Installation of the printing press in areas using the Arabic script

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ABSTRACT

This research examines the factors underlying the rate of installation of the printing press in areas of the world that use a version of the Arabic alphabet. The experience of South Asia is placed at the forefront of the study. It was in South Asia that lithography was repurposed as a primary means to reproduce text: a superior reproduction method given the nature of Arabic script. In addition to introducing the mechanical difficulties of attractively reproducing Arabic letters through early print technology, other impediments on the path to print are presented. These include the absence or entrenchment of regional literary traditions, governmental mandates, and deference to religious customs. These factors are considered as a whole to tell the fuller story about why print was slow to spread across the lands from North Africa to Southeast Asia that use the Arabic alphabet to express the written version of a local language.

RELEVÉ

Cette étude examine les causes ayant retardé la propagation de l'imprimerie dans les régions du monde où est employée une forme de l'alphabet arabe. L'histoire de l'Asie du sud est mise de l'avant en tant que région où la lithographie a été réinvestie en tant que moyen principal de reproduction: une méthode de reproduction supérieure étant donné la nature de l'écriture arabe. En plus d'une introduction aux défis mécaniques posés par la reproduction des lettres arabes au moyen des premières technologies d'impression, d'autres obstacles rencontrés sur le chemin de l'imprimerie sont présentés. Mentionnons l'absence ou l'attitude de retrait des traditions littéraires régionales, les mandats gouvernementaux et le respect des coutumes religieuses. Ces divers facteurs sont abordés ensemble afin de livrer un récit plus complet de la diffusion lente de

l’imprimerie, des confins de l'Afrique du nord à l’Asie du Sud où l'alphabet arabe est utilisé pour écrire une langue locale.

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INTRODUCTION

The initial supposition for this thesis was based on a premise that, through deeper research, turned out to be only part of the full story. My original intent had been to demonstrate how the elaborate system of geometric rules underlying the *nastaʿlīq* script posed so great a technical challenge that it hindered the reproduction of Persian and Urdu texts in an acceptable manner through the medium of typography. To demonstrate this, an accounting of the volume of texts published in those languages before and after the introduction to the Indian subcontinent of the alternate printing technology of lithography—a medium which was not as restrictive in its ability to display printed forms—would show a spike in publication output that could be attributed to the latter technology's ability to more flexibly, accurately, and attractively reproduce the true form of the script.

This hypothesis was not mistaken—but it was only a partial consideration. Difficulties in displaying the nastaʿlīq script through typeface was one among several factors that drove and restricted the rate at which the printing press was installed, and mass reproduction of texts grew, throughout the lands where the Arabic alphabet is used. The more complex nature of the Arabic script, especially the ornate nastaʿlīq style, did indeed pose challenges for people adapting typography to reproduce texts through conventional moveable type. The laying of individual letters of type along parallel rows in a galley to string into words and, ultimately, pages of text, was harder with scripts that lacked the discrete, freestanding forms of letters that were the norm for alphabets used throughout Europe, the birthplace of the print revolution sparked by the Gutenberg press. However, equally significant to the technical factors that influenced the rate at which print technology was adopted were social, economic, religious, and political issues.

Complicating my efforts were my admitted limitations in the Persian and Urdu languages. Being far from fluent meant, in largest part, relying on secondary sources for accounts of the aesthetic perceptions of materials printed by various techniques. A deeper investigation, perhaps a dissertation, would benefit from contemporary critiques of such printed matter originally voiced in the languages for which these scripts were used.

To more thoroughly explore the story behind the rate at which print arrived and grew in areas using some form of the Arabic script, this thesis has been expanded. It presents both the initially intended analysis of the intricacy of the nastaʿlīq script, and several sections that address those additional factors which I have found to bear the greatest weight in affecting the rate at which print became an established medium in areas where the written version of a language was expressed through the Arabic alphabet.

1. LIMITATIONS IN REPRODUCTION OF ARABIC SCRIPT IN EARLY PRINT

The moveable-type printing press, the initial technology used for mechanized mass reproduction of text, served adequately enough for representing alphabets such as Latin and Cyrillic. A prime advantage of printing works in these scripts over printing works in several other scripts of the world, such as Arabic and Chinese, is that the former could be represented in non-cursive forms, employing free-standing letters. Furthermore, they could be legibly expressed with minimal use of ligatures and little need for connection to adjacent letters. Conversely, early attempts to print works in languages written in the Arabic script not only sacrificed the overall beauty of the script but failed to adhere to basic conventions in the formation of its letters. The results may have been legible, but not beautiful. This chapter explores the limitations of early print technology in relation to the requirements of languages employing the Arabic script.

Mechanical, blocky, printed reproduction of texts in languages written in the Arabic script (e.g., Urdu, Persian) held limited aesthetic appeal for a readership accustomed to words given form (and occasionally set off by illustrations) by professional scribes and calligraphers. Evidence of this is seen following the innovation of lithography: the medium's ability to reproduce forms onto a printed page beyond those included in a defined set of letters proved attractive to readers, and was followed by a spike in output printed in languages employing some form of the Arabic script. This is especially evident in the rise in publication of books printed in the Urdu language in 19th-century India, corresponding with the end of the Mughal Empire and the dawn of the British Raj. Later in this chapter we will examine how various shortcomings in reproducing the Arabic alphabet through the medium of moveable type were resolved through a novel repurposing of technology, as lithography gained a foothold in the Indian subcontinent over this era.

The first sets of metal moveable type in the Arabic alphabet were crafted in Europe over the 16th century (AbiFarès 2001, 45), where production remained for the next two centuries. Nearly everything related to the printing process came from Europe to other continents over this time: presses, fonts, and even ink and paper were all sourced from Europe to South Asia until the late 18th century (Shaw 1981, 29). It wasn't until the end of the Ottoman prohibition on printing the Arabic script in 1726 that a local print industry developed and the first Arabic typeface was cut outside the West (AbiFarès 2001, 65).

A cursory glance at the underlying structure of the Latin and Arabic scripts will quickly evince the central reason these initial forays into printing the latter were unattractive: the very nature of how Arabic letters join when forming together into words tested the limitations of the medium. When printing with moveable type, every possible form of a letter appearing in a word requires its own individual piece of cast-metal type. While an uppercase and lowercase set of letters might be adequate for languages employing the Latin script, the crudest attempt to print anything in the Arabic script would require four different forms for the majority of its base 28 letters to comprise a full font, disregarding forms taking additional diacritics. (Indeed, "a typical Latin font consisted of 56[1] individual characters for each type size" (AbiFarès 2001, 130), whereas the first typeface regarded as truly correctly representing the *naskh* version of the script comprised over 1,500 types)[2] (Milo 2002, 122). The inelegant initial representations of the language may be attributed to more than the several-fold increase in the number of additional keys (letter forms cast in reverse to set in type) that would be necessary to print in accordance

[1] The letters and punctuation marks that were standard in a typeset grew from the earliest days of printing. For discussion of when i/j, u/v, and vv/w and other forms appeared in the printer's practice, see Leslie and Griffin's "Transcription of Early Letter Forms in Rare Materials Cataloging" (Leslie 203).

[2] This unwieldy system was the creation of Ohanis Mühendisoğlu and is described in greater detail later in this chapter.

with accepted conventions of Arabic orthography. Technology aside, a large factor contributing to the lack of perfection in the earliest Arabic typefaces may be identified in their very place of origin and the motivations for creating them: this technology was developed in Europe by Europeans and not in any region where the Arabic script was in common use.

The first font designers were Europeans who lacked native ability in Arabic and had not grown up exposed to languages in the Arabic script. Indeed, the first Arabic metal fonts to be cast were by (presumably, based on his known business dealings) the Italian typographer Francisco Griffo in 1514, Jesuit father Giambattista Eliano in 1564, and then by Parisian typecutter Robert Granjon in 1580 (AbiFarès 2001, 45-47). Insofar as these and subsequent typecutters' familiarity with non-European languages was learnt in their later years of life, their earliest attempts at font design failed to capture many nuances of how the letters of the Arabic alphabet are joined. There are records of Arab scholars working alongside typecutters in Europe but never playing the leading role, instead serving as assistants in the production of Arabic moveable types and related roles in the print process, from the 16th to 18th centuries. (AbiFarès 2001, 64). However, whether the master typecutter deemed them unnecessary, or—in all likelihood—too technically challenging to implement, basic features of the way the script correctly connects letters to one another were rarely retained in the final cast version of the type.

The story of how the first Arabic type was finally cut outside of the West in 1727—detailed later in this chapter—marked the birth of regionally-based Arabic type production. But even in that origin story there remains a strong European connection. The Turkish court officer who petitioned for the establishment of a print house, Ibrahim Müteferriqa, was himself Hungarian and had converted to Islam from either Calvinism or Unitarianism (Erginbaş 2014, 63).

The conditions that led to the creation of typefaces in the Arabic script in Europe were numerous. Burgeoning trade with and travel to lands outside Europe created demand for dictionaries and grammars. There was a market for reproductions of academic works from the Arabic canon whose significance was recognized by Europe (Hamilton 2001, 83). Above all, the greatest motivation prompting European typographers to begin crafting Arabic fonts arose from the religious interests of various Christian movements.

The first book to be typeset in Arabic script was the *Kitāb aṣ-ṣalaät as-sawā'ī* (a.k.a *Horologium Breve*, a.k.a. *Septem horæ canonicæ*), printed in 1514 with the Pope as its backing patron (Hamilton 2001). Its intended readership was Christians living in Syria. With the establishment in 1584 of the Typographia Medicea, the Medici Press, illustrated editions of the Gospels were published with an eye to uniting Rome with Arabic-speaking Christians. However, it was not solely dissemination of scripture that drove demand for publications in Arabic text in Europe. Interest in Arabic stemmed from a huge desire for access to languages related to those associated with holy authority (namely Hebrew and Aramaic). Scripts held particular religious associations. Just as the Church employed Latin letters as their script of choice, and the Orthodox Church used the Greek alphabet, the Arabic alphabet became intertwined with Islam. In 15th-century northern Europe, a bloc of dissident Protestants who held affinity with none of these languages or their associated scripts played a crucial role in the spread of knowledge of the Arabic language and script throughout Europe. Dubbing their movement "Hebraica Veritas," they advocated for religious text to return to Hebrew (Coudert and Shoulson 2004).

How was it possible for Europeans to access Hebrew in 16th-century Europe? The route was largely through Arabs and Arabic. Hebrew had been a dead language for well over a millennium and was yet several centuries away from its eventual return to being a living language, spoken in everyday use at home and on the streets; such a status was achieved only

with the establishment of the State of Israel. The Catholic capture of Spain in the 15th-century Reconquista brought to northern Europe a certain class of people not only familiar with Hebrew as a literary and religious language but who were also native speakers of Arabic. Not only were remaining Muslims forced either to convert or be expelled, but Arab Jews were also driven out, many fleeing either to Arab lands or Protestant-controlled areas of England and the Netherlands. These refugees taught Hebrew and Arabic to dissidents of the Hebraica Veritas movement. Rooted in a common grammar and sharing much vocabulary, the study of Arabic served as an auxiliary discipline that offered a living language able to express and approximate structures of the language that those advocating for change in choice of script most desired to learn. In a similar vein, study in Syriac—with its associations with Aramaic—was also sought out by Biblical scholars who recognized the similarity of both languages to Arabic. Though linguistic categories such as "Semitic" would emerge only centuries later, access to both the then-living language of Syriac as well as to Arabic was seen as a valuable complement to the study of the actual target languages, Aramaic and Hebrew.

In short, the background and motivations of people with an interest in accessing Arabic and other languages written in the Arabic alphabet during the initial phases of publishing in the Arabic script in Europe were far removed from the norms of writing of the time. Standards of text reproduction in the Arab world were built upon fuller traditions of calligraphy and manuscripts that had blossomed under the Abbasid and Ottoman caliphates. The aesthetic appeal of early print was diminished from these standards, as typeset words often contained gaps where the text should have been one flowing unit. Letters were sometimes positioned askew from the places they would have occupied in a traditional presentation. When coupled with other factors, such as the limited availability of a range of content and high start-up costs, the technical limitations of moveable type would have future implications in the rate of adoption of typeset publication until

the advent of lithography. Reading material produced by inked impressions left by a metal punch, even if it was legible and adhered to conventions of form, looked nothing like a woodcut reproduction, let alone a calligraphed manuscript.[3]

To this day primers often simplify teaching of the Arabic script to a system in which the majority of letters (e.g., those that, in keeping with the conventions of handwriting, do not connect to a following letter) can take different forms depending on where they appear in a word. Any given letter's shape will appear as either "initial," "medial," "terminal," or "in isolation" in its written place relative to the letters that precede and follow it. This portrayal is not inaccurate but reduces inherent features of the script by ignoring a tremendous amount of variation in appearance that happens in all standard forms of handwriting, calligraphy, and print across all languages. When employing the Arabic alphabet in type, these simplifications in letter form become more difficult to work with. This reduced view is precisely the fixed perspective of the printer whose task has to be carried out with a limited set of moveable-type reverse letter forms that can be strung together to express any given word. This is wholly at odds with the perspective of the calligrapher, who can employ appropriate variation, within the rules of the calligraphic style, to position and draw out the forms of each letter dependent upon where they appear relative to surrounding letters.

Modern-day Arabic typographer Thomas Milo addresses some of these historic mistakes with what he terms "Arabic script grammar." Milo might be the foremost authority on mechanical and computerized ways to represent the Arabic script. His foundry, DecoType, was the first to create decent Arabic fonts when most computer systems were capable of expressing

[3] For examples of woodcut illustrations in the Ottoman Empire's earliest day of sanctioned printing, see Tarih ül-Hind il-Garbi el-müsemma bi-Hadis-i nev, which was published in Constantinople in 1730 with 13 woodcut illustrations (Müteferriqa et al. 1730). (See Figure XXX)

only ASCII characters. Well into the 21st century, his company has continued to craft products that are able to approach calligraphic-quality renderings (most recently, "Tasmeem") which leverage the sense of proportion and geometry of this Arabic script grammar. The early European attempts at Arabic typography are lambasted by Milo as "absolute monstrosities" (Milo 2002, 121).

