically over a dot and resting on the baseline. The shape and size of its components are identical to those of the Comma and the Period. It originally derived its shape from old medieval manuscripts. It indicates a juxtaposition between two or more independent clauses within a compound sentence.

2.4. The Dash. It consists of a horizontal line. The Dash included in most Arabic character sets is the standard computer and typewriter keyboard Dash. It is roughly an en dash (–). A full en dash can also be created manually by typing two en dashes. In Arabic fonts it is also used for prolongation of certain letter connections within a word. (This is used for justification purposes and is called Kashida or Semitic justification.) It indicates a break in the thought or structure of a sentence.

—signs for sequences and editorial purposes within a sentence

2.1. The Parentheses. They consist of a pair of modulated curved rules that enclose a section of text, used curving towards the text. It is used to enclose an explanatory word, phrase or sentence that is inserted within another sentence or passage of text. It is also used to isolate a group of letters or numerals (i.e. in mathematical formulas, addresses, telephone numbers, etc.).

3.2. The Square Brackets. They consist of a pair of square plain straight vertical lines ending on top and bottom by a short flat horizontal line. Like the Parentheses, they are always pointing towards the enclosed text. They are used for editorial purposes to mark insertions or alterations into quoted matter. They are also used as a secondary set of inner Brackets. They are also used in logic and mathematics to mark a collection of different parts.

3.3. The Quotation Marks. They are designed in Arabic to be distinctly different from the Dammmah vocalisation mark. In well-designed Arabic fonts they have the shape of a double miniature parenthesis that has relatively flat curves. They are positioned above the baseline with their top lining with the top of the letter Aleph. Their lines are modulated going from thick to thin at the bottom for the opening mark and the upside down version for the closing mark. They curve towards the enclosed text. They are rarely used because of the general aversion towards the more distinctive shape of the guillemets. They were originally invented in the 16th century and were extensively and repetitively used in the 17th century to mark sections of a printed text. They are used for enclosing a quotation in which the exact phraseology of another author or another text is directly cited.

3.4. The Guillemets. They consist of a pair of double miniature angled brackets that sit on the baseline. They are often used in Arabic texts because their shape creates no visual conflict with any of the Arabic letters and vocalisation marks. They are generally set with a generous space between them and the text they enclose. They always curve towards the enclosed text. They are named after the 16th century typecutter, Guillaume Le Bé, who allegedly invented them. Their function is identical to that of the Quotation Marks. They are also called Chevrons, Duck Feet and Angle Quotes.

3.5. The Virgin. It consists of a diagonal line. It was originally used by medieval scribes as a Comma. It is used to denote "or" (as in and or), and "or" (as in black/white), "per" (as in days/week). It is also used for writing fractions (1/2), or as a line break, or in dates (11/1/1965), or anywhere else as a sign of separation.
3.3.2. Numerals

Numerals and calculation systems are some of the oldest forms of writing recorded by human civilisations the world through. Although the first forms of calculations were originally done with concrete objects (stones, bones, and other implements), it is their representation into written symbols that has contributed to their development as more abstract concepts. Archaic numerical systems were not up to the same level of perfection as our present day system; nonetheless, they displayed a level of intellectual sophistication and millennia of experimentation with possibilities that led to our universal system. The earliest clay tablets from Uruk (c. 3500 BCE) in Mesopotamia, show calculations based on a sexagesimal system using multiples of 60 (i.e. 1, 10, 60, 360, 600, 3600, etc). We still use this system today to measure time or angles (i.e. there are 60 seconds in a minute and 60 minutes in an hour, and 360 degrees in a circle).

Many of the other archaic forms of numerical notation systems follow the verbal expression of numbers, in that they are structured according to groups of tens: called the base ten (with numerical notations of the numbers 1, 10, 100, 1000, etc). This counting principle might have originated from the most basic human counting device—the number of fingers on our hands. The most primitive notations of numbers were based on an additive process (adding up the numerical value of each symbol to represent the total value of the composite number), following the principle of counting with concrete objects. This system led to a large amount of symbols to represent one single number. It evolved later to include a hybrid system where not only addition but also multiplication was used (writing $x + 5$, $2x + 4$), $6x + 5$, to represent the number $465$, following the spoken expression of numbers. This method helped reduce the amount of symbols needed for transcribing large numbers.

Originally numbers were written with each respective culture’s traditional script: the Egyptians used hieroglyphs for their numbers and then evolved their symbols into the later more-cursive Heratic and Demotic scripts; the Romans used their Latin alphabet for numerical notations; the Hebrews and later the Arabs used their alphabets as well as assigning a specific numerical value to each letter.

The problem with all these systems was that no arithmetic calculation could be done using any of these written numerical notations, often an abacus or other accounting devices were needed. With the invention of the Indian positional notation system—the system we use today—many of the numerical notations with alphabetic letters stopped being used for mathematical purposes. They survived either in magical or other esoteric or religious practices (in the Islamic and Jewish religious), or for typographic purposes (using Roman numerals for classification purposes).

