# ADVANCES IN ARABIC PRINTING

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The practice of printing involves two processes: typesetting--that is, the composing of words and lines of text and the assembling of them into columns or pages; and the printing itself, the process of transferring the surface images of the letters and words to paper by some mechanical method. The craft of printing from movable type began to be practised in Europe in the middle of the fifteenth century. Until well into the nineteenth century the craft spread widely throughout the world, and its output of printed work increased considerably without any substantial changes in its methods. Each piece of type was assembled by hand, and each forme of pages inked and printed off on a manual press. The first notable advance occurred in 1814, when the power-driven printing press was introduced to provide a much increased rate of production of the finished work.

The process of printing, or press-work as it is usually called, requires a good deal of skill, but it does not vary from one place to another. In short, the language in which the work is composed has no bearing on the method of its printing.

The case is otherwise in typesetting. The compositor must be familiar with the letter forms in which the language is to be expressed, and the traditional conventions of those character forms. European languages require two alphabets, capitals and lower case, in the 'roman' script; and a few other scripts, for example Russian, Greek, Armenian, follow the same convention. In most of the world's scripts the individual letters are expressed in one form only, but they do contain special complexities--notably, the representation of vowels as attachments to the consonant element in a syllable rather than as separate letters. This is true of Arabic, which has the additional characteristic of being cursive; that is to say, the letters are connected to each other as in personal handwriting. Until recently, this characteristic, and the variations in letter form which result from it, made the manual and mechanical typesetting of Arabic a more laborious task than the typesetting of European languages. Nevertheless, Arabic typesetting began quite early in the history of the craft, because the important contributions made by Arab culture to the general body of learning aroused the keen interest and appetite of European scholars during the Renaissance. The first book which included passages composed in Arabic type was printed at Fano in Italy as early as 1514. An edition of the Qur'ān is known to have been printed in Venice in 1518, though no copy has survived. Robert Granjon, the great French type-founder, cut the punches for the Arabic type which was included in the printing of a book in Rome in 1585. Indeed, he cut several Arabic types, and some of them survive to this day in the archives of the Imprimerie Nationale in Paris. At Oxford, Archbishop Laud, who established a Chair of Arabic in 1635, encouraged the university printing office to buy Arabic types from Holland, which it did in 1637. The first Arabic type to be created in England was cut by William Caslon in 1720.

It cannot be said that the artistic quality of these European-made Arabic types was of a high order. This was not because of lack of skill. Granjon, one of the greatest of sixteenth-century punch-cutters, was renowned for the beauty of his roman type forms, and he had produced an exquisite *civilité* type, in imitation of a formal handwriting popular in France, before he cut his first Arabic type. The probability is that European scholars declined to lend their valuable Arabic manuscripts to the type-founders, and supplied them merely with their own handwritten

versions of the Arabic characters. The punch-cutters[1] could do no more than follow these imperfect models. Not until well into the nineteenth century did Arabic type design become at all respectable, with the use of photography in providing the type-founder with good models, and the introduction of the pantographic punch-cutting machine. The establishment of typefoundries in Near Eastern cities also did a great deal to improve Arabic type design.

Power-driven printing presses were in general use by the last quarter of the nineteenth century, and their ability to produce printed sheets at high speed emphasized the great need to mechanize the process of typesetting. This was accomplished before the end of the century, when the Linotype and Monotype mechanical composing machines were invented and soon became a reliable and satisfactory form of typesetting. In their different ways, and in the extended versions of them which were developed in the first half of the twentieth century, the Linotype and Monotype machines[2] transformed the process of typesetting. Printing in the Arab world benefited considerably from those machines. Although the Monotype machine was not equipped with Arabic matrices until 1939, the makers of the Linotype machine in England produced a special version of the Linotype with 180 keys, furnished with Arabic matrices, as long ago as 1911. By 1936 the Linotype machine was widely used in the Arab world, and in response to demands by newspaper printers the total array of characters in the matrix font was reduced by the elimination of a number of non-essential items and a bold type was developed and coupled with the normal version of the Arabic characters.