Regardless of how closely the earliest Arabic typesets ever approached perfection of form, the efforts to print in Arabic spearheaded by Rome over the latter half of the 16th century did bring about progressive improvements in representation of the Arabic alphabet in moveable type. Pope Pius IV's 1564 commission of a book to be printed in Arabic led to both the establishment of the Tipografia del Collegio Romano and a new font cut by Jesuit father Giambattista Eliano. The types used for this print run offered additional clarity by adhering more closely to prescribed rules of proportion, though its overall word forms remained blocky and linear. Letters in this font frequently appeared as individual units that did not connect with one another as they ought when rendering text in Arabic script. These types would remain the standard over the next 20 years. They were then supplanted by a series of four fonts created by master type-cutter Robert Granjon, originally of Paris, which are typically regarded as the first typefaces to take into consideration the conventions of forming and connecting letters of the Arabic script along multiple baselines. These and subsequent sets were cast in Rome over the period from 1580 until Granjon's death in 1589 (AbiFarès 2001, 49). While these more closely mirrored the style of naskh script appearing in a contemporary manuscript than the Jesuit fonts had been able to, they were still inexact. Granjon's Arabica Grande font, as with the font it supplanted, continued to reproduce Arabic in discrete letters that did not flow into one another where they would connect when handwritten. His final font, Arabica Piccolina (AbiFarès 2001, 48), did better at connecting letters together but

was little able to position them along multiple baselines, a technical challenge to typsetters of the Arabic script for centuries on.

To be fair to the typecutters of late 16th-century Rome, many of the constraints hindering the realization of an aesthetically pleasing font expressing the Arabic script in accord with its underlying calligraphic rules were mechanical in nature. Though there is certain allowable variation in writing the Arabic script—such as changes in letter dimension across script styles and choosing whether or not to display vowel markers, which are ordinarily absent within a word—accepted convention dictates that letters must always follow multiple baselines that run at intersecting angles. As with the majority of the world's scripts, Arabic text follows parallel horizontal lines along a page. However, within a word each string of letters that forms an interconnected block (often referred to as a "ligature," though Milo prefers to label these units "syntagms") that will follow its own baseline running at an intersecting angle. Clumps of letters within the naskh script descend along a baseline of roughly five degrees (Milo 2002, 120); the same sequence of lettering in the nasta'līq script will tilt between 30 and 40 degrees (Saeeda Naz et al. 2013, 186). This system of layering letters one beneath another, with an initial starting height dependent on the shape and quantity of all interconnected letters to follow within that word, poses no technical challenge to anybody writing by hand who is familiar with the conventions of how the letters join. A scribe wielding a pen is bound less by technical limitations than by the standards of orthography and calligraphy in deciding where to make the first mark beginning a letter sequence along a line. Conversely, this lack of horizontal linearity running within the Arabic script proved extremely vexing to anybody designing fonts for use in a mechanical-type press. Text was laid out in galleys with keys positioned in parallel, horizontal rows. By the nature of this structure any second intersecting baseline running along an intersecting angle was exceedingly difficult to replicate. The limitations of the moveable-type

press in reproducing the Arabic script in faithful accordance with its formalized conventions of appearance was in large part due to the lack of the medium's ability to adjust a letter's position vertically within a line of text.

It was not simply sheer mechanics of the printing press that stifled the creation of an Arabic font that could approximate the hand of a calligrapher. Challenges to establishing print houses in areas using the Arabic script varied across regions. While regulations in South Asia were not as stifling in the early days of the press, within the Ottoman Empire it was not until the early 18th century that governmental resistance to the press allowed mass publication in the Arabic alphabet. Milo says, "For more than two centuries the Ottoman authorities opposed the large scale introduction of typesetting and printing of Islamic script; the low quality of the designs was a factor in delaying the acceptance of typography in the Islamic world" (Milo 2002, 121). It was only at the start of the 17th century, after the end of the Crusades, that Constantinople began a long, slow period of rapprochement with European nations—at least regarding matters of commerce and trade. However, official policy made it clear that the reigning sultans still regarded the West with skepticism. It was strictly religious minorities and those living along the fringes of the Ottoman Empire who were initially permitted to operate presses, and that with the express proviso that all matter be printed using scripts other than the Arabic alphabet. The majority of these languages (e.g., Hebrew, Armenian, and Greek) would normally be written in their own alphabet, regardless. This decree did however lead to certain instances of presses taking unconventional approaches to comply with the letter of the law, such as the publication at the Convent of St. Antoine in Quzhayya of a psalm in both Arabic and Syriac but using solely the Syriac script to express both languages (AbiFarès 2001, 65).

The hesitation in adopting the new technology can be traced through the Ottomans' incremental acceptance of printing *fatwa* by *fatwa*. These decrees initially approved mechanized

reproduction of works in scripts other than the Arabic alphabet (AbiFarès 2001, 65), then of those non-religious works listed by Berkes as "the printing mainly of dictionaries and books on mathematics, medicine, astronomy, physics, geography, and history" (Berkes 1964, 40-41), and finally embraced all printing in the Arabic alphabet by backing the creation of a naskh font finer than any previously cast in Europe (Milo 2002, 123).

It was not until 1726 that Sultan Ahmad III set forth the decree that permitted mechanized printing to use Arabic fonts. This step toward openness came with restrictions as well, allowing the printing of the aforementioned non-contentious texts.[4] The very next year the first print house to employ Arabic sorts within the Ottoman Empire was established in Constantinople. One of its two founders, İbrahim Müteferriqa, who served as an officer in the Ottoman court, voiced identical complaints to those yet echoed by Milo today: the existing body of Arabic fonts that had been crafted in Europe failed to capture the nature of the script, let alone express its essence at any calligraphic level. Through a memorandum Müteferriqa convinced Ottoman court ministers that he could bring to life the aesthetics of Arabic calligraphy in typeset, printed matter:

> "He (Müteferriqa) criticized the Arabic types produced by Europeans for not achieving the aesthetic quality of the original Arabic calligraphy, and argued that his own skillfully cut samples of Arabic types would help printing preserve the beauty of the Arabic script" (AbiFarès 2001, 66).

This manifesto was the *Vesiletü't-Tıbâa*, or "The Utility of Printing," through which Müteferriqa argued of potential utility and benefits in addition to the aesthetic improvement he could effect cutting a new typeface (Erginbaş 2014, 67). Lower cost, accuracy and reliability over manuscript copying, prevention of the destruction of rare books, and an

[4] The output of the first print house (Müteferriqa's) to take advantage of Ahmad III's decree included maps, language manuals, dictionaries, and histories (Sabev 2011).

increase in the number of dictionaries and books on history, astronomy, philosophy, and geography are all advantages he cited in his essay as reasons he should be allowed to open up a printing house (Erginbaş 2014, 67-68). However, unlike the existing printing houses of the Ottoman Empire that were run by non-Muslims, the Müteferriqa Press would publish mainly in the Arabic script. It was the *Vesiletü't-Tıbâa* that led directly to Sultan Ahmed III's decree permitting printing in the Arabic script in the Ottoman Empire.

Successfully petitioning to cut a new font of his own design, Müteferriqa proceeded to advance publishing in a region where the Arabic alphabet was the standard for written language. (Ottoman Turkish employed a modified form of the Arabic alphabet until Ataturk's reform to the Latin script some two centuries after Sultan Ahmed III's acceptance of printing in the former script (Basgoz and Wilson 1968, 87).)

Ottoman punchcutters, well acquainted with the nature of the Arabic script, ultimately tackled the issue of representing it correctly in type over the next century through a comprehensive approach to design. Individual keys were cut that were able to express any conceivable ligature: two, three, or even more to a key. The apogee of this work came in the 1860s with a naskh font designed by Ohanis Mühendisoğlu. His creation held over 1500 individual keys of type: a comprehensive set including a unique key to express every imaginable string of contiguous letters appearing within a word. This was considered the only solution to faithfully render text in the Arabic alphabet through moveable type. Even with this mechanical solution, its proper implementation required that typesetters choose correctly from among so many possible keys for any given letter or combined letter sequence that quite often an incorrect form of a letter would be mistakenly substituted in lieu of the correct version, which did appear on another existing key (Milo 2002, 122-123).

Mühendisoğlu's work provided a functional, if cumbersome, solution to attractively print languages using an Arabic alphabet with the medium of the day. However, by the time of the appearance of this viable means to reproduce text through type in a form faithful to the standards of calligraphy, an alternate means of reproduction using different underlying technology was beginning to find adoption in the world's print houses: lithography.

As an entirely different medium of reproduction from the moveable-type press, lithography had none of the constraints in reproducing text—or even images, for that matter—that led to the ugly initial forays in printing works using the Arabic alphabet. Rather than cutting individual keys from metal alloys to produce each letter, lithography used a process that allowed for much more flexible transfer of content onto the page through printed impressions. The flat surface of blocks of limestone was ground to the desired smoothness with another stone and treated with carborundum (Antreasian, Adams, and Tamarind Lithography 1971, 26). It was then etched (i.e., drawn using a crayon or other fatty implement) upon directly by the calligrapher or artist (Senefelder 1968, 190). The oils drawn onto the stone caused any areas upon which the text or image had been etched to absorb ink. Those areas that had not been touched by the artist's hand would resist ink (Antreasian, Adams, and Tamarind Lithography 1971, 28-29). This expanded the possibilities of what could be printed from the range of type sets that usually consisted almost entirely of alphanumeric characters to whatever the intent and the talent of the person etching directly on limestone allowed.

While far freer with regard to what could be reproduced, the process of lithography did add an additional twist to the production process of the artist or calligrapher. As the image was stamped directly from limestone to paper it was necessary to etch the stone entirely in reverse. The artist or scribe had to prepare an intermediary transfer paper on which the words would be written out as usual, following the normal direction of handwriting. This inked page was then

flipped onto the stone to provide a mirror image of whatever was desired to appear in print. Without this, calligraphers would have to write backwards directly onto the stone (Marzolph 2001, 15).

Leveraging the new medium of lithography to reproduce text was a practice that originated not in lithography's place of origin, Europe, but in South Asia over the first decades of the 19th century. (This innovative application of an existing technology to create a product other than what had first been envisioned by its inventor will be treated in more detail in further chapters of this thesis.) There, the Mughal Empire was in decline while the British presence in the Subcontinent was increasing, bringing with it new technology, including moveable-type and, later, lithographic presses, that would precede the official dawn of the Raj. When lithography had become a viable concern in South Asia, it brought a solution to the problem of rendering printed text in languages employing the Arabic script (chiefly, Persian and Urdu) in an attractive manner—a problem that had not concerned Europeans printing their languages with moveable type in the 19th century. In Europe, lithographic runs were done only for ornate illustrated works such as reproduction of maps and musical notation. Typography held the authority of centuries as the extant, entrenched medium through which to reproduce text by the time of the invention of lithography at the end of the 18th century. These moveable-type presses would continue to be the dominant means through which to publish the written word in the West for another century beyond the time that lithography had been repurposed in India to print text attractively in the Arabic script.

To sum up, two factors needed to be overcome in bringing a comprehensive solution to the problem of mass publication through print of works in the Arabic alphabet in a manner that conformed to the basic rules of the script: the mechanical limitations of moveable type and the more limited sense of aesthetics on the part of European typecutters, who lacked rich familiarity

with the Arabic script and its rules. It was only through the marriage of the new technology of lithography, coupled with the trained eyes and hands of South Asian calligraphers who were thoroughly familiar with the Arabic script and its traditions of calligraphy, that mass publication of works in languages such as Urdu and Persian became possible.

Of course, publication of works through moveable type was bound by the same innate mechanical limitations across all areas that used some version of the Arabic script to express a written language. Further chapters will explore how the process of using lithography to reproduce attractive text in the Arabic alphabet was imitated to publish works in regions beyond South Asia where the practice began.

2. INTRODUCTION OF PRINT TO THE SUBCONTINENT AND DEVELOPMENT OF PRINTING THE ARABIC ALPHABET

> The Arabic joins with tolerable ease; but the forms that have been given to the same letters, in the Persian mode of writing, are such that it is impossible to join them in a straight line, and we are obliged to have compound characters, of two, three, and even four letters, cast together, in order to join them in the manner of the manuscript, without doing which they would look badly, and offend the eye, by being against all rule. (Warren 1856, 47)

The first press in the subcontinent was set up by Portuguese missionaries in Goa in 1556. Two years later, the first full book to be printed in India—a work in Portuguese, *Conclusoes* by Antonio de Quadros—was published. This was followed by the publication two years later of *Compendio spiritual da vida christa*. The press continued to publish exclusively in Latin and Portuguese over the next two decades, until the first work in a language and script indigenous to the subcontinent was published in 1577: *Kiricittiyani vanakkam,* a Tamil-language translation of *Doctrina Christam* (Stark 2007, 29).

Print continued over subsequent centuries in areas under European influence, i.e., the Deccan and Ceylon. Printing in Tamil continued over this time and was expanded into other regional scripts and languages such as Sinhalese through Dutch efforts (Kesavan and Venkatachari 1984, 58). However, although these works established a precedent as the first books to be printed in India, this tentative venture into print, which did not continue, is perhaps best described as, in Graham Shaw's words, a "false dawn... the 'non-history' of printing in South

Asia" (Shaw 2007, 131). Of greater relevance to this thesis: none of the typesets used for languages in these precedent-setting publications included letters of the Arabic alphabet, so their output will not be examined further in this paper.

In contrast to the experience in Ottoman areas, where initial attempts to print and publish works in the Arabic script were hampered by official resistance, the path followed by the printed book in India was quite different. Another impediment that had slowed printing in Ottoman lands was not a factor in its installation in the subcontinent. Initial publications in the latter region were printed in a less-contentious local script, Tamil, which was not as loaded with the religious associations and veneration that was accorded to Arabic text. This differing attitude regarding the Tamil script can be seen in the evolution of the Tamil manuscript tradition as it developed a century after the Portuguese brought the printing press to South Asia. The accordance of differing levels of reverence and special handling of a text was based not on religious content or lack thereof in the text. Rather, how the material object was treated was based on whether its text was in the traditional Tamil script or a modified version of the Arabic script (Ricci 2011, 173). At the end of the 17th century, Muslim Tamils began to use a version of the Arabic script with added marks to represent sounds particular to the language. Muslims in all of the south of India as well those in Ceylon adopted this system into widespread use. It was known as *lisānul-Arwi,* or, more commonly, simply shortened to Arwi (Ricci 2011, 171-172). Ricci draws attention to Thurston's observations of the contrast in how Arwi texts were treated versus those in the traditional Tamil script. Many works of non-religious nature appeared in the former (among them satire, travelogues, and fictional novels) (Ricci 2011, 172), while at the same time the latter script was also used to represent works related to Islam. Thurston notes that:

> "A book so written or printed [i.e., in Arwi] is called a *kitab*, rather than its Tamil equivalent *pustakam,* and is considered sacred. It commands almost the same respect as the Koran itself, in regard to which it has been commanded 'touch not with unclean hands.' A book of a religious nature, written or printed in Tamil characters, may be left on the ground, but a *kitab* of even secular character will always be placed on a *ribal* or seat, and, when it falls to the ground, it is kissed and raised to the forehead" (Thurston and Rangachari 1909, 4:206, quoted in Ricci 2011, 175).

This relative lack of objection on religious or governmental grounds allowed an indigenous print culture to take root more freely in South Asia than was experienced in other areas that also used some form of the Arabic alphabet to render a local language into text. Thus, concurrent with the developments in Italy pioneering typefaces to reproduce Arabic and other scripts through the new medium of movable type, Portuguese Jesuits spread print technology—first in Roman script, soon thereafter in Tamil—to areas under Portugal's colonial influence.

