

Orthographic Transparency and the Ottoman Abjad

Maithili Jais

University of Florida

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I. Introduction

In 2014, the debate over whether Ottoman Turkish was to be taught in schools or not was once again brought to the forefront of Turkish society and the Turkish conscience, as Erdogan began to push for Ottoman Turkish to be taught in all high schools across the country (Yeginsu, 2014). This became an obsession of a news topic for media in the West as well as in Turkey. Turkey's tumultuous history with politics inevitably led this proposal of teaching Ottoman Turkish in all high schools to become a hotbed of controversy and debate. For all those who are perfectly contented to let bygones be bygones, there are many who assert that the Ottoman Turkish alphabet is still relevant and important. In fact, though this may be a personal anecdote, there are still certainly people who believe that the Ottoman script is, or was, superior to the Latin alphabet with which modern Turkish is written.

This thesis does not aim to undertake a task so grand as sussing out which of the two was more appropriate for Turkish. No, such a task would be a behemoth for this paper. Instead, it aims to answer the question, "How?" Rather, "How was the Arabic script moulded to fit Turkish and to what consequence?" Often the claim that one script is superior to another suggests inherent judgement of value, but of the few claims seen circulating Facebook on the efficacy of the Ottoman script, it seems some believe that it represented Turkish more accurately and efficiently. However, this paper will not even attempt to address the issues relating the comparative efficacy of one script to another. Instead, this paper intends to only look at the Ottoman script alone.

The particular way in which this thesis will explore the aforementioned question will be through the lens of orthographic transparency. Specifically, this paper will explore two aspects of orthographic transparency and how they are manifested in the Ottoman abjad. These two

properties are consistency and neighbourhood density. These two have been chosen specifically as they are both well-studied aspects of orthographic transparency, have been shown to be especially relevant in reading comprehension and orthography processing, and finally are the most immediately relevant to address upon a simple examination of the Ottoman script itself. This last point being perhaps a bit mundane, it is still evident that the role of history in creating the Ottoman script cannot be ignored and indeed history had left its mark on the script in a way that, without knowing of it, one might presume that the script itself must be random, the assignment of phoneme to character relatively arbitrary.

However, such an analysis could not be further from the truth. In fact, the complicated nature of the script hints at the part which had borne it, and no doubt, still echoes in the debates of modern Turks over alphabet or abjad. As such, no understanding on the insistence on the Ottoman abjad or the reluctance to learn it can be informed without first understanding the script itself and its origins.

I. A Few Moments in History

In many ways, before one can begin to understand the modern insistence on the efficacy of the previous abjad system, one must first understand how the Ottoman abjad came into being, and therefore arises the question of how the Ottomans arose to an empire from their nomadic beginnings. Ultimately, just as Atatürk's vision for a Latin alphabet to represent Turkish was based on the identity bequeathed the young Turkish Republic following the fall of the Ottoman Empire, so too are the demands to return to the abjad steeped in a sense of identity that is inseparable from the experience of the Empire, and then, the Republic.

That is, to understand why some modern Turks still insist on the superiority of the Ottoman abjad to the modern Turkish alphabet, one must first begin by turning to history to understand how the abjad came into being and the world in which it existed and was used, and though it is admittedly beyond the scope of this paper to analyse the opacity of the modified Latin script currently in use for Turkish, it is still relevant to understand the process by which the script arose as it sheds light on a number of challenges and strengths of adapting a pre-existing script to an unrelated language.

2.1 Geopolitical Context

The world in the era leading to and of the Turkish expansion was one characterised by a landscape of power and the efforts to grow or, at the very least, maintain it, but even more strikingly it was an era marked by the rise of religious unity in the Middle East. This was the era in which Islam was spreading with great gusto and enthusiasm, and it would be with the help of this expansion that migrating Oghuz Turks would come to find first a home, then an empire, in Anatolia.

Following the unification of Arabia under the Prophet Muhammed (c. 570 – 632), Arab armies conquered Transoxania and the Umayyad Caliphate rose to replace the Sassanid Empire. Following this, the Abbasid Caliphate came to power in 750 and replaced the Umayyad Caliphate (McCarthy, 1997). This caliphate was a massive empire, spanning the course of all of Central Asia to India and in the opposite direction, to the Atlantic Ocean itself and would come to be one of the most expansive and far-reaching empires the world has ever seen (McCarthy, 1997). Of course, as the Turks would begin their migrations south and west, their contact with Islam is hardly surprising.

Additionally, though today the role of religion may be somewhat diminished in our politics, it is important to remember that the world in which the Turks travelled, warred, and ruled was a devout one. Where Islam was spreading throughout the Middle East and Central Asia, in the West was Christendom. While the fall of Constantinople to the Turks would fall in 1453, until then Anatolia was occupied by the Byzantine Empire, a devout Christian empire. Beyond this, there was the presence and power of the Roman Catholic Church in continental Europe. (Bisaha, 2004)

2.2 Entering Anatolia

The story of the mass migrations of the Turkic peoples into Central Asia, and then, their conversion to Islam, first begins in the Altai Mountains in Mongolia. Though there were many Turkish peoples occupying this area at the time, the dominant power in these lands were the Oghuz until AD 745, when this dominance was passed over to the Uyghurs (Hostler, 1993). This would lead to an almost cascade-like migration of the Oghuz west and south into Central Asia, making them among the most important players in Ottoman history (Frye, 1996).