Because of their urgent need for rapid production, newspapers have often been the stimulus for innovations in printing technology, and it was a newspaper proprietor who stimulated Linotype into the next advance in Arabic typography. This was what came to be called 'Simplified' Arabic. The essence of it was not new. The manufacturers of typewriters for Arabic are obliged to employ a much-reduced set of Arabic characters because of the strict limitations of the machine. On the typewriter the characters are so designed that there are only two forms of the letter 'b', for example, instead of the separate initial, medial, final, and unconnected forms normally provided in printing types. The Simplified Arabic developed by Linotype followed this principle but the characters for printing were carefully designed by a professional Arab calligrapher. The advantage of Simplified Arabic was that since the keyboard operator had a smaller number of characters to concern himself with, his rate of output increased. More particularly, Simplified Arabic could be composed on the simplest form of Linotype machine, in which only a main magazine is needed, without the additional side magazine necessary in the earlier method. And it was that fact which opened the way for the next important advance.

During the 1930s, American news agencies, newspapers and linecasting machine manufacturers combined to develop a rapid and economical system of supplying news reports direct to the composing room of a newspaper many miles from the central news agency. In the news agency the news 'copy' is typed out on a special keyboard, the output of which is a perforated tape, in which each character is represented by a unique code. When the tape is fed into a transmitting device, the codes are translated into impulses which can be received many miles away by a receiving device in the office of the subscribing newspaper. This receiver translates the impulses into perforations on a tape, like the original, and this tape can be fed into an electronic device which automatically activates the keys of a Linotype machine. There are many newspaper offices around the world which have no need for the reception of news

material from a distance, but yet find perforator keyboards in their own composing rooms of considerable value because they can be operated a good deal faster than the more extensive keyboard of the linecaster machine. The arrival of Simplified Arabic made it possible for printers in the Arab world to take advantage of the perforator keyboard, and during the early 1960s, a number of important newspapers in the Arab world adopted the use of perforator keyboards to expedite their typesetting functions.

It is a requirement in the typesetting of continuous texts, as in the columns of newspapers or the pages of books, that all the lines of type should be set to the same length--a process known to the printer as 'justifying' the lines. In practice this means that the spaces between words are increased or diminished according to the number of, and width of, the characters in the line. It is a process which requires some deliberation by the keyboard operator, and it is not surprising that during the 1960s it was realized that a computer could be made to perform this function, the computer being programmed to assess the total widths of the characters required to fill a line and where necessary to insert hyphens (or in the case of Arabic, *kashīda* extension strokes) to achieve correct justification. *Al-Ahrām*, the distinguished newspaper of Cairo, was the first printing office in the Near East to computerize the justifying aspect of its typesetting. Indeed, the special computer supplied by Linotype to *Al-Ahrām* did more than that.

It had long been realized by the Linotype people that, although Arabic composition on the linecaster is very rapid by comparison with the hand typesetting method, the operator's rate of line production is limited by his having to recognize and choose amongst several versions of a letter, according to the position of the letter in the word. Clearly, the computer could perform that task as well as the justification function. A character selection program was therefore devised and included in the *Al-Ahrām* computer. The whole concept was a notable piece of creative work, and the experience gained in developing it proved immensely valuable in the next great advance in Arabic typesetting.

In the past quarter-century in the Western world printing techniques have been substantially affected by developments in applied chemistry, the technology of photography and electronics--especially in the form of the computer. In the process of printing itself (the transfer of image to paper), the offset lithographic process, in which the words and pictures are transferred to a single plate, has made considerable advances. And the combination of photographic optical systems and computers has resulted in the development of a wide range of remarkable typesetting devices known in general terms as phototypesetting machines, which produce type composition at very high speed in the form of film or photographic paper ready for transfer.