It was in the north of India in the latter half of the 18th century that print runs using the Arabic script became established as a going concern. While the very first books printed in India may have been products of other European powers (i.e., the Portuguese and the Dutch), it was the British who truly installed the technology in the subcontinent. Though Madras takes distinction as home to the first British-run press in 1761 (Shaw 1981, ix), the craft blossomed in Calcutta over the decades that witnessed the waning of the Mughal Empire and prelude to the Raj.
It was at Fort William College that first Gladwin and then Gilchrist employed a nastaʿlīq font (see fig. 2). The latter took especial pains to ensure accurate orthography, representation of

sounds between which there was not ordinarily accorded differentiation in other writing, correct punctuation, and addition of vowel markers (Kidwai 1972, 135). He decried what he foresaw as the potential for the high standard of detail he brought to printing in the nastaʿlīq script slipping into shoddiness with less attention afforded to such particulars—a premonition that was fulfilled in the limbo decades of the early 19th century (before the arrival of lithography), when print houses began to substitute naskh for practical considerations. Despite his conscientious approach to the language, Gilchrist himself succumbed to the advantages of printing in naskh.

A prime surviving example of Gilchrist's attention to detail, and the limitations of type by which he was bound, is held in the University of Chicago's Rare Book Collection. Available for consultation is a bookworm-ravaged (see fig. 2) publication of *Nusri benuzeer: or a prose version, by Meer Buhadoor Ulee, of the Sihr ool buyan, an enchanting fairy tale in Hindoostanee verse by Meer Husun*, which Gilchrist published in 1802.

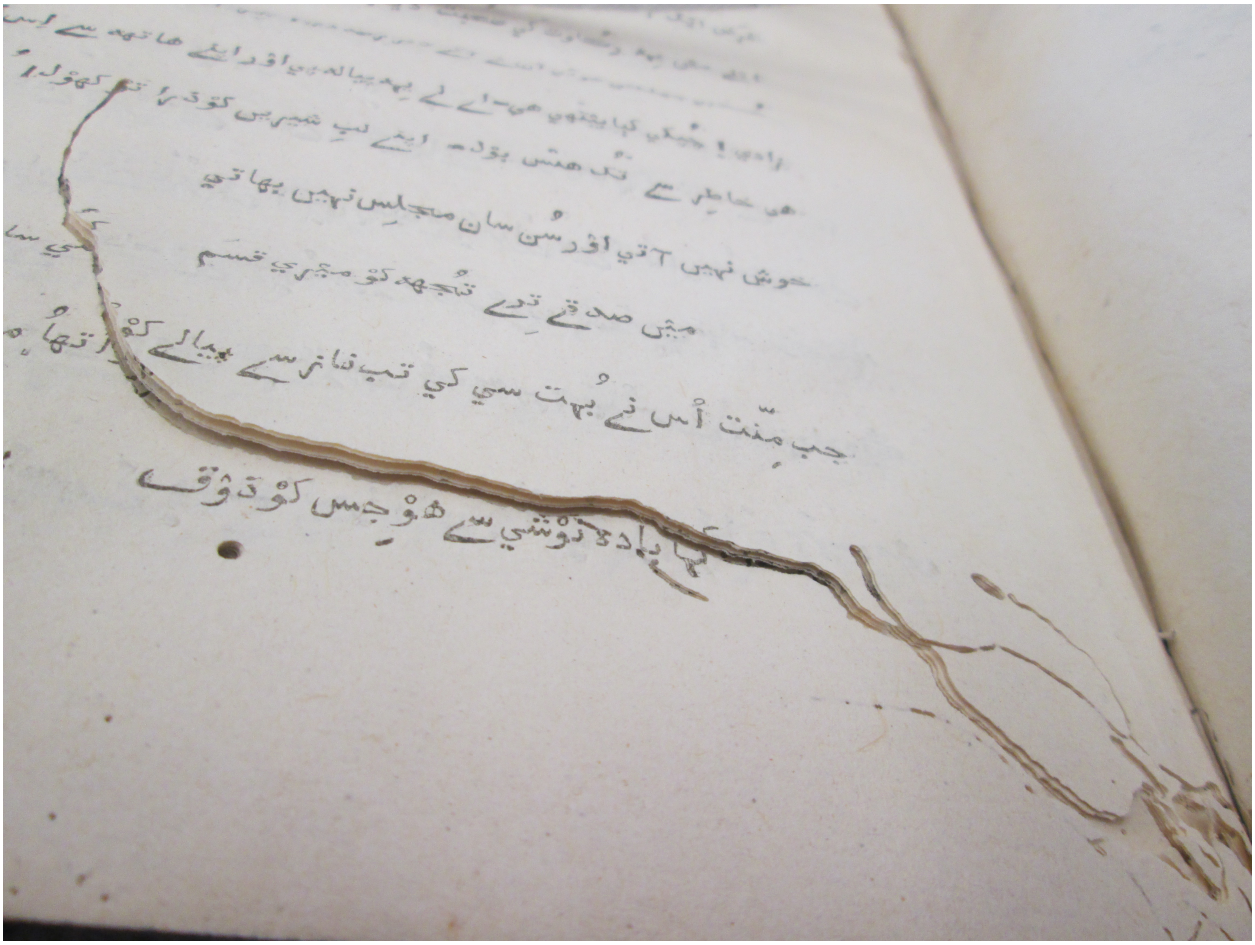


Figure 1. Bookworm-eaten copy of Husun, 1803, published by Gilchrist, held at University of Chicago Rare Book Collection.

Gilchrist addresses his choice of fonts in the preface he writes to his publication of Hasan's work:

> It may be necessary to state, that my reasons for adopting the small Arabic type, for this Hindoostanee publication, were, in the first place, to expedite its appearance, and in the second, to accustom the Hindoostanee students to this particular letter. As I began a number of works at the same period, there was no other remedy than to use several fonts upon them. The small Arabian character

> is much used in books printed at home, and is on the whole so very distinct, that few real Hindoostanee scholars can ever be at the smallest loss to decipher it… when compared with the nustaleeq… he may yet find it of great use for writing notes in the oriental languages (Husun 1803, vi).

Examination of the fonts which Gilchrist used in this printing illustrate the story behind his struggle to remain true to contemporary standards of orthography and conventions of script choice, as well as the limits of what he had to work with.

Page 11 offers a typical example of Gilchrist's mixed use of fonts on one page. As throughout the rest of the book, most of the text appears in what Gilchrist calls the "small, Arabian character" (i.e., naskh). However, the chapter header on the ninth line, *Dāstān Benazīr ke paidā hone ke aḥwāl meñ,* shows Gilchrist's use of the nastaʿlīq font. Both fonts suffer from a shared set of difficulties in positioning and connecting letters relative to how they would appear when handwritten. However, the broken appearance does not appear as pronounced in the naskh typeface he has used to print the surrounding lines forming the main body of text. Kerning issues and the difficulty of stacking letters to follow multiple baselines result in a more fragmented appearance to the text in nastaʿlīq than that appearing on other lines. The long letter *sin* and following letter *te* fail to connect as they ought (see fig. 2.) The same failure to flow from one letter to the next is also a defect in every appearance of the letter *barī yē*, which at best manages to hang by a thread from a preceding letter *nūn*, but appears wholly disjointed in its three other appearances. A typecaster clearly tried to emulate the higher position of an initial letter *pe* as it should appear when connecting in nastaʿlīq script. However, the problem of kerning that piece of type closely enough with the following letter *yē* forms such a separation as to make one word

appear to be broken into two. Even letters which ought not connect with one another in the word *aḥwāl* are set apart from one another with greater space than they normally would be separated by when written out by a calligrapher (see fig. 2).

کي اُمّيد کا کھيت سبز ہوا اور پھل اُس کو ملا جب ايسي لَو لگائي تب مُنھ مانگي مُراد پائي ا

حاصل يہہ ھي کہ بادشاہ کي بياھتا بي بي اُسي سال ميں حاملہ ھوي اور بنياد اَولاد کي بندھي

جو کُچھہ دل پہ گُذرے تھے رنج و تعب

مُبدّل ھوئے وُہ خوشي ساتھہ سب

خوشي سے پلا مُجھہ کو ساقي شراب

کوئي دن کو بجتا ھي چنگ و رباب

کروں نغمۂ تہنيت کو شُروع

کہ ايک نيک اختر کرے ھي طُلوع

داستان بے نظير کے پيدا ھونے کے احوال ميں

جب نو مہينے خيريت سے گُذرے - بادشاہ کے يہاں ايک بيٹا ايسا شکيل پيدا ھوا کہ گھر آنگن

اُجالا ھو گيا ا مہر و ماہ کو اُس کے جلوے نے ھيچ کر ديا - بلکہ شيدا پريزاد تو کس شُمار

ميں اور انسان کس قطار ميں؟ جب حُسن و صورت ميں اُس کا نظير نہ ديکھا - نام بھي بے

نظير رکھا ا اندر بادر مُبارک سلامت کي دھوم مچ گئي - محلِ مُبارک ميں شادي رچ گئي ا

Figure 2 (Husun 1803, 11).

Given the increased complexity in setting type with the appropriate ligature in nastaʿlīq, and the fractured, inexact appearance of the results, it is not surprising that even a publisher such as Gilchrist, who had such a reputation for attention to detail, would substitute a font he himself described as "expediting appearance."

Despite the fact that the installation of the press into India may not have had the challenges it did elsewhere (such as the Ottoman prohibitions that stymied the foundation of print shops), an established print culture did not take root in the subcontinent until the late 18th century. This is in large part owing to the firmly established system of calligraphers, scribes, and illustrators employed by the Mughal emperors. Works were commissioned as unique masterpieces, sole manuscripts crafted over many years by multiple artists, pieces never intended for mass production or wide readership. The grandest example was Emperor Akbar's (rt. 1556-1605) patronage of the *Hamzanama*: an exquisitely illustrated and calligraphed account of the legendary, epic adventures of Amir Hamza. The work took over 15 years to complete after its commission in either 1557 or 1558. The final resulting masterpiece comprised 1,400 painted miniature illustrations as well as the text of the narrative written out in nastaʿlīq script (Guy, Britschgi, and Metropolitan Museum of 2011, 37). In contrast, much of the content that the budding colonial power chose to disseminate was of the exact opposite nature. Shaw notes how "Most eighteenth-century Calcutta imprints were designed predictably enough to meet the practical needs of the small European community... " (Shaw 1981, 18). Government records, grammars, missionary tracts, news accounts, registers and almanacs—as opposed to illustrated manuscripts crafted by bodies of artisans over months—were all materials meant to be replicated and circulated as widely as possible.

Contemporary production of works in Persian and Urdu, the dominant languages employed by the Mughals, required employing the standard script of choice used for writing

both: nastaʿlīq. As outlined in Chapter 1, this more ornate style of putting letters to a page was a burden on print houses in terms of both time and expense. Print houses were required not only to own a set of the enormous and subsequently far costlier font but to further take the time and effort necessary to print in that style of script. Layout took longer than it did with other versions of the Arabic alphabet. As seen with Gilchrist's publications at Fort William College (figures 1 and 2), the final output looked less attractive than the non-typeset versions of script to which readers were accustomed.

The added strain on resources was not limited solely to the cost of acquiring a full font or the additional time it took to set the more complicated nastaʿlīq type. Owing to the complexity of multiple baselines outlined in Chapter 1, use of paper was less efficient when printing as opposed to writing by hand. Slotting every letter into parallel rows along a printer's galley resulted in unnecessary spacing between lines and within words, as shown in figures 1 and 2. Given these conditions it is not surprising that Western publishers in late 18th-century India chose to adopt a technique that became more and more common over subsequent decades: substituting the typeface of the simpler, more-linear naskh script in place of nastaʿlīq. Naskh was the standard for representing works in the Arabic language, but not for text in either Persian or Urdu.

Shaw's *Printing in Calcutta to 1800* chronicles how the earliest works were, by and large, printed in the nastaʿlīq script. In this book Shaw presents an "Index of Works Containing Printing in Exotic Types, Etc." in which he inventories all unusual fonts appearing in all publications known to be run off in that city to the end of the 18th century. All of these printed works which he lists must have been typeset: lithography was itself not invented until the end of the 18th century and, further, was not brought to India until the 1820s (Stark 2007, 45).

Though its use of additional ligatures required more keys to be cast than would be for a naskh font, nastaʿlīq was by far the most frequently used type. By Shaw's count, 70 works

(among them a system of Bengal revenue accounts, dictionaries, and a wealth of material in Persian ranging from classical poetry to English grammars to Bengal legal regulations) using that particular typeface were printed prior to the dawn of the 19th century. In sheer numbers, Shaw's totals would appear to show works printed in nastaʿlīq equaling the total of publications in all other scripts combined: he tallies Bengali appearing in 31 published works, naskh in 16, and Devanagari in a total of 13 publications. (Works published in Calcutta, including languages employing other alphabets, such as Armenian, Greek, and Hebrew, each totaled fewer than three works prior to the end of the 18th century.)

Shaw's list is deliberately comprehensive, so it contains intersecting and overlapping data. Though many of the works inventoried in *Printing in Calcutta to 1800* list non-Roman fonts other than nastaʿlīq, many of these were used in only a few works. Examples of such occasional use of a non-Roman font include what Shaw identifies as the only specimen of Greek printing from 18th-century Calcutta. Greek appears on the title page of *Storia della pittura e la scultura. Da i tempi più antichi. Tomo I. = The history of painting and sculpture, from the earliest accounts. Vol I.* which is otherwise composed in parallel text in Italian and English. Volumes such as the regular publications of *The New Asiatic Miscelleny* were printed almost entirely in English, with its non-Roman content appearing overwhelmingly in nastaʿlīq type. The rare pages where another font might be used, no matter how few the instances, are considered grounds to warrant that script's inclusion in both lists. For example, the sole work listing the use of a Hebrew font, item 185 of Shaw's index, also contains text printed in both naskh and nastaʿlīq. This particular work, Francis Gladwin's *A Vocabulary, English and Persian; with Introductory Grammatical Remarks*, even includes an explanation-cum-apology of why a naskh type was substituted for the standard nastaʿlīq, "not only on account of the combinations being less

complex, but also because more lines of it than of Nustaleek are comprised in a page" (Gladwin 1791, quoted in Shaw 1981, 145).

Shaw's figures demonstrate that— notwithstanding the additional expense and technical layout issues when employing nastaʿlīq in movable type and the gradual substitution of naskh fonts—initial British efforts to print in Persian and Urdu in India had been almost entirely faithful attempts to reproduce works in some approximation of the local script of choice, as opposed to the naskh movable-type print runs of subsequent decades. As recounted above, Gilchrist felt it necessary to specifically address and defend the grounds for his departure from nastaʿlīq to naskh in publications over the earliest years of the 19th century at his press at Fort William College. Though his defense opens with a simple rationale of "to expedite its appearance," the bulk of his justification goes on to identify the "convenience and benefit to Western scholars learning the Hindoostanee language" (Husun 1803, vi). Gilchrist, however, makes no mention of how this change in typeface—remarkable enough to call attention to in the preface to his publication—might benefit locals whose connection to the language was much more immediate than that of learners from Europe.