Early Turkic history can be characterised in many ways by the constant rise and dissolution of vast networks of tribal power. That is, while the domination of Turks in the lands they conquered may not be able to be described as a traditional empire, it can certainly be described as a network of tribes which would all pay allegiance to a “charismatic” tribe, as Frye (1996) describes. However, during the sixth century, two major Turk khanates can be seen to rise and then dissolve. Firstly, in the west, Turkish khagan Ishtemi established the power of the Turkish khanate in the beginning of the sixth century. In the east, the rise of the Sui dynasty led to the dissolution of a previous eastern khanate under Taspar Khagan (Golden, *Central Asia in World History*, 2011).

It was under the rule of Taspar that the Turks seem to first take an interest in “foreign religions” (Golden, *An Introduction to the History of Turkish Peoples*, 1992). He would come to be the last ruler of a unified Turkish empire in the region, enjoying enormous influence and affluence in China, as China feared an invasion or attack, offering him many riches and treating Turks in the capital extremely well in an effort to appease the Turkish Khagan (Golden, *An Introduction to the History of Turkish Peoples*, 1992). However, following Taspar, while Taspar’s son feuded over the throne with his cousin, a smaller vassal broke off to form a small khanate of his own in the holy lands of the Ashina (the heavenly order from which the Turk elites were said to originate) and came to be referred to as Isbara Khagan.

Finally in 742 the Oghuz would be defeated by a branch of the Ashina led by Isbara Khagan, who would soon after that themselves be replaced by the Uyghurs (Golden, *Central Asia in World History*, 2011), leading to precisely the type of “billiard-ball” type mass migration discussed by Frye (1996). Following this, the Turks, and especially the Oghuz, would come to inhabit large swaths of land in Central Asia by the tenth century, when another Turkish clan would find itself slowly rising to power again. This clan in particular was that of the Seljuks, a branch of Oghuz Turks which migrated to Transoxania in the eleventh century (McCarthy, 1997). They would have taken over all of Iran by 1054, following the defeat of other Turkic clans to their south by 1040 (McCarthy, 1997).

The Seljuks would prove to be especially significant in their role in restoring an orthodox caliphate in the region, or at least, so they were seen. In the years leading up to the Seljuks’ entering Baghdad in 1055, the Abbasid Empire had not only weakened but had come to be divided along deep religious divisions: the Sunni Shi’a divide. As Islam was an all-encompassing religion, such a divide threatened not only the sanctity of the religious power of the Caliph, but

additionally introduced the threat of political upheaval. It was to this end that the Caliph looked to the oncoming Seljuk Turks as their hope at maintaining power. (McCarthy, 1997)

However, upon entering Baghdad and being named sultan, Tugrul and the Seljuks would end up relegating the Caliph to a role of power restricted to the religious, coming to call themselves rulers in all the secular matters of the empire. They would greatly expand the empire, especially to the West, taking over beyliks in Azerbaijan and then eventually managing to push into Anatolia through these loose networks of Turkish settlements that had come to be interspersed throughout the region. However, upon entering Anatolia, the Byzantine emperor would not find these incursions made on behalf of the Turks to be most unpleasant and quite contrary to his taste. As such, he would go to war with them, though he would not come to be victorious. Instead the Seljuks would defeat him in the Battle of Manzikert and thus find themselves at the threshold of Anatolia, free for their conquest. (McCarthy, 1997)

2.3 Becoming the Ottomans

As this paper does concern itself with the Ottoman abjad, it is perhaps fruitful to understand how the Ottomans themselves came to be seated on the throne in Anatolia when in the eleventh century, the doors to Anatolia were opened by the Seljuks. As a result of the disorganized and complicated structures by which nomadic leaders maintained power in the Turkic nomadic culture, the Seljuk Empire was short-lived and fraught with conflict (McCarthy, 1997). However, the legacy of the Seljuk Empire would inform the actions of other nomadic tribes for centuries.

Following the dissolution of the Seljuk Empire, the rise and fall of another Turk power and that of the Mongols would lead ultimately to the rise of the Ottomans. As the delicate network of centralized authority that had been formed by Seljuks over the Turks (which had

really been a bureaucracy the Seljuks themselves had borrowed from the Abbasids), the remaining tribes in the region were left to infighting over land and money. It would be the Ottomans, a small and relatively weak Turkic tribe on the border of Christendom that would lead the onslaught into and against Europe and would as a result eventually come to power. It would be this clan that would come to be the Ottomans of the Ottoman Empire.

2.4 Islam

Islam, from the very beginning of the inception of the Ottoman State, played a key role in gaining power and in maintaining it. The Seljuks before the Ottomans had adopted much of the bureaucracy of the Abbasids, and it would be exactly this same system (with a few minor adjustments) that the Ottomans would employ in their own empire (McCarthy, 1997). Additionally, the role the Seljuks played in cultivating an appearance of being frightful *gazis* would prove to be useful to the Turks not only as an effective marketing strategy but additionally as an example to future Turks who were particularly illustrious in their expansion efforts.

The manner by which the Ottomans pushed into the West, and the reason for picking westward expansion itself, was rooted in Islam, even if not in the principles of the faith, in the principles of the faithful. That is, the Ottomans, who were on the edge of Christendom, came to understand quickly that there was little in the way of profit or progress by fighting against other Turkic tribes. Additionally, their being Muslim made it difficult to justify war against other Muslim principalities and empires surrounding them. As a result, the rather small beylik invested in recruiting other Muslim Turks for holy war, or jihad, against the already well-established and quite wealthy western Christendom. (McCarthy, 1997)

Additionally, the success of the Ottoman Empire, upon its establishment, and in fact its resilience can also be traced to Islam. Where the successful expansion of the Turks into Christian lands and then also the surrounding Muslim areas was justified through religion, the surrounding empires found themselves in a more volatile position for it. But this is a tale that requires one revisit the methods by which Islam was first spread.