The Indian invention of positional notation of the 4th century AD revolutionised written numerical calculation bringing the art of calculation to a final conclusion. It took a few hundred years for it to spread, reaching the Arabs (c. 773 AD) through an Indian ambassador to Baghdad. In the 12th century AD, it reached Europe via the Arabs in Spain, through a book written by the well-known Arab mathematician, Muhammad Ibn Musa Al-Khwarizmi (c. 780–c. 850), entitled *The Book of Addition and Subtraction by Indian Methods*. This book was translated into Latin and had a great influence on the development of European numerical notations and calculation methods.
The ingenuity of the Indian positional notation system stems from its simplicity, flexibility, and capacity for unlimited representation. Its invention was to mathematics what the alphabet was to writing. Its three important characteristics are:

1—-the principle of position
Positional notation states that the value of a digit is not constant, but varies according to its position in a number (i.e., 1 is equal to one but in a 1000 it is equal to one thousand, whereas in the Roman numerals the I always represents one and the M always represents one thousand regardless of their written sequence). This in fact is an abbreviated representation of the hybrid system where only the coefficient of the number of base needs to be written, the base value can be deduced through the sequence (i.e., 786, is simply an abbreviation of 7x1000 + 8x100 + 6x10 + 1). The number of digits needed was limited to ten, and was easy to memorise.

2—-the dynamic nature of units
For the system to work efficiently, each unit had to have its own autonomous symbol that is visually independent from any other possible meaning. For example, when using letters, words might be created that carry a meaning. Since the digits were independent from each other, the shapes of the symbols representing them were distinctive and free from ambiguity. They read horizontally like letters, yet unlike letters, every group of digits would invariably represent a specific and unique number (not all letters can combine to form words, some combinations will produce meaningless nonsense). The amount of digits can be as big as the size of the number, which made comparisons between numbers quite easy at first glance (i.e., the longer the digit the greater the number).

3—-the invention of the zero
A fundamental condition for a numerical system to function as efficiently as our present-day system is that it must have a zero—the symbol representing nothingness or the value of none. This concept became indispensable when people started using positional notation, because a symbol was needed to mark the empty place value ensuring the correct placement of each digit forming in its precise position. The zero is only needed for the positional notation system.

The symbols representing the ten digits have come to be called by Europeans, Arabic numerals, as a way of distinguishing them from the Roman numerals that use the Roman letters. The symbols representing the digits have preceded the invention of the positional notation system and that of the zero. These shapes can be seen in old Indian manuscripts dating back to the 3rd century BCE. The form of these symbols gradually changed and developed as they spread universally into what is in use today. The shapes of the numerals used in modern Western and other cultures using the Roman script originated from the Gharar numerals of the Western Arabs in Moorish Spain. The Arabic numerals used by modern Arabic script are direct descendants from the Indian symbols. Their shapes are visibly different, but some evident resemblance testifies to their shared origin.
3.3.3. Symbols

A large number of abstract symbols can be combined with a text for a variety of communication purposes and in different media. The history of symbols and their development is long, complex and beyond the scope of this book. It testifies to the basic human need to communicate complex abstract ideas with relatively simple visual forms. This need has led to the creation of various types of symbols most of which were at the origin of all written languages. However, some other types of symbols have survived in their illustrative or abstract non-alphabetic or sound-representative form. These are varied but share one common aspect of representing whole ideas and concepts instead of just sounds.

The symbols we encounter in our everyday or professional lives have been the result of centuries of conventions and universal standardizations, originating from different disciplines and historical periods. Their number can be so large and their use highly specific. They can be sometimes available as specialised fonts, or custom-made to accompany certain existing fonts. Many sophisticated Latin fonts carry a considerable amount of mathematical and typographic symbols as part of their font family, in the form of an expert font. Arabic and other small-family fonts often lack this rich variety and are confined to a rather limited basic standard set of non-alphabetic symbols. The classification of symbols leads to a long and maybe an ever-expanding list of which the most common categories are listed below.

3.3.3.1. The common set of non-alphabetic symbols

This set of non-alphabetic symbols began their life on the keyboard of a typewriter and were expanded a little further as they got upgraded for use on typsetting machines and computer keyboards. It remains the basic minimum to which many additions may be made—the number of additional characters is practically unlimited within the scope of the latest digital font technology. Arabic and most small-family fonts do not exceed this basic set, which consists of the basic calculation signs, some monetary and legal symbols (these are often based on Latin type and are used as such in Arabic texts), some typographic symbols, like the asterisks and the bullet and some other measurement symbols. In Arabic fonts, some additional scriptorial symbols can be seen, carried through from the Quranic manuscripts, like small rosettes, and some religious word and phrase logograms.