Gilchrist had grounds to excuse his choice of typeface in his preface. Though it was a very different political realm far from South Asia, when print had been legalized in the Ottoman Empire in the previous century, rebellion sprang up from calligraphers (Berkes 1964, 40) who saw their livelihood being supplanted by a technology that produced choppy results. But, not long after, a timely solution to satisfy both calligraphers and publishers presented itself with the invention and adoption of lithography. This new technology had massive benefits over printing with movable type, which had itself demonstrated so many advantages over the previously existing manuscript tradition. Lithographic reproduction was far cheaper than either of the previous production methods. (The estimated price of a lithographic edition of a book printed in

the Punjab in the 1880s—by which time the technology had been comfortably established across India—was roughly one-tenth the cost of the same work in manuscript form (Bayly 1996, 240-241).)

The new medium was also far less restrictive. Text could be written out normally onto a transfer paper which would then be flipped over to etch directly (in reverse) onto the stone, providing the impression to be reproduced. An alternate technique which did not meet with widespread adoption (Proudfoot 1998, 127) was employed at the Naval Kishore Press where several calligraphists who were masters of both mirror writing (*mak'kūs-nigārī*) and stone correction (*iṣlāḥ-e sang*) etched directly onto the stone in reverse script (Stark 2007, 272). Following either procedure to set words meant that a print house was no longer restricted to publishing solely in the sets of typeface it owned, nor limited to printing in the languages for which it owned corresponding fonts.

Additionally, lithography obviated any aesthetic considerations of the mechanics of type being unfaithful to the "script grammar" of the writing system. The previous limitations of printing, such as those called out by Gilchrist and Müteferriqa before him, were rendered moot. Lithography took the task of giving form to text back from rows of cast metal blocks set alongside one another, and returned the role to those wielding a pen. Connecting letters on a page of mass-produced text was no longer a matter constrained by physical limitations in existing typefaces to join letters neatly, or the exacting calculation necessary on the part of the typesetter to identify, locate, and then set the correct key bearing the most appropriate form of the ligature. This entire process was instead accomplished with the stroke of a pen by a calligrapher.

In addition to these benefits of flexibility, aesthetic appeal, and the lower start-up costs to establish a functional lithographic press relative to one employing moveable type, the new medium fed naturally into the pre-existing Mughal order of employing scribes and calligraphers

to copy out texts—a structure that was at complete odds with the role of a pressman setting type along parallel rows of a galley (Orsini 2009, 13).

While individuals who were mindful of aesthetic standards in early forays into printing (before 1800) retained nastaʿlīq as the dominant font, it is worth noting the factors that led to a gradual shift to publishing works in naskh in the decades before the arrival of lithography. In *An Empire of Books* Ulrike Stark notes these initial efforts to attempt to print in a typeface (i.e., nastaʿlīq) that resembled the local standard for text reproduction at the time. She places the blame for the introduction of works appearing in naskh type squarely on European influence:

> Remarkable improvements were also made with regard to the founts used for printing in Persian and Urdu. Nonetheless, the Serampore Mission Press continued to import Persian founts from England. Urdu typography was still in its infancy: owing to the scarcity of suitable founts, nearly all Urdu books printed in India before 1800 were in nastaʿlīq. The naskh character, which lent itself much better to movable type-printing and was much used for oriental printing in England, only made its appearance in India when it was popularized by missionary printers and schoolbook societies. (Stark 2007, 39)

Graham Shaw documents the expense of procuring requisite materials and supplies to publish in India at the dawn of nineteenth century. He chronicles the shift from an industry reliant on scarce, costly imports in which "nearly all printing equipment and materials—the presses themselves, types, paper, ink, etc.—had to be imported from Europe" into a nascent state of self-sustenance (Shaw 1981, 29).

In 1786, the printer Joseph Cooper left work at Calcutta's first established and only existing type foundry, the printing office of the British East India Company, to go on to create his own rival type foundries, casting fonts for both Asian and European languages (Shaw 1981, 45). With this shift to local sourcing of base material, industry prices for certain aspects of the print production process fell. As Orsini has noted, "Purchasing or making Urdu and Hindi typefaces was costly: at the beginning of the nineteenth century a set of Nagari types forged in Britain cost as much as £700, while at Serampore it cost around £100, or Rs 1500" (Orsini 2009, 11).

However, even with this gradual shift to locally manufactured technology, compromises were still being made well into the nineteenth century. The cost differential in font price and the additional burden of labor in correctly setting its letters led to the frequent decision by missionary presses to substitute naskh for nastaʿlīq, a compromise that local printing houses would not brook.

> Indian-owned presses stuck to the even more expensive Nastaʿlīq, which looked far more familiar to Indian readers... another significant factor was the alien look of the typeset book, with its pagination, wide white margins, and fonts... they catered to a rather different public.... (Orsini 2009, 12)

Though the missionary presses might be perceived as lacking consideration of local aesthetic preferences with their substitution of the more easily-rendered naskh font for nastaʿlīq, initial unfamiliarity and unease with the aesthetic of a printed object and rejection thereof was a common reaction worldwide, going back to the earliest days of typography as the technology and printed matter spread from the 15th century onwards. Perception of a printed book as a peculiar, alien object was neither strictly a Muslim nor a South Asian reaction to the odd physicality of the

new medium, whose contrasts with the dimensions, heft, and layout of the familiar handwritten manuscript were substantial.

Even in Europe, the birthplace of the Gutenberg press, the printed book carried not just an unfamiliar nature but a whiff of outright unholiness. Elizabeth Eisenstein chronicles the story of a 15th-century publisher who brought Bibles to sell in Paris. These printed books reproduced holy scripture in such a precise manner and in such volume that they became suspect as objects stemming from some dark origin. The publisher was forced to flee town:

> Whether the new art was considered a blessing or a curse; whether it was consigned to the Devil or to God; the fact remains, that the initial increase in output did strike contemporary observers as sufficiently remarkable to suggest supernatural intervention. (Eisenstein 1979, 50)

Associations of identity evolved out of these complicated factors of cost combined with the unfamiliar nature of the medium. Moveable type served well enough for printing works in the majority of European scripts, which employed freestanding letter forms with little variation (i.e., Roman, Greek, and Cyrillic). But typesetting did a rather poor job of reproducing any script in popular use in India, be it Urdu, Bengali, or Devanagari.

Keys of type served the reproduction of letter shapes in European scripts well enough. Even Senefelder, the German inventor of the process of lithography, envisioned the medium as one that would be used not to reproduce words, but to represent information conveyed in forms other than text. These would be forms that would be more difficult to print with type or that would require casting a large number of keys, such as musical notation and illustrations (Proudfoot 1997, 181).

The shortcomings of the movable-type press's ability to do an adequate job reproducing the languages of India led to the use of the lithographic process to reproduce works of text: an innovative application of existing technology that originated in the rendering of text in Asian scripts (Stark 2007, 45-46). This subsequent repurposing of lithography to create output superior in appearance to the best efforts of typecutters led to another key factor in its subsequent flourishing after its arrival in the subcontinent in the early 19th century. Lithography, when re-purposed to print text in local languages, became more closely associated with local identities—specifically a "Muslim identity"—despite its European origins.

India's use of lithography was not the only innovation to adapt printing technology in a way that suited local scripts. A fusion adaptation of lithography with typography, independent of the parallel development of the press in India, had been effected in Southeast Asia to pair printing of typeset English alongside Chinese or Japanese (Proudfoot 1998, 118). This further repurposing is relevant to a fuller story of how Arabic-script printing spread: these same print houses also published in Malay, Jawi, and other languages that use the Arabic alphabet. Their incorporation of lithography will be examined in the final chapter of this thesis.

3. OTHER SCRIPTS, OTHER ISSUES OF TYPE

In contrast to the ubiquity of the Arabic script in Ottoman and Safavid lands in the early 19th century, in Mughal-ruled areas, a variety of competing scripts were used to represent local languages. This diversity of tongues was common in all areas where print shops were first established in the subcontinent. Unlike the modified versions of the Arabic script that were used to express Persian and Urdu, most Indian languages were written in syllabaries descended from the Brahmi script. These were, at base, of different structural form than Arabic letters. For example, the site of one of India's first established publishing houses, Fort William College, used the Bengali script to express the language most spoken in Calcutta.

In 1837, as British influence arose, a language inquiry of the East India Company set the stage for a shift away from Persian, which was still the official language of administration of the declining Mughal Empire (King 1994, 54-55). English as well as Indian languages rendered in alphabets other than the Perso-Arabic script were considered as replacements. Devanagari (often abbreviated to Nagari) and its cursive variant, Kaithi, were prime candidates for script of choice. Though there was widespread use of both writing systems in both Oudh and Bihar, governmental policy was hostile to Kaithi in the former area (King 1994, 66-68) and eventually, in 1882, criticized and officially discouraged in the latter. The increasing adoption over the 19th century of Devanagari to render languages of India, among them Sanskrit, Nepali, and Hindi, is argued by King in the case of the latter language to be “the deliberate creation of a new language style… the ‘Sanskritization’ of Urdu” (King 1994, 69). The rise of Devanagari had more to do with associations of scripts and religions (i.e., Nagari becoming equated with Hindu identity) (King 1994, 57,62) than with any consideration of its suitability to the printing methods of the time. However, in one particular regard—its running linearity—the Devanagari script did prove

perfectly suited to being laid out in movable type in the same manner as the Roman script around which the Gutenberg press had been designed. In addition to being formed of discrete units running in a linear direction along rows of a page (the same fashion as scripts of all languages of Europe), the letters traditionally hung down from a horizontal line or *rekha* that strung them together on a visible line running along the top of each row of text. This feature can be seen as the solid bar running the length of the word in the rendering of the script's own name: देवनागरी.

This underlying structure meant that Devanagari had fewer issues of running along multiple baselines (outlined in Chapter 1) that proved such a challenge to printing the nastaʿlīq version of the Arabic script with movable type, though it did require cutting individual keys for stacking conjunct letters taking unique melded forms.

Bearing that advantage in mind, adapting movable-type print technology to the syllabaries commonly used to represent languages of India was necessarily a larger task by scale than the process of cutting type into the forms of Roman letters. The quantity of type required to print a full Devanagari font could contain more unique forms than even a nastaʿlīq font (Orsini 2009, 11).

The expanded type required was on account of an underlying function of how Devanagari associates shapes with sounds. The script employs dozens of additional variants beyond the basic form representing each letter as it might appear when not conjoined with any other sound in the word. Beyond the most commonly occurring form of any given letter, Devanagari further contains extended, alternate glyphs to express certain sounds or combinations thereof. These chiefly fall into two categories: vowel variations and consonant clusters (Shapiro 1989, 8).

Expressing vowels in Devanagari necessitated additional keys in a way that text printed in the Latin script would not. The "full" form of a vowel appears when the sound is not preceded by

a consonant, when it stands in isolation, and when it serves as the second vowel in a diphthong. When printing in Devanagari, in many cases there would be no way to represent certain syllables without casting additional unique types, given the nature of how vowels adhere above or below the preceding consonant. A font expressing the Roman alphabet could put any vowel to double duty alongside any consonant. However, a font to print Devanagari would require an exponential increase in individual types within the set as each syllable necessitated its own distinct type. For example, a Devanagari alphabet used to represent Hindi contains 11 commonly-used vowels. Some of these could stand freely, as they would appear before or after a consonant they were at play with. However, when certain vowels were connected to a consonant, they would have to appear above or below a consonant (such as shapes representing "e" or a vocalic "r"), necessitating casting of a unique type (Shapiro 1989, 9).

To view this, consider the vowel "e". When not following a consonant, its Devanagari form appears as "ए". However, when preceded by a consonant it takes a wholly different form, appearing above the consonant: "ॅ ". When coupled with an "l" sound, which is rendered in Devanagari as "ल", rather than merely placing the two types alongside one another (as seen in this incorrect coupling, "लए",) to generate "le" a new form needed to be cast: "ले".

Clusters of consonants unbroken by a vowel create another challenge in the moveable-type press. These usually take a single fused form (known as a conjunct character) that extracts dominant features of the two or three (occasionally four or as many as five) letters being conjoined. It is not sufficient to string together the standard consonant shapes next to each other. Each new, resulting glyph requires an additional, unique type to represent the consonant cluster. A "k" sound, represented by "क", followed by a retroflex sibilant "ṣ" whose default form is

rendered as "ष", requires a unique character to express the resulting consonant cluster. Placing the two alongside to form "कष" implies a syllable pronounced "kaṣ" rather than "kṣ" (see figure 3).

Figure 3, Devanagari consonant cluster "kṣ".

This meant the total number of individual types required for a full font to print text in languages such as Hindi or Sanskrit would comprise several more letter forms than a standard set of letters in the Roman script. This greater size of the necessary range of keys to produce a full font was the sole technical difference between printing in the Devanagari script and printing a book in any of the European languages. Vowels may have been duplicated and consonants may have taken unique forms when appearing conjunct with one another but, at a technical level, it was simply a question of scale to cut additional keys to correctly represent the cluster of sounds.

Given the structure of these two scripts, Devanagari and nastaʿlīq, it is further evident that difficulties in print mechanics were not merely a question of the sheer quantity of keys required to comprise a full set of type. The Devanagari script, in fact, employed a significantly larger number of keys to print. A typical set took 600 character combinations in nastaʿlīq, while for Nagari there were over 1,000 individual keys (eventually pared down to 700) in Charles Wilkins' creation of a new font at the Serampore Mission, the first Devanagari types to be developed in India (Orsini 2009, 11). Although Devanagari was complex, and demanded an enormous number of keys, the script's discrete sound representations were strung together in a linear nature that was better suited to typography than any version of the Arabic script. The rekha running as a rough

upper horizontal line connecting one letter to another served well enough even when broken by print, as opposed to Arabic letters that could join together from all levels of running baseline.