The Turks first came into contact with Islam via their many incursions west and especially through trade. Turkic tribes from the very beginning were quite interested in monetary enrichment, coming to gain either power or influence in many cities along the Silk Road (Frye, 1996). Trade was lively along these routes and as a result, of course the Turks came into contact with merchants and traders of all backgrounds. As a result, it is likely that Turks were first introduced to Islam through trade, coming into contact with it first through their business partners (Golden, *Central Asia in World History*, 2011).

In fact, the conversion to Islam was not one that came with particular difficulty for the Turks. There are many reasons for this, including but not limited to the fact that the Turks had already come into contact with Christianity and other Abrahamic faiths and that their own shamanistic beliefs were not entirely unlike Islam (McCarthy, 1997). Additionally, as mentioned before, because of the Silk Road and the ongoing trade at the time, Turks had already come into contact with the Arabs in Central Asia and also with the Christians of Byzantium prior. In fact, in 563 itself the Turks had come into contact with Byzantium with regards to trade, when a Turkish ruler Ishtemi approached the Byzantines with the possibility of an alliance that would circumvent involvement with the Sassanians (Frye, 1996). Only a few years following that, there would even be Byzantine embassies that would seek conference with the Turk Khagans of the East (Golden, *Central Asia in World History*, 2011).

Furthermore, as a result of the ongoing slow but steady travels of the Turks west and south from the fifth century and onwards, Turks had come into contact with more and more differing religions, some Turks converting to a variety of faiths, including Judaism, Buddhism, and Christianity (McCarthy, 1997). As such, the Turks were not unfamiliar with monotheistic religions and in fact, historically had even come to rely on these partners for trade. Especially following the rise and expansion of the Abbasid Caliphate, Turks found themselves increasingly in contact with Muslim communities, armies, and missionaries, especially as their travels took them further into Central Asia and towards the Middle East. This familiarity with many different religions likely made them more apt to adopt Islam when it was introduced as a choice, especially as pragmatically it would to be increasingly practical, if from no other than a business perspective (though this is not to say that converted Turks did not necessarily believe).

An important point to note is that as Islam, like Christianity at the time, was a highly structured religion which outlined specific laws and seemingly valued orthodoxy where it might have been hard for the Turks to convert, the Turks did so quite willingly not only due to the resemblance of their own beliefs with those of Islam but additionally due to the flexibility which Islam allowed new converts (McCarthy, 1997). Frye (1996) points out that the rapid expansion of Islam and the Abbasid Caliphate was likely one of the reasons why in the eyes of the Europe, Islam came to be associated with a ruthless violence in its tactics to convert non-Muslims even though this is an inaccurate representation of the policy of Muslim missionaries abroad. Instead, Islam's fundamental push for egalitarianism was a major reason for the Turks to adopt it in the first place.

Following their conversion, the Turks did not face a complex hierarchy that othered converts, but rather they found themselves to be accepted among a community much larger than

simply their own nomadic company (Hostler, 1993). Converts were not looked upon as second-class citizens of the *ummah* but were rather looked upon as brothers in what was a community of faith. Additionally, though the Muslim traders through which the Turks were first introduced to Islam were quite keen on the converts converting, they were not themselves fundamentalists or overly orthodox, allowing that there were certainly going to be some minor differences in practice from converts (Frye, 1996). It can however be said that these differences were not always looked upon kindly (Lindholm, 2002). Ultimately, however, it would be this liberal, lax attitude of merchants and traders that would lead to the destabilization of other Islamic states in the region surrounding the Ottomans and Anatolia, leading to an overall weakening of the orthodox political systems that the Ottomans expanded against or into (Lindholm, 2002).

A final note on Islam and the Turks is that much of the influence of Islam on the Ottomans specifically is rooted not only in the manner by which they were introduced to it, but in addition by *whom* they had been introduced. The Turks, as a result of travelling east to west rather than easterly from the west, first confronted Islam on the Silk Road from Persian-speaking peoples (Golden, Central Asia in World History, 2011). Of course, this would affect their future decisions, but it is no stretch to suggest that perhaps the reason the Turks adopted the Arabic abjad was because they encountered it before they encountered Latin, or other scripts, at least not before they found somewhere they were willing to settle.

This paired with the fact that much of the Ottoman system was borrowed from the previous Seljuk Empire, which had itself borrowed from the Abbasids before them, leads to there being no surprise that the script that is ultimately used in the empire is the Arabic abjad, no matter how reshaped to fit the Turkish language. Furthermore, the importance of Arabic as a language in and of itself in Islam is crucial to understanding the role a script might play in a

devout, religious empire. Not only had Islam been an effective method of expansion and maintaining control, it was also still very much a religion and additionally, very much a religion which was practiced and observed. Islam by doctrine is meant to be all-encompassing, and so it was very much at the centre of the lives of the Ottoman subjects (Lindholm, 2002). As such, the script was given importance not only as the script of bureaucracy, trade, and government, but additionally, it was the script of religion. It was the script of the Qu'ran. It was the script of an Islamic nation, an Islamic people.