Although the mechanical typesetting of Arabic has been commonplace for sixty years or so, it has had its limitations, particularly in regard to the inclusion of vowel signs in educational work--a slow process in metal typesetting and far from durable in the actual printing. So it is to be expected that enterprising people in the Near East should have taken a keen interest in the advantages of photocomposition, and that they should have approached Linotype-Paul[3] of London, who have a reputation for creative work in computer-directed phototypesetting systems. The first Linotype-Paul system to be equipped for Arabic composition was the Linotron 505C, which embodies a cathode-ray tube in its optical array, followed by the Linofilm VIP, which has a direct optical system. Both these machines have a computer incorporated in the

photo-unit and it is the computer and its programs which have radically simplified the traditional processes of Arabic composition.

The programs take care of a number of different functions. The most important is the process of character selection; that is to say, it is the computer which decides whether the appropriate form of a letter to be used in response to the keystroke is to be the initial, medial, final or the unconnected version of the letter. A second function of the program is to select the logotype represented by two separate character keystrokes: for example, the operator may key the letters 'l' and 'm', and the computer will recognize this as a particular logotype--of which there are nearly a hundred in the total character array provided in the 505C system. (The logotypes, which add a great deal of calligraphic elegance to the appearance of the text, can be switched out of the system for certain kinds of work). The character array also contains twenty vowel and diacritical signs, each in high or low position. The computer is programmed to choose the appropriate version of the sign for each letter character according to its style.

Line justification is another function of the computer program. Arabic words may not be broken or hyphenated at the end of a line. By tradition, justification is effected, and regular word-spacing maintained, by extending the stroke between joining characters within the words--and there are strict rules as to the character combinations where this is undesirable and where it is permissible.

As if the transferring of all those functions from operator to computer were not enough, two other useful options are available to the user of the Linotron 505C. One of them is a language-mixing program, which enables the keyboard operator to set Arabic and English without having to keyboard one of the languages backwards. The other option is an ingenious dictionary program. The operator sets the whole of the first language in the entry, and then the other; the program stores the first language in memory and, when the entry is completed, brings the two parts out in correct run-on linear form--the Arabic reading from right to left and the English, correctly spaced and automatically hyphenated where necessary, reading from left to right.

In recognition of the fact that these would be the first computer-directed phototypesetting systems to be produced for the Arabic World, it was decided to commission a new type face for the purpose. The design, by Osman Husseini of Damascus, reflects all the refinement of the finest examples of *naskh* calligraphy, and is said by some judges to be one of the best Arabic type designs ever created. In addition, the simplified Arabic type previously mentioned, popular in many newspapers and periodicals, has also been adapted to the phototypesetting systems.

There are several important benefits in all this for the Arabic-language printer, apart from the obvious advantages of speed and quality of output. The composition of fully-vowelled text for educational and classical work is now reduced to a simple letter-plus-sign routine at the keyboard. The large character capacity of the grid enables a considerable number of typographic refinement logotypes to be included--far more than could sensibly be included in a 'metal' fount. And because the keyboard shows only *one* form of an alphabet letter, instead of two as on a typewriter or four forms as on a 'hot-metal' machine keyboard, the operator's work is a great deal easier than it has ever previously been--and any practical printer will realize that the easier the keyboarding, the better the chance of error-free output.

Publishers and printers in the Arab world have been quick to realize the advantages of these Linotron and Linofilm computer-directed phototypesetting systems, and a number of systems are already installed in

several major cities and actively at work. There are positive signs that the use of these systems will increase quite rapidly. The student of Near Eastern affairs will note with interest that the development of computer programs for the typesetting of Arabic, Persian and other languages now places the printer in the Near East on the same technological level as the printer in the Western world.