Here, Sheila Blair gives a brief description of the enormous effort involved when setting the Arabic alphabet in type in a presentable manner:

> Despite the attempts of people like Faris (Ahmad Faris Efendi, founder of the al-Jawa'ib press in Istanbul) to adapt Arabic script to printing, many problems remained in composing Arabic script to metal type. It was time-consuming, for example, to insert the ligatures required between letters. There were also visual problems. When using cold metal type, the individual sorts are set side by side. It is impossible to overlap letters, a process known in typesetting as kerning, and the system creates small but noticeable gaps between letters that would be filled by the flow of ink in handwriting. Furthermore, line justification is possible not by extending the letter bodies themselves, but only by stretching a baseline stroke between letters. (Blair 2006, 605)

Though a solution to the rigidity of type in reproducing text had come in Senefelder's creation of lithography at the beginning of the 19th century, efforts to adapt textual form to the medium of moveable type continued well into the middle of the 20th century. To circumvent the laborious process that Blair describes, there were various attempts at simplifying the Arabic alphabet itself by crafting forms of each letter that better suited the needs of typographic printers—even well after the spread of lithography. Though all were clever in their repurposing of shapes already existing within the alphabet, or even appropriating letters drawn entirely from

other alphabets (i.e., Latin; see figure 4) to represent approximations of a rough form of Arabic script, none were ever well received, let alone employed at broad scale.

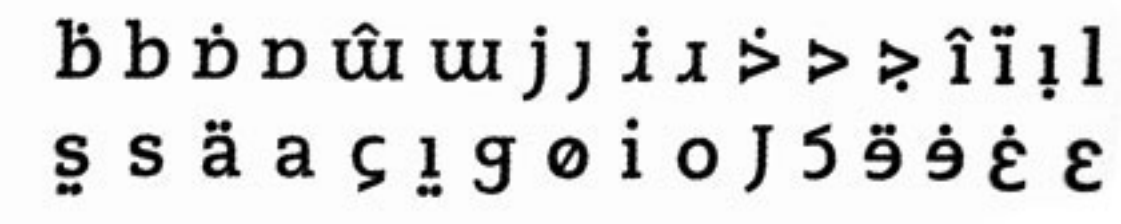


Figure 4, Yahya Boutemène's 1945 representation of Arabic based on Latin forms (AbiFarès 2001, 73).

These latter efforts were undertaken by font designers whose familiarity with and connection to non-Roman scripts spanned a tremendous range. Among them were Westerners who had no capacity in any language employing the Arabic script, such as Eric Gill's failed Arabic font of 1937 (Blair 2006, 606). At the other end of the spectrum were type designers who had grown up in regions where the Arabic script was ubiquitous, as was the case for Nasri Khattar with his 1947 United Arabic font project (see figure 5). Neither adaptation was extremely well received nor broadly implemented (ibid p. 607). Quite simply put, these ongoing experiments with simplifying forms of the script were demonstrably unnecessary attempts to box the form into the wrong medium. By the time of Khattar's attempt, lithography already had a century of practice, demonstrating it to be the superior method to reproduce the traditional forms of the Arabic script.

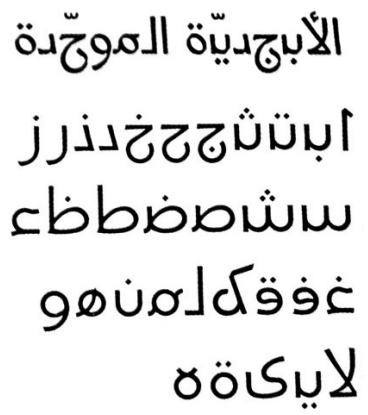


Figure 5, Nasri Khattar's Unified Arabic Font (AbiFarès 2001, 75).

Whatever complications there were in using type to represent either a script based on the Brahmi syllabary (e.g., Hindi, Bengali, Tibetan) or one based on the Arabic alphabet (e.g., Urdu, Persian, Jawi), all were rendered moot with the arrival of lithography. Beyond its lower costs, lithography offered distinct advantages: it eliminated the need to cut additional type to represent Devanagari, and avoided the limitations—, such as gaps appearing between letters in areas where they should not break—of joining Arabic letters cast in type. However, despite the new medium's proven benefits to publishing in both Brahmi-derived and Arabic-derived scripts, its primary advantage, in Shaw's words, was its role as the "one printing technology that struck a cultural chord, particularly with Muslim communities… because it enabled the printed book to imitate the characteristics of the manuscript" (Shaw 2007, 127).

There was more underlying the story of print in the Arabic script than the mechanics of type. Further chapters will delve into factors beyond the technical capacity to join letters into words, including:

- The acceptance of printed text alongside established traditions of knowledge transmission, including the manuscript and oral-based traditions.

- The degree to which a given language had an existing tradition of disseminating written works of any nature.
- How traditional perceptions of particular scripts shaped behavior regarding writing as a material object.

4. DEFINING AND RENDERING THE ARABIC SCRIPT

As printing the Arabic alphabet by means of a typographic press was first done in the 16th century, what impeded the acceptance of the nastaʿlīq version of the script—the style that was used primarily in languages of 19th-century northern India (i.e., Persian and Urdu), and that appeared frequently to represent Ottoman Turkish? How was mechanical reproduction of nastaʿlīq further complicated, beyond what was required to operate a printing press in other areas of the world that used a simpler form of the alphabet? How did the same letters, when strung together in nastaʿlīq, so benefit from an innovative application of lithography to present text in Persian and Urdu in a familiar form? The short answer is that the geometric rules underlying the formation and joining of letters in the nastaʿlīq version of the script require a higher degree of angular tilt and stacking of letters than those defining the formation and joining of letters in the naskh version of the Arabic script. An answer in greater depth requires revisiting the history of the various styles of Arabic calligraphy and how they became standardized.

The rules defining how each letter should appear for certain calligraphic scripts were first codified in the 10th century by Ibn Muqla, a vizier of the ʻAbbasid caliphate. Muqla developed rules to define the representation of letters in six extant styles of calligraphy: *al-aqlam al-sitta*, or "the six scripts." These were *muhaqqaq*, *naskh*, *rayhani*, *riqa'*, *tawqi'*, and *thuluth* (Blair 2006, 195). (The nastaʿlīq style was yet several centuries away from creation.) Muqla's contribution was to use the *alif*, the first letter of the Arabic alphabet (which is represented by a single vertical stroke) as a base unit from which a ratio of relative size would be made, measuring out the proportions of all other letters (Gruber 2010, 11).

Furthering Muqla's system that used the alif to define the proportional sizes and shapes of all letters in the Arabic alphabet, Ibn al-Bawwab, who served as a manuscript illuminator under

the ‘Abassids into the early 11th century, crafted an extension to Muqla’s original concept. Still rooted in the alif, Bawwab’s innovation was to slice a fraction of the alif to define a dot forming a near-square. Rather than leaving these rhomboids stacked flat atop one other to use as his base unit of measure, Bawwab rotated this form 90° diagonally so that the angle formed an apex at the top, creating a string of diamonds. These measurement dots would always be oriented angle-upward, whether they were laid along the length of an alif (or the ascending parts of any other letter) to represent its verticality, linked side by side to express a letter’s width, or even when used to define negative space between the curves and lines of a letter. Depending on which style was being written, the vertical line of the alif could comprise anywhere from 3 to 12 of these rhomboid dots. For example, when written in the in muhaqqaq script, the letter alif is measured out to be eight dots high (Blair 2006, 297). This geometric foundation was *al-khatt al-mansub*, the proportionate script (Gruber 2010, 11).

> While [Ibn Muqla’s] treatise does not state a figure for the length of alif, he has dropped a couple of hints. In his penultimate chapter, where he explains the rules to observe in all strokes that share a certain shape, the fraction one-seventh is twice repeated. This in itself is rather striking because it happens to be the only numerical measurement found in the entire work. (Moustafa and Sperl 2014, 185)

Ibn Muqla is well-known as the first to write a treatise defining the shapes of the Arabic letters relative to the alif. In it, the 1/7th ratio that he twice invokes to define this ratio of dot width to alif height is now commonly used in manuals describing how to write the naskh script.

However, in his *Risāla fī l-Khaṭṭ wa l-Qalam*, or *Epistle on Penmanship*, Muqla himself never once makes reference to the dot as a unit of measurement—that was an innovation of Bawwab.

Ibn Muqla's treatise in its entirety remains accessible through Hilal Naji's biography of the great calligrapher, *Ibn Muqlah, k̲h̲aṭṭāṭ wa adīb wa-insān*, in which he reprints Muqla's work in full. There is some irony in the fact that Naji's entire book on the man who first formally defined the calligraphic forms of the Arabic alphabet was itself set and printed in a rather plain naskh type that did little to emulate any calligraphic graces.

The exact dimensions of the alif were never specified in Muqla's treatise, despite the role the alif served as the base unit from which to draw all other letter shapes. This key piece of information was of such fundamental nature that it led some to speculate that this critical point's omission was no mere oversight. The ratio the letter shape provided was so central to Muqla's new system that the authors of *The Cosmic Script* go so far as to speculate that perhaps he "deliberately withheld" specifying its dimensions (Moustafa and Sperl 2014, 163).

This absence of a defined reference point from which to measure led to competing interpretations in the name of Muqla's system of proportionate script and Bawwab's improvement thereupon. Persian historian Abū Bakr Najm ad-Dīn ar-Rāwandī, who had himself studied calligraphy over the decade from 1174-84 (Blair 2006, 211), wrote in the 13th century of his own methods at codifiying the six scripts. While Rāwandī similarly used a circle and line as Muqla had first proposed, his methods resulted in letters expressing, in the words of Blair, "odd proportions" (Blair 2006, 213). Though she dismisses Rāwandī's system as "fanciful," she crucially notes the impediment with which his method struggled: "Ravandi was apparently trying to apply proportional theories to round styles of writing that were still in the process of development" (ibid).

A greater departure from the fundamental system first put forth by Muqla was Rāwandī's premise that the same letter would take different proportions when appearing in different styles of script, rather than remaining keyed to the same basic unit of measure. Though Rāwandī was an advocate for calligraphic proportions that were neither the standard at the time nor later adopted into widespread use, the oldest extant piece of writing referring to the dot as a base unit of measurement when defining all other letter shapes is attributed to him. The entirety of his treatise is lost, though one chapter survives, reproduced in a history Rāwandī wrote of the Seljuks, *Rahat al-sudur wa ayat al-surur* (ibid).

Not all prescriptions for a proportioned script were based on the dot. There is mention made of a wholly separate scheme to systematically represent letters of the Arabic alphabet, relative to another basic unit of measurement: in this alternate case, a horse's hair. However, Mamluk cryptographer Qalqashandī (1355-1418) is the sole author to reference this system. Though other methods eventually won favor (and there is no evidence that this obscure technique to express the forms of Arabic letters was ever widespread), its mere existence is worth mentioning to reflect the developing stage Arabic calligraphy and letter shapes were yet in during Qalqashandī's time (Moustafa and Sperl 2014, 177).

There were also complementary methods to describe calligraphic accuracy, in a manner other than through geometric breakdowns based on rhomboid dots, horse's hairs, or other fixed units of measure.

A common approach was to associate the shape of a letter with a visual reference, often part of the body of an animal. These could include the ears of an elephant or a horse, the open maw of a serpent or lion, and even the testicles of mules (Moustafa and Sperl 2014, 170-171). Manuals in this vein, using such playful depictions of the shapes and curves of the letters of the Arabic alphabet, still remain current in 21st-century publications. In the generously illustrated

Rumūz-i khūshnivīsī, yā, Asrār-i nast'alīq, a long letter *sin*, written without teeth, becomes the arch of a horse's back (see figure 6). The backward-stroking letter *barī yē* turns into the space surrounding the head and snout of a fish (see figure 7).

Figure 6 (Mahmudi 2006, 73).

Figure 7 (Mahmudi 2006, 162).

Effective as these depictions are in associating the form of a letter with some common object that can be easily visualized in the calligrapher's mind, Mahmudi's manual additionally relies on a parallel presentation of Bawaab's system of measurement in rhomboid dots relative to the length of the guiding letter alif (see figure 6).

Though these alternate methods (measuring in hairbreadths; drawing comparisons with forms existing in nature) have existed to convey and define the form of each style, it is Bawwab's system that was ultimately agreed upon, that has endured for a millennium, and that today remains the standard used as a guide when teaching calligraphy in every language using the Arabic alphabet. The principles of *al-khatt al-mansub* have been extended to define scripts that were created well after Bawwab's time, specifically nastaʿlīq.

Nastaʿlīq was not among those original six scripts codified by Ibn Muqla, nor was it among those that al-Bawwab later had a hand in standardizing, such as *rayhani*. It was developed several centuries later by Mir ʻAli al-Tabrizi (Bloom and Blair 2009, 537) who, according to legend, took inspiration for its forms from a dream of geese flying across the sky. This flapping, floating vision from which the script was modeled speaks succinctly to the difficulties that moveable-type printers would encounter in its reproduction. Nastaʿlīq stacks more letters atop each other and is more flowing, more angular, and more diagonally cascading than any previous versions of Arabic script had been. It is everything that naskh and muhaqqaq, let alone kufic, were not. The letters of the nastaʿlīq script came together in a way that was less perpendicular, less free-standing, less boxy, less isolated, and less constrained.

One key aspect in favor of the nastaʿlīq script's adoption into the manuscript tradition was its late-coming status relative to other scripts that had traditionally been used to express the Arabic alphabet. Nastaʿlīq was relatively free of the cultural baggage associated with the kufic script, which was almost exclusively used to record verses from the Qur'an. This is unsurprising as it was initially *hijazi* script, followed by the various sub-styles of kufic, that were the preferred scripts in the earliest days of Qur'an production. As standards were laid down and styles perfected, certain other scripts came to supplant kufic as the style in which to write out Qur'ans. Khalili documents the initial appearance of a Qur'an in several of the major styles, noting that the first Qur'an appearing in the naskh script was written out in Baghdad and dated to the first year of the 11th century. The earliest surviving example of a Qur'an in muhaqqaq is from 1160. At the beginning of the 14th century a Qur'an written out entirely in thuluth was commissioned by the Mamluks, though that particular style was more often used for short sections other than the body of the Qur'an itself (Khalili 2006, 51). Though calligraphy on a monumental scale, attached to mosques, tombs, shrines, and other holy sites, often appeared in thuluth, muhaqqaq, and naskh,

such ornamentation seldom employed nastaʿlīq, whether in Ottoman, Safavid/Qajar, or Mughal lands.

Significantly, while examples do exist, it has always been extremely rare to find an entire Qur'an written out in nastaʿlīq. Though admired for its beauty of form, nastaʿlīq was not laden with the deep holy associations of calligraphically expressing the Qur'an, as first kufic, then naskh, rayhani, and thuluth evolved to do over the centuries following the time of Mohammad. This minimal baggage made nastaʿlīq the perfect choice in which to write out verses of Persian poetry and the standard in which to write documents of the Ottoman and Mughal courts. According to Khalili, the latter favored production of nastaʿlīq calligraphy and miniature painting over production of Qur'ans (Khalili 2006, 61).

Artistic expression in the forms of Persian epics, Urdu *ghazals*, Turkish *meşnevīs*, and captioning of miniature paintings were all perfectly suited to the slender style. However, the adoption and proliferation of this style would nevertheless delay the acceptance of the typographic press and fuel the subsequent rapid rise of lithography. Though all styles posed technological and aesthetic challenges as they were adapted for printing, the ornate manner in which nastaʿlīq's letters took shape and connected with one another in conformance with Tabrizi's rules defining the script proved especially difficult. Calligraphic and artistic triumph though it may have been, nastaʿlīq's graceful structure would frustrate future type-setters (Warren 1856, 47-48).