II. Literature Review

Though the modern Turkish alphabet is transparent, it has certainly not always been this way. Today, Turkish uses an adapted version of the Latin script with a few extra letters. However, prior to the Ataturk's Language Reforms starting in 1928, Turkish was orthographically represented by an adapted version of the Arabic abjad, much like Persian. Many modifications were made in order to accommodate the drastic differences between the Turkish and Arabic phonological and morphological systems. This thesis will be an examination of these differences and their effects on the depth of Ottoman Turkish orthography as well as the ways in which the abjad was adapted to account for the aforementioned differences.

Orthographies can either be defined as shallow or deep, where the depth of the orthography is the ease of predictability of the pronunciation of words based on their corresponding graphemes (Besner and Smith 1992). Simply put, according to Besner and Smith (1992), orthographies can be described as shallow if words are spelt as they sound in an unambiguous way. While this book does a good job of addressing the orthographic depth hypothesis and its limitations, it does not actually take into account the many ways in which ambiguity in orthographic representation can increase cognitive load in processing.

Coltheart et al. (1977) discuss a number of factors that can contribute to ambiguity in orthography, such as, for example, neighborhood density, which is the number of words that are spelt or written similarly to each other. While Besner and Smith (1992) do address the concept of the relationship between orthographic-semantic access and orthographic-phonological mapping, they do not address these other aspects of orthographic depth that have come to be so widely studied in the field. This being said, it is not the scope of this paper to decide which orthography, Latin or Arabic, is more or less demanding cognitively when applied to Turkish. Rather, it is the sole aim of this paper to understand the ways in which the orthographies differed in aspects of their transparency and to what extent this depth may have brought more or less challenges in their adaptations to Turkish.

There is a variety of literature on orthographic transparency and reading performance, many trying to ascertain whether a shallow script can aid literacy acquisition. Juel et al. (1986) propose that one of the key factors in understanding early literacy acquisition is phonological awareness, describing it to be the metalinguistic ability to manipulate phonological segments of speech. Other studies since conducted have corroborated this, showing that phonological awareness can predict accuracy in word recognition in even adults (Byrne and Ledez 1983; Oney and Durgunoglu 2009).

Ziegler et al. (2010) also found evidence that the most consistent predictor for reading accuracy across three languages of varying degrees of orthographic transparency was in fact phonological awareness, though they point out that this is influenced by the orthographic transparency itself. This particular study is especially notable in its wide variety of languages covered (Finnish, Hungarian, Dutch, Portuguese, and French), and as such included in its range an

agglutinative language as well as a number of other fusional ones, making it especially relevant to this thesis as Turkish is agglutinative and Arabic is root-and-pattern.

In other words, both the language which borrowed the abjad orthography and the language for which the orthography was developed are not only both non-fusional languages, but are additionally languages that each have completely different morphological systems altogether, therefore demanding the wider scope of this study for it to be relevant to begin with. The fact that this study does have such a wide breadth in its languages means that its conclusions are not restricted to being accurate only to a specific family of languages that all share the same morphology, especially as this study includes two languages that are Uralic, or rather, non-Indo-European.

Furthermore, as there is a wide variety of literature affirming this claim that phonological awareness plays a major role in reading accuracy, though studies differ from each other in their claims to what degree, some claiming essentiality and others a more modest effect (Rahbari et al. 2007; Burt 2010; Bar-Kochva and Breznitz 2014). As Turkish phonology takes into account some aspects of Turkish's own morphological structure, it is important to recognize that morphological and phonological representation cannot be wholly separated when looking at the processing of the Ottoman abjad, especially as the script itself mirrored this phonological dependency on morphology.

With this in mind, Ehri (1987) suggests that literacy is in fact necessary to build phonological awareness in the first place. This brings the role of phonological awareness out of simply being casual into also occupying a role in literacy acquisition and processing that is also affected. In essence, bidirectionality, where phonological and orthographic awareness do affect each other, thus comes to the forefront of the challenges faced by literacy acquisition, not only in

the late Ottoman Empire and early Turkish Republic, but also in a more modern sense, to the forefront of even modern language revitalization movements, especially as increasing literacy in endangered or at-risk languages increasingly becomes a cornerstone strategy to ensure their revitalization.

In fact, Wagner et al. (1994) investigates this bidirectionality and comes to the conclusion that not only is phonological awareness causally linked to word-decoding, but additionally that letter-name knowledge affects future phonological processing abilities with a modest causal relationship. This is corroborated by Landerl et al. (1996) who found that children with normal reading development sometimes gave responses based on orthographic rather than phonological information, whereas children with dyslexia dealt with such orthographic intrusion less frequently. In this sense, bidirectionality is especially important when considering the effects of inconsistent orthographies, or inconsistency in orthographies, in literacy acquisition, as an awareness of phonology is not solely sufficient in acquisition and orthographic awareness is not solely sufficient in production.

Of the characteristics of orthographies that determine their opacity or transparency, there are two in particular that this thesis concerns itself with: neighborhood density and consistency, especially as these two are the most relevant in order to determine the depth of Ottoman Turkish orthography and its possible effects. Neighborhood density can be defined as the characteristic of a grapheme as being phonologically similar or different to other strings of letters, or words (Coltheart et al. 1977). Coltheart et al. (1977) demonstrated that nonwords that were more similar to other real words took longer to process than nonwords that had less neighborhood density. This suggests that orthographic consistency might play a larger role in orthographic processing rather than being arbitrary.

Another important aspect of considering the challenges in appropriating the Arabic abjad for Turkish is quite simply the vast differences between the phonological inventories of Turkish and Arabic. When appropriating the Arabic abjad for Turkish, there would have been a number of challenges faced by the Ottomans, including but not limited to only having seen a variety of Arabic letters become redundant, but additionally noting a distinct lack of letters for all the consonants in the Turkish phonological system.