The successful application of phototypesetting to Arabic and other languages which use the Arabic script is by no means the end of the matter. Indeed, as in the typesetting of European languages, it is a new beginning, because many sorts of printing which by their nature have been difficult to produce have now become quite different propositions, both in the production and the economic sense. Obvious examples are the daily newspaper, which consists of a large number of items from many different sources to be assembled in an elaborate format and the whole issue printed off in large numbers in a matter of a few hours; and the dictionary, in which a considerable variety of text styles, accents and typographic symbols may be required for purposes of differentiation. A particular benefit which may be looked for, which has hitherto not been available in mechanical composition, is the development of type styles other than the familiar *naskh* form of script. In photocomposition systems, or at least some of them, it ought now to be possible to create new types based on the *ruq'a* and even the *nasta'līq* scripts, which will add to Arabic printing the kind of variety in visual expression which is so necessary and valuable in a fully-developed publishing industry. And this aspect of phototypesetting--its stimulating effect on the creation of new types--must change the point of view from which one regards the numerous script reform schemes which have been advocated from time to time, and which have had the limitations of metal type as their *raison d'être*. The simplifying of Arabic letter forms will continue to be a worth-while activity (within the limits of public acceptance), but it should be for reasons other than technical.

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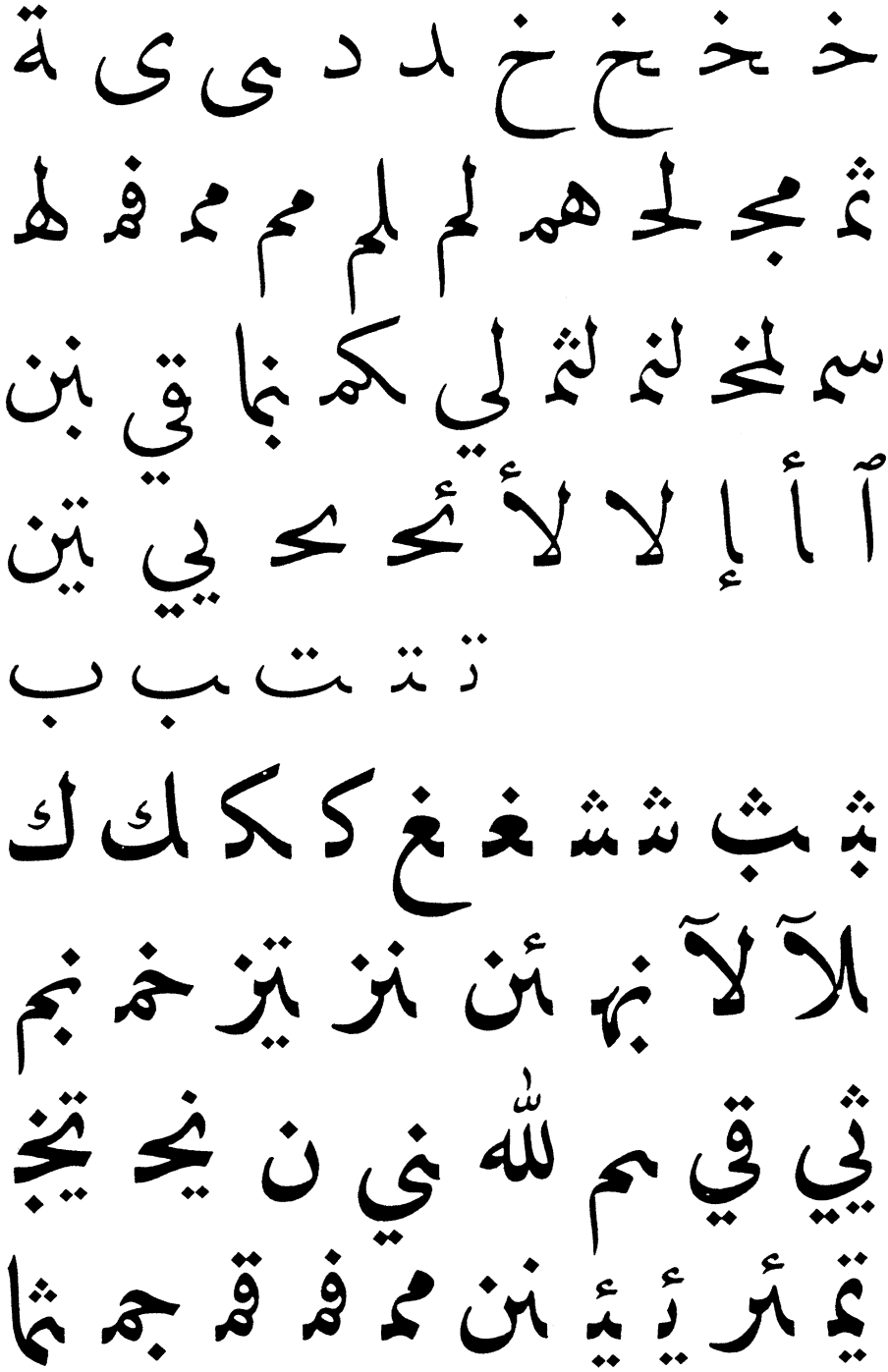
1. The making of type required the shaping of the letter on the end of a steel bar; this punch was then struck into a small block of copper to form a matrix, which was fitted into a mould. A molten lead alloy was poured in to the mould and the type then ejected--this casting process being repeated many times to make a sufficient supply of the letter. The casting process was mechanized in the early years of the nineteenth century, but punches continued to be cut by hand until the invention of the pantographic engraving machine in 1885.
2. The Linotype machine consists of a magazine loaded with character matrices, an assembly area into which the matrices are released in sequence by the action of the keyboard, and a casting system which automatically injects molten metal into the line of matrices. The product is a bar or 'slug' forming a whole line of type.