Taming nastaʿlīq with technology has remained an issue to this day. The area where the style has proven stubbornly resistant to technological adaptation is in its reproduction through any media where the forms of the letters are not drawn out by hand. Whether the technology was a metal sort cast for the Gutenberg press, a pixel set defined to appear on a computer monitor, or

the demand of a smartphone application to allow nastaʿlīq as choice of font, attempts to mass-produce the script frequently foundered despite technological advances.

Echoes of the same difficulties underpinning script definition that confounded typesetters over much of the 19th century resonated again across the 20th century and into the 21st. Examples include Ahmed Mirza Jamil's 1967 invention of a system of "computerized Urdu calligraphy" (Kashfi 2008, 12). Though practicable, it did not manage to supplant the existing system in the industry that inspired it, the Urdu newspaper production house. Newspaper publishers continued to retain calligraphers to write out the main bodies of text by hand for several decades. Jamil's invention did spawn the "Noori Nastaʿlīq" font which is still used on PCs in the early 21st century. However, even when used in conjunction with contemporary software such as the widely-used word processor Microsoft Word, the text generated often still has visible problems properly connecting and spacing letters in relation to each other. Words still appear better when written out by hand.

By the second half of the 20th century the greatest initial impediments in printing, such as procuring presses and typefaces from Europe and casting type from molten alloys, may have been obviated. However, problems of geometrical alignment (not to mention the problem of capturing the essential beauty of the script) that had been the bane of the typographic press resurfaced in an attempt to give form to Arabic letters on a cathode ray tube. In the nascent pre-PC state of computing in 1970, a custom-built system of hardware and software was again tripped up in the same task that had vexed print houses before: it could neither represent the letters in an attractive manner nor string them together with each other in the places where they ought to connect (see figure 8).

13.

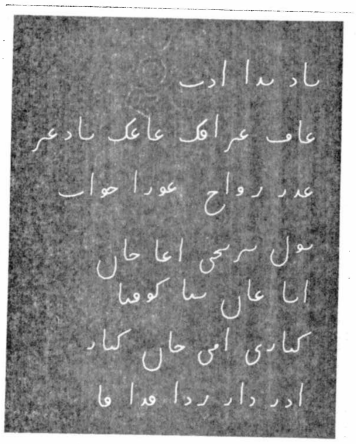
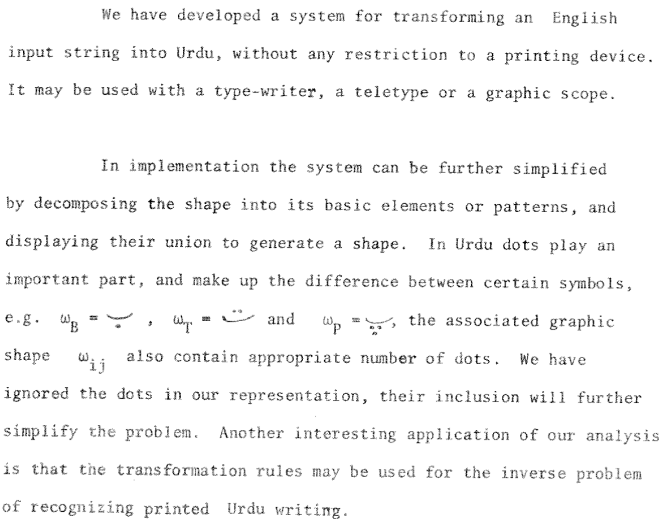


Figure 5 - Sample output of Urdu generated on CDC 1700/274 Digigraphic scope.

Figure 8. Sample computer-generated Urdu script output, 1970 (Hyder 1970, 13).

For whatever proof of concept the system may have served in displaying connected Arabic script, the advantages of the new computer technology were not even implemented in the publication of the very work in which the process is described. The work concludes that the authors have "developed a system for transforming an English input string into Urdu, without any restriction to a printing device. It may be used with a type-writer, a teletype or a graphic scope" (Hyder 1970, 19). Despite his conclusion on this seeming success, the physicality of the medium in which the author shares his findings is what itself betrays the ever-persistent problem of publishing in nastaʿlīq and other styles of the Arabic script: the comb-bound publication appears to have been composed on a standard typewriter with roman keys. Tellingly, all representation of letters in Arabic script, both isolated and connected, have clearly been written out by hand in gaps left in the initial composition (see figure 9).



We have developed a system for transforming an English input string into Urdu, without any restriction to a printing device. It may be used with a type-writer, a teletype or a graphic scope.

In implementation the system can be further simplified by decomposing the shape into its basic elements or patterns, and displaying their union to generate a shape. In Urdu dots play an important part, and make up the difference between certain symbols, e.g. ω_B = ، ω_T = ت and ω_P = پ, the associated graphic shape ω_{ij} also contain appropriate number of dots. We have ignored the dots in our representation, their inclusion will further simplify the problem. Another interesting application of our analysis is that the transformation rules may be used for the inverse problem of recognizing printed Urdu writing.

Figure 9. Hand-drawn Urdu letters that differ (note existence or absence of dots) from output generated by computer system on which the publication focuses (Hyder 1970, 19).

Though Hyder does not invite further scrutiny of how close to practical implementation his system must be, he does recognize that, even if the system of hardware and software he has custom-configured serves as working proof of concept, its results (see figure 8) are ugly:

> For those not conversant with Urdu/Persian/Arabic languages the script … (p. 13, displaying a rough screenshot of text) may not be visually pleasant, for which the author requests their forbearance. It requires a surgeons [sic] hand and calligraphic experience to generate isolated macros with a light pen that form a well formed word on linking together (Hyder 1970, 14).

Accounts of the challenges in displaying Urdu script in its traditional, elegant nastaʿlīq guise continue on into the 21st-century era of touchscreens. In "The Death of the Urdu Script" (Eteraz 2013), the author recounts his frustrations with the limited selection of fonts that are

available and appeals to mega-corporations Apple and Microsoft, given their outsized influence in the world of technology, to support Urdu text display in its classical nastaʿlīq form on the smartphones they manufacture.

In the same year that Eteraz published his online lamentation, "Challenges in Baseline Detection of Arabic Script Based Languages," a paper highlighting the component difficulties confounding the opposite process—generating a digital text file from already-rendered printed matter through optical character recognition—was presented at conference in London. In this case, the specific topic is adapting OCR technology to effectively tease apart and recognize the nuances of the nastaʿlīq script that give definition to its letter shapes. After presenting a detailed analysis of the underlying rules and the specific feature of the script—its running multiple baselines—that made printing any version of the Arabic alphabet by letterpress so difficult, the final section of the paper, entitled "Future Direction and Conclusion," offers bleak prospects for progress and a targeted insight into the single aspect that makes the script so hard to reproduce through any means other than a pen: "There is no perfect and robust method available for Urdu baseline detection due to multiple baselines…" (Saeeda Naz et al. 2013).

5. CHANGES IN TECHNOLOGY, CHANGES IN KNOWLEDGE CHANNELS

It is important to note that, although a language can be written in the Arabic alphabet, this does not equate with a speaker of that language being Muslim or adhering to any of Islam's traditions or philosophies. King's argument that *shuddh* (pure) Hindi had to be deliberately created as distinct from Urdu both through word choice (Sanskrit vs. Perso-Arabic) and writing system (Devanagari script vs. Arabic alphabet (King 1994, 59)) might upon first reading suggest that scripts have the character of an empty vessel: any writing system may be used to represent any spoken language. However, even within King's account of this seeming neutral quality of Hindustani —that it could be written in either script "with the addition of a few diacriticals or other special symbols" (King 1994, 57), he goes on to note how "the use of Hindi and the Nagari script became increasingly identified with being Hindu" (King 1994, 62).

By taking on such manifestations of identity, writing systems often adopt a role beyond that of neutral vehicle used to key phonetic sounds or words to a script. In discussing how the printed Arabic script spread, the historical associations and evolution of the script must also be presented. The Arabic alphabet's tight developmental connection with Islam has bearing on how and where that alphabet is used, demonstrated for example by how a common Hindustani vernacular forked into two perceived separate languages, Hindi and Urdu.

Though there are many examples of Muslim-majority societies (such as Bangladesh, Uzbekistan, and Turkey) that today use some script other than the Arabic alphabet to represent their language, the inverse—an area lacking a Muslim component in its identity that chooses to use the Arabic alphabet—is far more unusual. As King points out, historical associations have long tied particular religions with particular scripts. This chapter explores two related topics: the perceptions and treatment of text by those who developed, defined, and most interacted with the

Arabic script; and the more generalized experience of how knowledge transmission and literacy arrived into both Muslim and non-Muslim societies in different parts of the world.

It was not only the aforementioned technical constraints of representing script through moveable type, the aesthetic shortcomings of the printed page, and the jarring unfamiliarity of foreign conventions of layout (e.g., the existence of title pages) that hindered the blossoming of a print culture in South Asia (Marzolph 2001, 14-15). There was a more fundamental, deep-seated disconnect inherent in the transmission of knowledge and authority through channels other than a person-to-person oral tradition. A printed page of text was rendered a tangential supplement that lacked full credence when taken as an object in isolation of its author. As Green argues in his account of uses of books in the late Mughal era, "Among many of the Muslim religious circles… knowledge was primarily in persons rather than in books" (Green 2010, 243).

In societies undergoing the process of acquiring widespread literacy, the shift in consciousness necessary to accept the veracity of information arriving through new media has been documented across the globe. An earlier chapter in this thesis referred to the notion that early modern Europe also struggled with the unfamiliar, perceiving the overly perfect form of a printed Bible as the possible mark of some sinister, dark origin. Resistance to change in traditional media—especially that touching on religious matters—was not a phenomenon unique to Islam.

Walter Ong examines the root causes of hewing to an oral tradition as a means of knowledge transfer in his seminal book, *Orality and Literacy*. In it, he posits a rupture between apprehension of the world through the most immediate channels of one's own senses and the additional layer imposed when processing and interpreting speech, sounds, and meanings that have been rendered into text (i.e., the written word):

> In a primary oral culture, where the word has its existence only in sound, with no reference whatsoever to any visually perceptible text, and no awareness of even the possibility of such a text, the phenomenology of sound enters deeply into human beings' feel for existence, as processed by the spoken word. For the way in which the word is experienced is always momentous in psychic life. (Ong 1982, 73)

This process of gradual acceptance of knowledge conveyed through text certainly was not unique to those adopting any particular script. However, there was a longstanding system in place which intensified the favoring of speech over text—whether printed or written—in Muslim societies. The accordance of authority to verbal lineage derived from the earliest days of Islam—long before the religion arrived in South Asia. Green's article analyzing the use of books in a dervish lounge over the period of Mughal rule concludes that "premodern modes of Indo-Muslim religious knowledge were predominantly anthropocentric, placing knowledge and the authority from which it was inseparable in persons and their incorporative textual and supra-textual learning techniques" (Green 2010, 264).

Strictly speaking, no region into which Islam had made inroads by the time of the printing press could have strictly met Ong's definition of being utterly unaware of the concept of textual representation of language; as the religion crossed continents, it brought with it the written Qur'an. Even areas that did not previously maintain traditions of representing their local languages in script, such as many of the islands of the Pacific where Islam blossomed, would have had some understanding of the existence of such a system by dint of being aware of the existence of the Qur'an itself. However, Ong's point about the tremendous conceptual shift

required to assign value, credence, and relevance to information when first conveyed through a new medium is key. Also supporting this view of orality in relation to literacy, Harris notes further purposes beyond practical recording and conveying of information that were accorded to writing in archaic Greece and Italy: "very early texts also served to identify the owners of objects on which they were inscribed, to perpetuate the memory of the dead…." (Harris 1989, 323).

In the lands where Islam began and forms of the Arabic script were standardized, philosophical thought on the nature of meaning gave a clear distinction to concepts relative to the medium through which they were received. These separate categories of knowledge are reflected upon in the thorough review and examination of the rules defining correct formation of letters in the Arabic script, the origins of the alphabet, and the philosophy contemporary to the time of its development, as explored in *The Cosmic Script* by Ahmed Moustafa and Stefan Sperl. The authors parallel the equivalence of penmanship and eloquence with the premise distinguishing language and meaning that was widely held in classical Arabic literary theory: "Meaning or *ma'na* was conceived to exist in the mind quite separately from its manifestation in the form of *lafz*" (Moustafa and Sperl 2014, 144).

That *The Cosmic Script* delves into underlying thought on the nature of letters and words relative to reality and perceptions thereof is no accident. However, the striking aspect of the two-volume treatise's main exploration is not, as its title might indicate, a wholly existential probing. Rather, the main intent of the work is to perform an in-depth, geometrical examination and exploration of the initial rules of calligraphy first laid down by Ibn Muqla, himself the creator of several styles of the Arabic script.

Since its origins, Islam has cherished the spoken, and granted authority to information, knowledge, interpretation, and understanding that has been passed along through documented oral lineages known as *isnad* (Robinson 1996, 68). Green posits that the *huffāz*, central players in

this tradition who memorized important works, effected greater social influence than did widespread book use in the Mughal era (Green 2010, 244). This role of remembrance through recitation and spoken performance has been the case from the nascent moments when Muhammad first spoke the words that became enshrined as the Qur'an continuously to the present day, when the call to prayer is now collectively performed by *mu'azzins* across the globe every day.

The difference in acquisition of knowledge when received orally versus when conveyed from writing on a sheet of paper was expounded upon by 14th-century Arab historian Ibn Khaldun, long before the era of mass production of text brought about by print:

> Language is merely the interpretation of ideas that are in the mind... Words and expressions are media and veils between the ideas... The student of ideas must extract them from the words that express them. But, when a student has to rely on the study of books and written material and must understand scientific problems from the forms of written letters in books, he is confronted with another veil... that separates handwriting and the form of letters found in writing from the spoken words found in the imagination. (Khaldun, Rosenthal, and Dawood 1967, 431)

This preference for oral transmission of teachings and slow adoption of the printed word did not stem from any lack of familiarity with text or the veneration thereof. Blair notes that in the seventh century there already existed a "desire to write down the text of the Koran, which… seems to have stimulated the development of fine calligraphy" (Blair 2006, 77). Other scholars detach the text of the Qur'an from the common lens of reading it through the life of Muhammad,

shunning reverent treatment done out of religious virtue to arrive at the base point from which historical scholarship may begin (Droge 2013, xii-xiii). Though, whether treated as literal text or as divine words of God, Arabic calligraphy had developed as an art form separate from oral record within a century of the lifetime of Muhammad. Coins minted under the Umayyads in the final decade of the 7th century (Blair 2006, 87) and mosaic inscriptions in the Dome of the Rock from the same decade (Blair 2006, 90-91) demonstrate calligraphic technique that foreshadowed letter shapes of the formalized styles used to copy out Qur'ans, such as Kufic, that were developed over the subsequent centuries.