It is to this end that many letters found themselves to represent far more than a single sound in the Ottoman alphabet, leading to a very inconsistent alphabet. In addition to this, as the Ottoman script maintained the underrepresentation of vowels in writing, and as vowels in Turkish are in contrastive distribution, many words came to be spelt similarly or even the same but having wildly different meanings (*olmak*, meaning *to be*, and *ölmek*, meaning *to die*, being only two examples.) It is precisely the demonstration of this characteristic of the Ottoman abjad with which this thesis finds itself, in part, involved.

Consistency, the second property of orthographies with which this paper involves itself, can be described as the presence of a consistent grapheme-phoneme mapping system. That is to say that if phonemes and graphemes are consistently mapped together with little variation, then the orthography is considered to be consistent and therefore less dense. Considering that the Ottoman abjad had to contend with both a higher vowel inventory in Turkish and voicing/devoicing rules, as well as consonants rendered redundant, it is not a surprise that many letters were mapped to more than one sound.

However, it is not simply this fact that adds depth to this orthography. In addition to letters being mapped to more than one sound, many sounds were mapped to more than a single letter. Even in the Perso-Arabic abjad, which is the original Arabic abjad modified to contend with the

different sounds in the Persian phonological inventory, grapheme-phoneme mapping mostly remains one-to-one, where a single grapheme for the most part is mapped to a single phoneme.

Finally, as this paper concerns itself with both the phonological and morphological systems of Turkish and their orthographic representation with the Ottoman script, it is relevant to consider the effects of morphological structure on orthographic transparency and processing. In this regard, though there are studies addressing this, there seems to be little consensus (Amenta and Crepaldi 2012). However, when it comes to terms of literacy acquisition, some studies have found that both phonological and morphological awareness are required for successful literacy acquisition (Li et al. 2010; Nagy et al. 2013).

Additionally, it appears that orthographic processing can have aspects of processing specific to certain morphologies. For example, Tong et al. (2010) point out that in their longitudinal study of literacy acquisition in Chinese children, that certain factors, namely homophone awareness, visual skills, and syllable awareness, affected the acquisition of Chinese orthography over time but not the acquisition of English orthography. Abu-Rabia (2002) concludes that in Arabic, the lexicon is accessed following the initial identification of the morphological components of the text.

Even though this study also finds that phonology affects reading accuracy, access to the lexicon is firstly affected by the recognition of morphological structures, especially through the recognition of roots. Considering that abjads are designed for and operate in a manner most optimized for root-and-pattern morphologies, the application of an abjad to a non-root-and-pattern morphology should certainly be considered relevant for not only language revitalization or literacy development efforts, but is also important to understand how these systems are processed by readers from languages that are distinctly not root-and-pattern.

Furthermore, as has already been demonstrated by some literature, orthographic processing does appear to be a script with bidirectional processing and acquisition. Therefore, it is not a stretch to consider the implications of different triggers to accessing the lexicon as a result of difference in morphology coming to play a more significant role in scripts that are adapted from other morphological systems, especially considering the proliferation of the Latin alphabet in the modern era.

In this manner, other studies have posited that different morphologies exhibit different processing pathways. For example, just as Abu-Rabia (2002) showed in their study, Velan and Frost (2010) also demonstrate a similar trend, concluding that Hebrew words with Semitic origins are processed differently than Hebrew words with non-Semitic origins, the latter which were shown to be processed more similarly to words in European languages. Semitic words, at least in speakers of Hebrew, have been demonstrated to be organized morphologically rather than orthographically (Frost et al. 2005).

In fact, it has been suggested that morphology may constrain even alphabetic orthographies, and as such, may determine visual processing of words (Frost et al. 2005). That is, where Abu-Rabia (2002) points out that word processing pathways may be catalyzed by the recognition of morphological structures in abjads, the fact has also been seen as a phenomenon present in alphabetic orthographies suggests that further research should be conducted into if there are some universal aspects of orthographic processing.

What is of interest here is that there is limited literature on the processing of the Persian script, though there does appear to be literature on Arabic and Hebrew. This is especially relevant to this paper as Persian is not a language with root-and-pattern morphology, but rather is agglutinative. As such, if it is true that morphology may affect orthographic processing, the depth

of Ottoman Turkish may have led to different processing patterns and reading strategies. Regardless, the limited research into Persian orthographic processing does seem to support that phonological awareness is an important factor in lexical processing (Rahbari 2007). This would be especially helpful in understanding the likely effects of trying to process a highly agglutinative morphological structure with a root-and-pattern orthography. The solution that was settled on for this very problem presented when trying to adapt the Arabic abjad to Ottoman Turkish was to have some set suffixes that would not change regardless of vowel harmony or voicing/devoicing rules.

However, this is only the solution reached in the Ottoman orthography. Ottoman Turkish has not been the only language in history to have adopted a script from a different culture and then faced the requisite challenges in making the orthography work with their language. Even today, there are many other languages that have borrowed scripts from other languages that are sometimes wildly different than their own languages, be it in a phonological, morphological, or other sense. Additionally, it is not to say that only orthographies that have not been specifically created for their respective languages are worth studying, but rather it is clear that the field overall could certainly benefit from looking at more non-European languages.