   The Monotype consists of two machines--a keyboard which includes a roll of paper tape in which perforations made by keystroke action form codes to represent characters, and a casting machine, in which the matrix for a character is brought to the injection position by mechanical response to the tape code. The product is single pieces of type automatically assembled in the sequence of the keyboarded text.
3. Linotype-Paul Ltd. is the company in the international Linotype group which specializes in the creation and production of electronic devices for use in the printing industry.



1. A selection of alphabet characters and logotypes in the light and bold versions of the new type design commissioned by Linotype-Paul.

وَلَمْ يُخْلِ سُبْحَانَهُ خَلْقَهُ مِنْ نبيٍّ مُرْسَلٍ، أَوْ كِتَابٍ مُنزلٍ، أَوْ حُجَّةٍ لازِمَةٍ، أَوْ مَحَجَّةٍ قَائِمَةٍ؛ رُسُلٌ لا تُقَصِّرُ بِهِمْ قِلَّةُ عَدَدِهِمْ، وَلا كَثرةُ ٱلْمُكَذِّبِينْ لَهُمْ، مِنْ سَابِقٍ سُمِّيَ لَهُ مَنْ بَعْدَهُ، أَو غَابِرٍ عَرَّفَهُ مَنْ قَبْلَهُ على ذَلِكَ نُسِلَتِ ٱلْقُرُونُ، وَ مَضَتِ الدُّهُورُ، وَ سُلَفَتِ الآباءُ. وَ خَلَفَتِ الْانْبَاءُ.

2. A specimen of text with vowel signs, composed on the Linotron 505C system, showing the new type design.

ومن المشاكل العديدة التي اثرت
بصفة مباشرة على مشاريع النمو
الاقتصادي بدول العالم الثالث نخص
هنا بالذكر المواجهات العديدة والازمات

**والازمات السياسية التي برزت من
حين لاخر بين الدول النامية
والشركات الاجنبية حول كيفية
استغلال الثروات او نسبة المشاركة**

3. A specimen of Simplified Arabic produced by the Linofilm VIP system.