Though the written recording and reproduction of the Qur'an may have spurred both the standardization of the Arabic script and the rapid development of calligraphic styles, spoken dissemination of knowledge continued to remain central to learning. Over the centuries following the beginning of Islam, the perception was perpetuated that the most authoritative information came not from text but, in keeping with the analogous tradition of delivery through which the Qur'an was itself revealed, through recitation. Words were passed down directly from the author, or from somebody with whom there had been some traceable degree of face-to-face contact with the author. Much as today's readers might make efforts to attend a book signing, reading, or academic conference, it was similarly common for those seeking out education to travel great distances to centers of learning and cities to engage as a member of an audience, with the scholar present and speaking on a given topic. The *isnad* system of having documentable past engagement was seen as a way to impart the author's true meaning and enable reading between the lines on the page (Robinson 1996, 68). Printed matter alone lacked the authority accorded to knowledge with verifiable lineage, including oral channels, much in the way the systems of academic citations and bibliographies function, today.

The isnad tradtion, with its greater authority given to oral lineage, was not unique to South Asia or Islam. Stark points out that "Hindu religious leaders, while steeped in the world of oral transmission, recognized the power of the printed word and began to exploit it to propagate their views" (Stark 2007, 22). However, Blair also touches upon the degree to which this long oral tradition with its calligraphic complement remained current, even after the invention of the moveable-type press. Her account of the first Qur'an printed by Muslims themselves brings up the fact that its publication was commissioned not by a local religious figure but by a faraway European ruler who intended the endeavor to encourage unity and reach subjects on the fringes of an empire:

> It took two and a half centuries (post-Paganini) before Muslims themselves were willing to produce a printed edition of the Koran, although this too was something of an outsider's work: the first edition printed by Muslims for Muslims was made at St Petersburg in 1787. Intended for the new population of Muslims in Russia, it was made at the behest of Catherine the Great, who had occupied and annexed the Crimean Khanate four years earlier.... (Blair 2006, 29)

While other parts of the world may have more quickly adopted the printed book after it appeared as a new medium circa 1450, the isnad chain of knowledge transmission continued to flourish in Muslim intellectual circles for centuries beyond the creation of the Gutenberg press. Robinson argues that a favoring of orality over print into the 19th century was in keeping with conventions of Qur'anic transmission tracing back to Mohammad (Robinson 1996, 67). Mere text alone was not considered sufficient to convince or compel. To establish a seal of authority upon

information in the years after a scholar's death, a teacher who could trace his understanding of the work in question back to the original author's approved version would confer an *ijaza*: a system of recognizing which pieces of knowledge had been correctly received (Robinson 1996, 66). This established vetting process might be likened to a precursor to peer review. An ijaza served to accord not just an official pronouncement of a certain ability, such as to repeat scripture verbatim, but also bore a pedigreed record of all preceding scholars through whom those same words had passed on their way to the current learner (Green 2010, 244).

Rupture with set systems of knowledge transfer and conventions through which to comprehend the world was therefore one impediment among several in the early adoption of print. The extant manuscript tradition did offer a textual medium through which credible information could be shared in parallel to the structures of vetted orality. But, for its efficiency of mass production, typography was not perceived to be equivalent to the manuscript or any other accepted tradition. Citing the rejection of printed books on account of their unfamiliar form, Proudfoot notes how Muslims objected to Arabic typography as it did not resemble the handwritten manuscript (Proudfoot 1997, 174).

Moreover, the technical barriers and costs were high, considering that the same information could be shared through a *hafiz* or a copyist. All print materials had to be imported: the presses, the types, the paper, and even the ink (Shaw 1981, 29). The laborious process of casting fonts from molten lead and tin into the letters of scripts of Indian languages was initially done only in European nations. It was decades before local type foundries opened (Orsini 2009, 10). Furthermore, in the South Asian world of print prior to lithography, what little content was published was largely dictated by the colonial interests who established the presses and was unlikely to be compelling to the local population. In pre-Raj India, calendars, almanacs, grammars, company records, and court regulations made up the majority of known publications

printed in Calcutta prior to the start of the 19th century, as chronicled by the thorough list compiled in Graham Shaw's *Printing in Calcutta to 1800* (Shaw 1981, 41).

What overcame all of these hindrances was lithography's capacity to advance print technology at several levels. Its freer ability to reproduce any script obviated the need to own a specific type. This flexibility extended to illustrations as well, creating a greater connection with familiar forms of presentation, what Shaw terms the "mass-produced manuscript" (Shaw 2007, 127).

The genesis of lithography's advantage in presenting text and illustrations in the familiar manuscript form can even be keyed to a specific year and place: the Asiatic Lithographic Company's Press founding in Calcutta in 1823. This print house was "the first to exploit in book form the versatility of lithography in reproducing the naskh and nastaʿlīq scripts" (Stark 2007, 46). This is where the innovation taking advantage of the technical and visual flexibility inherent in lithography originated.

Coupled with this presenting of a familiar form, lithography accelerated the installation of print with the economic advantages it offered over moveable type: operating a press became within the reach of those without deep financial means or the backing of large institutions (Stark 2007, 46). The transformation of print into a more commercially-based endeavor fueled its spread across the subcontinent. The selection of which works would be copied out, recited, or otherwise shared was no longer solely in the hands of any religious or governing elite who had previously disseminated content through traditions of their choosing, either textual (i.e., manuscript and print) or oral (i.e., isnad and ijaza).

From the 1830s, this shift in not just the nature of what was being printed but precisely who wielded the power of the press truly led to the establishment of print houses across India (ibid). Prior to the introduction of lithography to the subcontinent, the dominant presses were

largely foreign enterprises, whose publications were often backed with a religious or governmental agenda. Among these older publishing houses established in the days of typography were Fort William College (est. 1800), Serampore Mission Press (est. 1802) and the Baptist Mission Press (est. 1818) (Stark 2007, 35-37). Stark notes the importance of having a sponsor in the publishing industry at the time: "If Indians of humbler means and origin entered the realm of print at the time, it was usually owing to government patronage" (Stark 2007, 43). However, with the advent of the far cheaper lithographic technique, Indian-owned concerns spread from Calcutta to the cities of the northwest, Agra, Allahabad, Benares, Delhi, Kanpur, Lahore, Lucknow, Meerut, and Patna among them (Stark 2007, 47-48).

When lithography came to Lucknow it was by invitation of King Nasiruddin Haidar in 1830; by the end of that same decade, the trade was established in multiple enterprises across the city, and in the hands of private citizens (Stark 2007, 54). Burgeoning interest in the external world began to be sated through the establishment of newspaper shops. In Agra, all Indian-owned presses started as newspaper houses (Stark 2007, 51). Over the middle decades of the 19th century, content expanded beyond news and the previously standard printed fare of grammars, court records, prose classics, and Christian tracts to include low-priced cheaply lithographed entertainment such as popular short stories, poems, and songbooks (Orsini 2009, 33).

It was in largest part the affordability of lithography relative to the high costs of starting up a moveable-type print shop that allowed these independent Indian-owned concerns to blossom. The resulting growth in publications benefited not just works in the Arabic script: as Stark points out, it was at this point that "printing in Hindi and Urdu really took off" (Stark 2007, 48).

From this we can see how the spread of printing in South Asia was initially held back: by its rupturing dissimilarity to previous accepted methods of knowledge transfer (including oral and

manuscript traditions), and by its lack of economic viability in the face of material sourcing from Europe. Lithography brought a neat solution to both: less expensive startup costs and, in Shaw's words, the mass-produced manuscript, which was able to win acceptance where typography had not.

6. TWO OTHER PATHS TO PRINT: IRAN AND INDONESIA

"The natural Arabic hand is a typographer's nightmare." (Proudfoot 1998, 121)

The adaptation of lithography from a medium to reproduce non-textual forms such as illustrations and images into a means through which the traditions and conventions of the manuscript might be maintained in the face of the restricted capacity of type to reproduce a format familiar to readers was first achieved in India (Proudfoot 1997, 181). But a similar repurposing of the technology spread to other parts of the world where the Arabic script was likewise used to express the written form of a local language. In such areas, the path of print witnessed a similar acceptance and surge in production output when a local printer capitalized on the advantages that lithography offered.

To appreciate the universal lack of appeal of early Arabic typefaces and their accompanying European conventions of book formatting, to which readers accustomed to a manuscript tradition so objected (Proudfoot 1997, 174), we can look to two separate experiences beyond the Ottoman and Mughal realms: Persia and the Dutch East Indies, where their different histories of the installation of the press also underwent a similarly ragged adoption until the arrival of lithography. These were lands under different rules of law. In the case of the latter area, established trade routes brought early print technology by sea across the Indian Ocean (Ricci 2011, 8), rather than the land routes that had enabled "little lithographic presses… [to] grow up like mushrooms" across the subcontinent over the final decades of the Mughal era and dawn of the Raj (Warren 1856, 45). Yet, despite greatly differing circumstances from the Ottoman and Mughal areas that have already been discussed, these areas experienced an identical sequence of initial ambivalence to works typeset in the Arabic script, a subsequent surge in publishing upon

the arrival of lithographic technique, and then a leveling off of or even a return to the older typographic method in the latter part of the 19th century. Proudfoot outlines the history of printing in Iran, noting only Tabriz (1819) and Tehran (1824) as early adopters of type—and that with government patronage. He goes on to note the rapid spread of lithography as it arrived and its near-ubiquity across the country by 1860, likening the experience to that seen in India (Proudfoot 1997, 165).

The first book in the Arabic language to be lithographed in Iran was a hand-calligraphed Qur'an—unsurprising given how the Qur'an in its entirety or excerpts therefrom often served as the initial publication in presses owned and operated by Muslims across the world. This particular edition was run off in 1828 (Proudfoot 1997, 180), just four short years after the arrival of lithography to India, where the medium went on to first be repurposed to reproduce entire works of text. However, it was not until 1843 that the technology was used to combine Persian-language text with accompanying illustrations: this for a copy of Maktabi's *Leili va Majnun* (Marzolph 2001, 19).

Though scripture continued to be a steady seller, the publication of other works also held an appeal. However, as Marzolph alludes, there was an inherent demand for other works across Persia based on the better capacity of lithography to replicate the beauty of the nastaʿlīq style:

> When set against the highly esteemed and aesthetically prestigious nastaʿlīq the naskh characters produced from movable type were bound to be regarded with disfavor by an Iranian audience and to be seen as unappealingly crude and unrefined. (Marzolph 2001, 14-15)

Clearly Marzolph is referring to a canon of literature other than religious texts: there are but rare examples of a Qur'an being written out entirely in nastaʿlīq script. Indeed, the above quotation comes from Marzolph's treatise delving into Persian narrative illustration: a technique that tended to accompany anything but holy word. Despite the fact that the standard style of text used across present-day Iran for street signage, books, and journals has reverted to the less ornate naskh script, to this day, works of classical Persian literature and poetry printed in Iran are more treasured when printed in the nastaʿlīq style. This equivalence of content and typeface can be likened to how in many Western countries a glance at a newspaper masthead in the blackletter (a.k.a. Gothic) font could offer a potential reader an immediate association of journalistic authority and a presumption of news content following beneath, all without parsing any bit of the text.

Marzolph states that in Iran, as had happened across other areas of the world when type in the Arabic script was first introduced, similar difficulties in adoption were inevitable when typography arrived. Such efforts were "bound to be regarded with disfavor by an Iranian audience and to be seen as unappealingly crude and unrefined" (Marzolph 2001, 15). In the case of Persia, an extant typographic industry was already in place at the time lithography began to be utilized by Muslim-run presses in India. As in the case of the Indian experience, the stone-printing technique was found clearly superior in replicating familiar styles of the manuscript—both in calligraphy and in formatting—so works published with the new medium won rapid acceptance. The quick shift to lithography in Persia was for reasons identical to those behind its rapid adoption in India and (as we shall see later in this chapter) in Southeast Asia. Costs were one-tenth what they would be for generating a manuscript edition (Proudfoot 1998, 130-131). The requisite time and materials necessary to establish a lithographic print house were a lower impediment than those for a publisher who worked with moveable type; there was less of an aura

of Western conventions rooted in Europe; and, above all, there was far greater aesthetic appeal to the finished product.

Interestingly, this clamor for lithography was but a temporary embrace. As Edward Browne observed in his 1906 account of the Persian press:

> Notwithstanding the chronological priority of the introduction of typography into Persia, it entirely went out of fashion in a short while, and that for a long time (more than fifty years) the presses of Persia confined themselves exclusively to lithography…. (Browne and Khān 1914, 9, quoted in Proudfoot 1997, 165)

More notable than the chronological precedence of type, as observed by Browne, is his suggestion of the medium's resurgence after a half-century of lithography in Persia. This coincidence of a return to type after 50 years falls neatly into the time just after the 1860s when Ottoman typographer Mühendisoğlu perfected his naskh font, what Milo terms the "zenith of Arabic typography" (Milo 2002, 122-123). Over the intervening period of lithography in Iran, typefaces had achieved such a superior level of craftsmanship that by these latter decades of the 19th century a return to type was not necessarily the unthinkable act it had been in the former part of the same century.

Iran's halting path to print and rapid embrace of lithography was similarly mirrored on the opposite end of the Muslim world. In Maritime Southeast Asia, yet another publishing industry owned by Muslims or targeting a Muslim readership followed an identical sequence of initial, sputtering start followed by a surge in output that is directly attributable to the change of printing

medium. Areas of the Dutch East Indies that also used the Arabic script for Malay witnessed the same phenomenon seen in Iran and India.

A late adoption and further stifling of print in the lands now forming Indonesia was not all on account of the inability of the typographic press to print text in a manner in accordance with aesthetic preferences. There had been a foundation of disseminating matter by the written word even prior to the archipelago's "pre-Islamic period" (before the first half of the 14th century), through the recounting of Hindu epics and other *hikayat* (stories) in text (Ricci 2011, 50). Ricci notes the further great addition to the literary and religious canon that entered alongside Islam from the established base that the Arab and Persian lands enjoyed. Works including stories of Muhammad and other figures central in Islam, the *Shāhnāmé* and *Alf Layla wa Layla* or *The Arabian Nights* were translated into Malay, Javanese, and other local languages (Ricci 2011, ibid). Clearly, it was not a dearth of content that most hindered the spread of print in the Dutch East Indies through much of the 19th century. Rather, it was the strict regulation of presses under the colonial regime. As Proudfoot notes, "[u]ntil 1806 there had been only two printing presses in Southeast Asia, both under the control of the Dutch East India Company… in the 1830s… very little had been printed in Malay" (Proudfoot 1998, 113). What few presses there were in Dutch colonial Southeast Asia over the former part of the 19th century (let alone those offering publications of particular interest to the Muslim population) fell into one of two categories. They were either under official governmental sanction, or they were unauthorized and therefore kept underground. It was not until the appearance of constitutional reforms in 1848 that the Dutch guaranteed freedom of the press both at home and for territories abroad. This freedom of the press was fleeting and effectively ended with the passing of the restrictive 1856 Dutch Indies Press Law. Defined among the many requirements imposed on printers in the articles of the act were: an obligation to give one month's notice to local authorities if a person intended to practice

the profession, a security deposit left in trust with the government, and a requirement to send a copy of every work printed to several governmental departments within 24 hours of publication (Ahmat 1995, 14).