III. A Brief Overview of Arabic and Turkish

Before going on to look at how the Ottoman abjad attempted to reconcile the differences between Turkish and Arabic, it is fruitful to quickly take an overview of these differences to begin with. The two most important aspects of these differences for the purposes of this thesis are those of phonology and morphology. As orthographies are used to visually represent sounds, and words, it is important to recognize that the differences between the sounds available to languages may drastically affect how the orthography must be adapted. Additionally, the morphology of a language may be dependent – or at least affect or be affected by – certain

aspects of its phonology as well. Additionally, it may be helpful to imagine these two systems are being joint, or at least, not entirely discrete from one another, even if in this section they will both be dealt with one at a time.

4.1 Morphology

The first matter to discuss is that of the morphologies of the two systems. Though there are many aspects of Arabic phonology that are fascinating, there is one in particular that is especially relevant when looking at abjads. Arabic heavily uses root-and-pattern morphology, where the root of the word may encapsulate a core meaning and is then able to be altered by the surrounding sounds (specifically vowels) and with the additional of prefixes or suffixes. Roots in Arabic can be anywhere from two to five phonemes, though the vast majority of the roots in Arabic are three-letter roots. These roots can then be altered by mapping them over a pattern, which will add grammatical information to the word or might slightly change the meaning. Patterns in Arabic might be comprised of vowels, some consonants, or even require the doubling of consonants, a process known otherwise as gemination (Ryding, 2005).

Meanwhile, the Turkish morphology is not root-and-pattern-based but rather is agglutinative and is highly suffixing. This is in contrast to Arabic, where there may be suffixes as well as prefixes and infixes. Additionally, Turkish morphology has a morphophonemic quality to it, where the addition of further suffixes affects the realization of certain qualities of other phonemes in the word: namely, voicing in consonants and roundedness and backness of vowels. That is, the vowels in suffixes are affected by the qualities of the vowels in the root, where they are modified to match those in the root in either backness, roundedness, or both if possible (Oflazer et al., 1994).

4.2 Phonology

Turkish and Arabic differ in phonology not only in inventory but also in system. Additionally, the differences are not limited to either consonants or vowels, but rather are interspersed between the two. When it comes to vowels, Turkish has more vowel than Arabic, but the two also differ in how these vowels interact with words, especially in relation to meaning, and additionally in what aspects of the vowels are prioritised in distinction. The same cannot be said of consonants, where Arabic has more consonants, though the morphophonemic system of Turkish does bring forth certain complications for orthographic representation.

4.2.1 Vowels

There are six vowel phonemes in Arabic, as represented in the following table. They are actually three sounds that are differentiated by length. That is, there are three short vowels and three long vowels. Short vowels are not generally marked in the orthography, though they can be through the use of diacritic marks. However, long vowels are marked, especially with the letters *alif*, *waaw*, and *yaa* (Ryding, 2005).

	Front	Central	Back
High	<i>i / i:</i>		<i>u / u:</i>
Mid			
Low		<i>a / a:</i>	

Figure 1: Ryding (2005)

Turkish, on the other hand, has eight vowel phonemes, also shown in a figure below. As Turkish has vowel harmony, there are two aspects of each vowel that are particularly important for conjugating Turkish words or distinguishing definition: roundedness and backness. As

vowels can appear in between consonants or before or after them, they are often either changed by preceding vowels or effect change in the vowels following them (Goksel & Kerslake, 2005).

These processes are often dependent on the environment of the vowel in question as well as the different permutations available of any suffix. In general, a root's final vowel dictates the succeeding vowels, leading to the selection of suffixes' forms that match the roundedness and backness qualities of the leading vowel as closely as possible. It is important to note that /o/ and /œ/ are not vowels that can be selected in suffixes as there are no suffixes that use these vowels in standard Turkish. (Oflazer et al., 1994).

	Front	Central	Back
High	<i>i / y</i>		<i>u / u</i>
Mid	<i>e / œ</i>		<i>o</i>
Low			<i>a</i>

Figure 2: (Goksel & Kerslake, 2005)

4.2.2 Consonants

Another challenge for the Ottomans in adopting the Arabic abjad would have been in dealing with the differences in the consonants available in the phonemic inventories of the two languages. Where there would be certain elements extra in Turkish that were not present in Arabic, there were also certain elements present in Arabic that were not present in Turkish. As the Arabic abjad was developed to be used for Arabic, there were certainly letters for some sounds that did not exist in Turkish but did in Arabic and a lack of some others for sounds that existed in Turkish but did not in Arabic. Below is a chart of consonants in Arabic.

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	b			t d t: d:			k	q		ʔ
Nasal	m			n						
Trill				r						
Tap/Flap				ɾ						
Fricative		f	θ ð ð:	s z s:	ʃ			X ɣ	ħ ʕ	h
Affricate					ɟʒ					
Glides/Approximant	w				j					
Liquid/Lateral approximant			l							

Figure 3: (American Speech Language Hearing Association)

As can be seen in the above table, there are 29 consonants in the Arabic phonemic inventory. Additionally, some consonants have both emphatic and nonemphatic forms. The emphatic forms are those that are elongated and marked above.

On the other hand, if we are to include “soft g”, a phenomenon discussed ahead with the introduction of the morphophonemic processes regarding voicing/devoicing of Turkish consonants, then there are 22 consonants in Turkish. The following table shows the consonant phoneme inventory of Turkish. As will be quite easily noted, there are some significant differences between the inventories of the two languages.