2—The scientific set of symbols

Symbols are often used for scientific disciplines and worked with in an efficient and integral way. The most recognizable of these are subjects that most literate people have dealt with in some form or other during their education. These subjects such as mathematics, physics, chemistry, biology and engineering, all have their own sets of symbols. Such symbols are often available in specialised fonts that rarely comply with the variety of type styles.

3—Symbols for professions and disciplines

Symbols are also developed for certain specialised disciplines where diagrams, maps and charts use symbols to convey essential information. For example, such symbols can be found on topographical or geological maps, city and leisure maps, architectural and agricultural maps. They are also used on charts, like airway traffic control, meteorological charts, astronomy charts, dance and choreographic diagrams. They are also seen as informative symbols on all sorts of equipment and products, like on packaging for food, agricultural and practically all consumer products, business, medical, photographic and all household equipment, car dashboards and music docks. They are used as writing to mark sound, as in the case of musical notations, which are more universally standardised than the Latin or Arabic alphabets. These have been experimented with and their representation conventionalised for experimental instruments and types of music, however, their universal original shapes still prevail. Most of such specialised sets of symbols can be found as independent digital fonts, such as the Carta font for general cartographic symbols, or the Sonata font for musical notations.
4—Instructional symbols or pictograms

Many symbols are generally encountered in public spaces, such as architectural signage in private and corporate buildings, museums, hospitals, train stations, airports, or on signage for outdoor urban spaces such as parks, roads, runways, ports, highways. These tend to be figurative in nature and often of essential instructional nature as warning or guiding signs. They are often accompanied by text and arrows; their function, content, form and even sometimes their colour coding, are internationally standardised. They tend to be pictorial and are generally termed pictograms. These pictograms are also found on machines and product packaging accompanying warning instructions, such as on heavy duty machinery, on household and corrosive products. These may exist as drawing templates but are rarely incorporated (with the exception of arrows) into the character set of a font. They can and should however be incorporated in typefaces designed for architectural signage, taking the style of the font into consideration.

5—General cultural symbols

Such symbols are often used for recreational facilities and related design applications, such as for sports events, amusement parks, zoos and public parks. They are also used in esoteric and religious circles, for astrology, alchemy, magical talismans, a range of spiritual beliefs, and HoBo signs. Some have been developed to raise ecological awareness like the highly visible recycling symbol that can be found on paper and other types of products and packaging, and on garbage bins and signs. Finally, there are symbols that have historic origins and used on flags and other visible media, like heraldry and their modern version, the logos of companies and institutions of all kinds.

6—Typographic and decorative symbols

These types of symbols are abundant in the graphic arts industry. They date back to the first illuminated manuscripts and are closely related and used in the book design craft. They have become popular since the beginning of the 19th century with the new development of printing and publication production. They have been expanding ever since with the explosion of digital fonts that came about with the spread of the personal computer, which provided easily accessible and user friendly type design software applications. These types of symbols consist of typographic as well as illustrative ornaments, and are sometimes found as part of large family fonts, either in the expert or special font set. They range from typographic symbols to old-fashioned ornaments, from illustrative fun symbols to decorative abstract borders and initials letters. They are most commonly found as totally specialized fonts such as the Zapf Dingbats and Woodtype Ornaments fonts that carry a collection of old printer’s ornaments, or the Fr Dingbost font that carries illustrative elements and characters, or decorative borders, each representing a specific subject and style. These kinds of fonts are too numerous to list in this book. One only needs to browse through the catalogue of any type foundry to come across a considerable selection of such so-called Pi-fonts.
4—Type Design

In this chapter, the design issues pertaining to Arabic type will be tackled in comparison to Latin type for a number of reasons. First, the same issues of visual perception apply to both scripts regardless of their visual differences. Second, the tools used to create them are nowadays exactly the same. Third, the majority of people reading and writing languages that use the Arabic script also use Latin as a complementary script for their bilingual visual communication. Fourth, most type designers who design Arabic fonts are or should also be proficient in designing Latin fonts, and therefore the comparison of both scripts might prove to be a pragmatic and informative approach.

All design activity starts with defining the purpose of the design application and the context in which the design has to perform its intended goal. The brief also contains a listing of the design constraints. With these elements a benchmark is created by which the effectiveness and functionality of the end result may be measured. This also counts for type design. The purpose of a typeface design, the scope of work, and the time invested in its completion, are constraints that vary from one typeface design to another.

Before going deeper into the description of the current spectrum of type design, a clear distinction between the various methods of text production needs to be drawn. In the professional field, often the production of text is divided into three categories: writing, lettering, and typography. The first, writing, is described as the free-flowing and uncorrected manual production of text. The second, lettering, is considered a meticulous method of producing carefully drawn letters, which allows for corrections during the text production process. The third, typography, is considered the industrialised method of text production—whether on the level of type design, or on the level of applying existing type to design applications.