In reaction to this constant burden of regulation, print houses owned by or catering to the Muslim populations of the East Indies quite literally moved offshore to nearby Singapore. In contrast to the way the Dutch administered their colonies, as an area under British rule, the city enjoyed more open freedoms of the press. Singapore's dominant status as regional center of Muslim publishing continued into the 20th century (Proudfoot 1995, 219).

Competition in choice of script was evident in the pre-lithographic Malay print industry. Ricci notes that missionaries tended to render Malay not in the predominant Jawi but in Latin letters, and how ethnic Chinese residents chose to follow suit in the publishing of their Malay-language newspapers (Ricci 2011, 172). (The Jawi script was the version of the Arabic alphabet adapted to address the "peculiarities" of Malay (ibid) via the addition of several letter forms not standard in the Arabic script, such as the phoneme [ŋ], expressed as a letter *'ain* with three dots above غٜ.)

In highlighting the low number of printing presses across Southeast Asia relative to the amount in other parts of the world, Proudfoot remarks that "In 1828 there were still no more than a dozen small typographic presses in the region" (Proudfoot 1998, 113). However, the same impediments to printing the local version of the Arabic script were again overcome through use of lithography in the Dutch East Indies. The stories of two print houses—one run by a local, the other run by Europeans—illustrates the adaptation of print technique in the region and the connection it shared with the Indian experience.

The earliest instances of non-European printing in the Dutch East Indies were Muhammad

Azhari's 1848 and 1854 lithographic runs of the Qu'ran at Palembang, with accompanying annotation in Jawi. It was the latter edition of Azhari's lithographed Qu'ran printings that was, upon its publication, lauded (mistakenly) by Dutch scholars and officers as being the first instance of an indigenous press operator publishing in the territory. Though in fact Azhari's first-edition run-off six years prior had been the first such event (Proudfoot 1998, 127), both publications remain significant for their commercial success and for forging an identical path for lithography to break free of the restrictions of type.

Azhari's background is compelling: he had the vision to recognize the potential of lithography to market texts to a local Muslim population. Azhari himself was worldly and well-traveled beyond the port of Palembang where he ultimately established his print house. Like his father and grandfather, he was a *haji* who made not only the pilgrimage but had further spent several years in various regions of present-day Saudi Arabia. Proudfoot ventures that "His *laqab*, or cognomen, suggests that he spent some of those years in study at al-Azhar, the great centre of Muslim learning in Cairo" (Proudfoot 1995, 217). Based on what is known of Azhari's life, travels, and routes, Proudfoot reasons that at some point along his journeys Azhari was likely exposed to the new applications that Indian printers were using in lithographic reproduction of text. Along his route back to Southeast Asia from either Egypt or the Arabian Peninsula, he would have necessarily been routed to Singapore by sea through ports of call including, almost surely, Bombay. Finally, upon his return to Singapore, he bought the very press he used for his first two printings of the Qu'ran, containing introductions in Jawi (ibid).

Azhari's broad exposure to cities such as Bombay and Cairo, which hosted thriving literary scenes, alternative models of printing, and innovation throughout the Muslim world of the 19th century, might alone have been sufficient to inspire a lithographic printing of the original

Arabic text of the Qu'ran with local language Arabic-script accompaniment. Additionally, he experienced a further strong connection to the method of text reproduction without type. Though Proudfoot is unable to ascertain from precisely where Azhari first got the idea to use lithography to print the Palembang Qu'ran, he implies that it was unlikely to be an original one. What Azhari did for printing in the Dutch Indies was to replicate the "mass-produced manuscript" as presses had begun publishing in India:

> Missionary experiments with lithography for Arabic script had recently produced promising results. However, his (Muhammad Azhari's) inspiration was more likely the flourishing Muslim presses in India which had raised lithography to a fine art…. (ibid)

The lithographic press that Azhari bought in Singapore to set up his publishing house in Palembang was, in fact, sold by the Mission Press. This was the print house where a missionary, Benjamin Keasberry, had published works that used lithography to publish in languages in the Arabic script.

Through Keasberry there is an even stronger connection established to the innovation of using lithography to reproduce works in non-European scripts, among them Jawi and Chinese. The work of the Mission Press was already going on in full force. This makes it curious that Proudfoot alludes to Azhari's inspiration as likely having been taken from the Muslim-owned presses of India. Keasberry's publishing innovations, outlined later in this chapter, are likely in part influential as well. Though a Protestant missionary of European extraction, Keasberry was truly the one who broke regional publishing beyond the constraints of type when printing non-

Latin scripts, using lithography first as an embellishment to text in the Arabic script and then as a substitute for type, itself (Proudfoot 1998, 126).

In his article "Lithography at the Crossroads of the East," the author examines the man more closely, profiling Keasberry and his mentor, Henry Medhurst, and detailing their divergent approaches after working together at a print house in Batavia (modern-day Jakarta). Medhurst had published Jawi text through lithography as early as 1834, but, as argued by Proudfoot, "spoiled the effect" in attempting to remain faithful to the Arabic fonts contemporarily available (Proudfoot 1998, 122). It was Keasberry who had the "bolder understanding of what lithography could achieve" (Proudfoot 1998, 123). Proudfoot builds a strong case regarding how their forays into printing text through lithography were shaped by their varying degrees of attachment to the European tradition, Western perceptions of text, and practical print shop experience—all of which came together to define their respective practices in publishing. These notions would accordingly restrict or broaden either man's use of the press into a traditional, flexible model that allowed for the freedom to innovate (in the case of Keasberry) or constrained its capability into the very forms of rigid letter shape and linear layout that initially made typography less compelling to Muslim readers (as with Medhurst.)

Keasberry was Medhurst's protegee: also a missionary printer who was no stranger to non-Latin scripts or printing techniques beyond moveable type, himself. Medhurst used several printing processes to reproduce both Chinese and Malay. Before transferring to Batavia he had printed both languages through typography, and the former language through the xylographic (woodblock printing) process that was common for rendering Chinese characters at the time. However, he actively resisted publishing any language through lithographic technique unless he deemed the process impossible through xylography or typography—this despite having the requisite materials to print in any of these three media. This was demonstrated in Medhurst's

1842 Chinese/English dictionary, in which he combined the two through typographically-set English upon which a second lithographic run of hand-calligraphed Chinese characters were overlaid.

Though Proudfoot credits Medhurst as being one of few European pressmen of his time with the insight to recognize the poor reception of typographic forms of Arabic letters by anybody who could read them (Proudfoot 1998, 121), he also portrays his experience as so steeped in the traditional manners of working with other reproductive media that he was in a way compelled to replicate their deficiencies (for example, by imitating the inferior letter shapes of Arabic types). This was the case even when using the superior and more flexible method of lithography to print Jawi script (Gallop 1990, 94, cited in Proudfoot 1998, 122). When a combination of Chinese characters appeared alongside text in Roman letters, as it did throughout his Chinese/English dictionary, Medhurst still remained wedded to the typographic method. The latter language would be typeset leaving open spaces, where the Chinese would be filled in by a calligrapher. The resulting pages would be lithographed in their entirety, reducing the crispness of the text in English.

As with his Chinese/English dictionary, on occasion Medhurst did these combination typographic/lithographic runs, duplicating typeset Latin text alongside a blocky form of Jawi that attempted to emulate Arabic type, as seen in his publishing of an untitled Malay reader in 1834 (Proudfoot 1998, 122). In all fairness to Medhurst, his devotion to typography, even when he had the tools to publish through lithography, was not unusual for a westerner printing in the Arabic script at the time. The American Reverend Joseph Warren—whose time in Allahabad would have been contemporary with that of Medhurst's tenure in Southeast Asia—expresses a similar reluctance when chronicling the state of the printing house in his retrospective *A Glance Backward at Fifteen Years of Missionary Life:* "Lithography has been resorted to… (which) is

more expensive [!] than letter-press, and can never be an efficient substitute for it..." (Warren 1856, 48).

Warren's depiction of lithography as a technique to be "resorted to" and "more expensive" than typography (contradicting the prevailing understanding that lithography was a cheaper overall printing method) (Marzolph 2001, 14) echoes a similar potential bias in favor of type and block printing on the part of Medhurst when stating costs.

Analysis of records of Medhurst's requests for funds for requisitions show that he strongly favored processes other than lithography, greatly overestimating its material costs while wholly underestimating its ability to produce a desirable finished product (Proudfoot 1998, 117). Proudfoot gives a reasonable motivation as to why Medhurst's figures would be so patently skewed. He speculates that in promoting a less efficient method, there would be more immediate money coming in to the mission to support Chinese typography (Proudfoot 1998, 117-118).

Whether motivated out of true artistic preference or financial backing (as suggested by Proudfoot), even after the spread of lithography, press operators of Western origin hewed to tradition and continued printing by setting words in type. This practice continued even amongst those who recognized the complexity of the Arabic script—especially in its more ornate forms such as nastaʿlīq. Both Warren and Medhurst acknowledge challenges such as the massive quantity of type necessary to comprise a font or complain of kerning issues (problems that would continue to vex attempts at the attractive display of the Arabic script on computer screens into the 21st century), even going so far as to declare that "the Persian and Arabic characters are both unfit for printing" (ibid). Neither of the pressmen were willing to entirely forsake the typographic medium with which they felt the most familiar and comfortable.

Conversely, Keasberry, who had begun his printing career as Medhurst's apprentice, enjoyed a background and upbringing that made him more amenable to capitalizing on the

capabilities of the tools with which he worked. Not only was Keasberry thoroughly steeped in Asia (he was born in Hyderabad)—he was an artist in his own right. It is likely that lithographic text runs from India had reached Singapore (Proudfoot 1995, 218). From wherever Keasberry drew his inspiration, Proudfoot cites his 1838 embossment via lithographic overrun of the local Malay ruler's official seal atop a public pronouncement typeset in Jawi as being the first breakthrough of lithography to reproduce text (as opposed to illustrations) in Southeast Asia (Proudfoot 1998, 123-124). From this first experiment in adding a flourish that would capture the eyes of those able to recognize the official signatures in Arabic script within, Keasberry went on to print exclusively in lithography, even in one instance adding an additional red print run, to add color replicating the formatting of a manuscript and further convey its authority.

When these accounts of print history in Persia and the Dutch East Indies are taken into consideration alongside the aforementioned arrival of the press in Mughal and Ottoman areas, their shared elements are obvious. Independent of whether these governments were hostile to the publication of works in the Arabic (or any other) script, once the lithographic method was leveraged to make printed matter appear more familiar, the results were able to allay qualms and overcome commonly held grounds for rejecting typeset text in the Arabic script across all of these areas. Contemporary accounts of such objections were typified in R.A. Binning's 1857 travelogue observing that "printing in types is not relished by the Persians, the characters being necessarily stiff and uncouth, and very displeasing to an eye accustomed to the flowing hand, which can be imitated very well in lithograph" (Binning 1857, 312). Lack of aesthetic appeal was tempered when text was presented in familiar form, as with the "aesthetically prestitgious nastaʿlīq… dominant in Iran" (Marzolph 2001, 14-15). Lithographed texts exuded a familiar sense of ownership over both the creation process and the content therein. This was demonstrated by colophons presenting publishing and authorship information to printed works such as the

Qu'ran that attested to the high standing and impeccably Muslim credentials of all involved in the process, from the calligrapher to the pressman, himself (Proudfoot 1998, 130-131). It was the adaptation of the new medium of lithography to reproduce text that allowed the spread of print in the Arabic script to truly take root.

CONCLUSIONS

To summarize, the rate of adoption of mass print technology applied to reproduce various forms of the Arabic script was consistently defined by not one but a combination of factors. The far-flung communities that might be generalized into a "Muslim World" are each revealed as exhibiting less a common experience grounded in shared religion than the use of a common base alphabet through which to express the written form of their languages.

All areas treated in this thesis experienced a fitful installation of mechanical text reproduction in the era of typography. This uneven adoption cannot be attributed to one sole cause but rather to a multitude of underlying reasons. Among the contributing factors were the degree to which a language already enjoyed an existing foundation for disseminating a variety of textual matter (a factor that hindered the institution of a print culture in Malay but not in the Arabic and Persian manuscript traditions); legal restrictions on publishing, such as those mandated by press acts of Dutch and British colonial authorities, as well as the centuries-long erosion of the Ottomans' initial printing ban; and the mechanical limitations of the moveable-type press in reproducing any suitably pleasing facsimile of the Arabic script.

The commonalilty across these diverse areas is that when lithography appeared, it consistently served to accelerate the spread of print. However, its adoption was neither immediate nor uniform. Entrenched practices and boxed-in perspectives, which often stemmed from European print-house traditions in publishing the written word, served to keep the focus on type despite its inability to work easily with the Arabic alphabet. Even when the right tool (i.e., the lithographic stone) was at the press operator's disposal, the gestalt necessary to recognize it as such was not easily observed by those steeped in the system of the traditional print house, as related in the divergent implementations of lithography by two operators of the Mission Press—

one born and raised in Europe, the other in Asia. The greater application of lithography in reproducing text had to be first used by pressmen who held some outsider perspective: those who had grown up outside of Europe, and whose vision was not bound by the norms of the traditional European rules governing how text ought to be printed. It took an innovation sparked within the subcontinent over the twilight of the Mughal era to envision the repurposing of lithography as a primary medium to print text, and then the subsequent publishing revolution of sorts to realize this additional potential in practice.

The new medium supplanting typography offered certain benefits that made it less contentious to both those crafting and those receiving the final, published product. Furthering its acceptance, printed results could offer familiar form in the essence of a richly calligraphed, lithographed book, versus the blocky, stark appearance of one set in type. However, even when the unfamiliarity of Western publishing conventions and the alien look of type and formatting were nullified by lithography's found ability to faithfully reproduce the appearance of a manuscript, there were yet other barriers to be overcome. In certain communities, a shift in adopting the new medium into its accepted, legitimate knowledge-transmission channels came more slowly, especially those communities that had long traditions of oral lineage bestowing authority on information.

The story of the installation and spread of the earliest printing presses, first typographic and then lithographic, across areas using the Arabic alphabet is a rich tale of progress, development, and adaptation, with societal, technical, and aesthetic dynamics woven throughout.

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