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d			k ɡ			
Nasal	m			n						
Trill										
Tap/Flap				r						
Fricative		f v		s z	ʃ ʒ					h
Affricate					tʃ dʒ					
Glides/Approximant				l	j					
Liquid/Lateral approximant										

Figure 4: (Oflazer et al. 1994)

A quick glance at the two tables leads to some immediate conclusions, with the first being that there are more consonants in the phonemic inventory of Arabic than there are in that of Turkish. In fact, there are a total of seven more consonants in the Arabic phonemic inventory than there are in Turkish. There are eight if “soft g” is not counted, as it is more a written phenomenon as a consonant than it is a phonetic one: the realization of “soft g” is often with the dropping of a /k/ phoneme and the elongation of the preceding vowel.

Additionally, a second observation that can be made is that where all Turkish plosives, fricatives, and affricates have both their voiced and devoiced forms present in the Turkish inventory, the same cannot be said for these consonants in the Arabic phonemic inventory. Both voiced and devoiced plosives, fricatives, and affricates exist in the Arabic inventory, but they do not seem to come in pairs necessarily as they do in Turkish. In fact, the very fact that in

Turkish these sounds seem to come, to some extent, in pairs is telling of another morphophonemic process in Turkish besides vowel harmony: consonants voicing/devoicing.

Just like vowels in Turkish, Turkish consonants are also not free from modification. They are both able to change the qualities of consonants in following suffixes as well as themselves be changed. If the suffix following begins with a plosive, the final phoneme in the root determines the voicing of the plosive. If the final phoneme is either a vowel or a voiced consonant, then the plosive is voiced, though if the final phoneme is devoiced, then the plosive is devoiced and becomes voiceless (Oflazer et al., 1994).

Additionally, if the suffix immediately following the root begins with a vowel, then the preceding consonant will likely be changed to be voiced if it is devoiced plosive especially. There is only one exception to this rule, and that is with the case of /k/ and /g/. If /k/ is in the environment to be voiced (that is in word final position and being followed by a suffix that begins with a vowel), there are two possibilities. If it is part of a consonant cluster, then it remains devoiced and is not changed. However, if it is not part of a consonant cluster, then it is dropped and the preceding vowel is elongated. This change in the modern Latin orthography is denoted by the letter ‘ğ’, or “soft g” (Oflazer et al., 1994).

IV. The Script Itself

As was mentioned before in the section giving historical background on the entrance of the Ottomans into Anatolia, it is important to recognize the role Islam had played in introducing them to the script. However, also as mentioned prior, it is equally important to note by whom the Turks had first been introduced to Islam, as this would especially influential in the doctrine they adopt and the way in which they convert. Most notably, as a result of their travels westward, the

Turks would have come to encounter many peoples, many of whom were Persian-speaking, and as such would have been quite familiar with the script as it was modified by these people for their own purposes. That is, the Turks would not have come across the script most impactfully from the Arabs but rather from the Farsi-speaking people they would eventually come to wage war against. That in itself is more likely to predispose the Turks to borrow the script from the Abbasids than it is to predispose them to borrowing it from the Arabs themselves.

	Phonemic Representation				Phonemic Representation		
	Arabic	Ottoman	Persian		Arabic	Ottoman	Persian
ا	Many, /a:/	/æ/ , /a/ , /e/	/v/	ض	/d:/	/z/ , [d]	/dz/
ب	/b/	/b/ , [p]	/b/	ط	/t:/	/t/ , [d]	/ts/
پ	-	/p/	/p/	ظ	/ð:/	/z/	/ʒ/
ت	/t/	/t/	/t/	ع	/ʕ/	/ʕ/ , []	/ʕ/
ث	/θ/	/s/	/s/	غ	/ɣ/	/g/ , /ɣ/ , /v/	/ɣ/
ج	/dʒ/	/dʒ/	/dʒ/	ف	/f/	/f/	/f/
چ	-	/tʃ/	/tʃ/	ق	/q/	/k/	/g/
ح	/h/	/h/	/h/	ك	/k/	/k/ , [] , [j] , /n/	-
خ	/x/	/h/	/x/	ک	-	-	/k/
د	/d/	/d/ , [t]	/d/	گ	-	/g/ , []	/g/
ذ	/ð/	/z/	/z/	ڭ	-	[ŋ]	-
ر	/r/	/r/	/r/	ل	/l/	/l/	/l/
ز	/z/	/z/	/z/	م	/m/	/m/	/m/
ژ	-	/ʒ/	/ʒ/	ن	/n/	/n/	/n/
س	/s/	/s/	/s/	و	/w/ , /u:/	/o/ , /u/ , /œ/ , /y/ , /v/	/v/ , /u:/ , /o/ , /ow/
ش	/ʃ/	/ʃ/	/ʃ/	ه	/h/	/h/ , /æ/ , /e/ , /a/ , [t]	/h/
ص	/s:/	/s/	/ʔ/	ی	/j:/ , /i:/	/w/ , /i/ , /j/	/j/ , /i/ , /v:/

Figure 5

As can be seen in the above chart, there are a few consonants that are not present in the Arabic phonemic inventory. Indeed, the orthographic representation of these are all also borrowed from Persian, where the same symbols exist. There is only one letter which is novel to Ottoman Turkish. This being said, many letters are also adapted to take on Turkish sounds or to represent Turkish sounds in different environments. However, what is most notable here is how much more similarity there is between Ottoman and Persian than there is between Arabic and Ottoman. This suggests, as previously stated, that the Ottomans did in fact borrow the abjad from the Persians, especially as many of the symbols unique to Persian are also present in the Ottoman abjad.

A final note worth mentioning is that this thesis omits the diacritics in its analysis. This is for one main reason, and that being that by and large these are omitted when writing or reading in Ottoman. Like in the Arabic or Persian scripts, these diacritics are often omitted, as is characteristic of abjads, and therefore it made little sense to include them in the analysis. Additionally, when they are included, it is often with other long vowels, such as *elif*

V. Consistency

As a result of some of the aspects of the Turkish morphophonemic system, phonemes in certain environments could be realized in speech in more than a single manner, and these changes would be something that the Ottoman abjad would have to find a way to cope with. In the modern Turkish alphabet, which uses Latin orthography, spelling is mostly entirely transparent, where letters are consistent and words are written as they sound. This means that phonemes are written as they are realized in spoken speech. Though it is true that there are many writing systems that do not operate in this manner – that is, by representing phonemes exactly as

they are realized (English comes to mind) – this is still an important aspect of script processing and orthographic transparency.

In particular, the difficulty brought up here is specifically pertaining to consistency, which can be defined as the phoneme-symbol mapping of a given orthographic system. When looking at the issues regarding consistency in the Ottoman script, however, it is important to recognize both the causes of inconsistency and the effects it would have. As Redhouse (1884) points out, for example, of particular interest are the vowels, as their omissions created interesting gaps or increased difficulty in trying to distinguish between words. The specific example offered by Redhouse is in the case of differentiating between the optative and simple infinitive of words. Specifically, the words *bilmek* and *bilemek*, which Redhouse claims to be written entirely the same save for the addition of the letter *hemze* (◌), which exists in the latter and not in the former.

This example is already sufficient in drawing attention to one of the drawbacks of omitting diacritics or not marking vowels when writing in Ottoman Turkish, but additionally draws attention to another very important aspect of the script: the reallocation of phonemes to symbols in an effort to bridge these gaps that convention created. In this manner, though in the above chart *hemze* is shown as being one of two vowels, [a] or [e], instead really when looking at Ottoman orthography, it can be fruitful to look at it as a “medial” or a case marking (Redhouse, 1884). Or, at least this is the case when it is not representing [h].

In fact, of particular interest are the vowels, as they pose some of the greatest challenges in Ottoman orthography. This is in part due to the morphophonemic system in Turkish which causes vowels succeeding previous ones to change in response to certain attributes of the former. These attributes are specifically backness or roundedness. Below is a chart of all of the vowels

and their representations in Ottoman Turkish, not including those that may be represented by diacritics. As mentioned earlier, these diacritics are being omitted as they are almost never actually represented in practice. Additionally, note that in the chart, only the vowels which the letters represent are included. Therefore, if a letter may also represent a consonant, it is omitted from the table.

Ottoman Turkish	Vowel Phonemes
ا	/a/ , /e/ , /æ/
و	/o/ , /u/ , /œ/ , /y/
ه	/æ/ , /e/ , /a/
ي	/u/ , /i/

Figure 6

Note that each of these letters seem to represent a general type of vowel more than a specific one. For example, *vav* (و) seems to represent all rounded vowels, both *hemze* and *elif* (ا) representing front, unrounded vowels, and finally with *ye* (ي) representing high unrounded vowels. This is especially useful when attaching suffixes to words as Turkish suffixes' vowels change according to those in the roots and this can be represented with ease, even if the vowel phonemes themselves are not explicitly represented.

Additionally, as both *elif* and *hemze* appear to be representing the same vowels, it may be tempting to suggest that they are redundant entirely. However, this is not the case. The main difference between the two appears to be in their position, where *hemze* generally appears

between roots and suffixes, or suffixes and other suffixes. *Elif* however generally appears anywhere within a root. It is in this regard that Redhouse (1886) describes *hemze* as a medial.

Another way in which the Ottoman abjad proves itself to be quite complex in terms of phoneme-to-symbol mapping is in the case of some consonants. Not only are some letters mapped to more than one phoneme, but additionally, some phonemes are mapped to multiple letters. This becomes especially relevant when considering what Redhouse (1886) describes as long and short vowels, a distinction most relevant when dealing with Arabic and Persian loanwords.

As seen in the abjad comparison table, the Arabic orthography is actually quite consistent, with no repeat consonant or double mapping. This is to be expected, to be fair, as the abjad was made for Arabic in the first place and only later adopted by the Persians and Ottomans. Even still, the level of inconsistency in the Persian consonants is still much less than that in the Ottomans'. In the Persian abjad, there are three phonemes that correspond to more than one symbol - /z/ , /h/ , and /s/ - and other than the letters representing vowels, no consonants correspond to more than a single phoneme. As with Ottoman, *waw* and *ye* both correspond to multiple phonemes, some of which are vowels and diphthongs as well as some consonants.

This is in part due to the fact that there are 32 unique phonemes that are expressed through the orthography in Persian whereas in Ottoman there are 35. It must be admitted, however, that this is in itself not enough to account for why there are so many more double-mapped consonants in the Ottoman abjad than there are in the Persian. First it must be pointed out that though in the Persian abjad, six of the 32 unique phonemes are vowels, in the Ottoman abjad of the thirty-five, nine are vowels. This leaves twenty-six consonants in both Ottoman and in Persian to be mapped, suggesting that there are other factors to the multiple phoneme-letter

correspondences in Ottoman that are not so in Persian. Of these, eleven consonants are mapped to more than one letter. The following table shows these phonemes; the letters in parentheses are letters that can represent the sound even if the corresponding phoneme is not its primary assignment. All the letters that are not in parentheses are the primary assignments for the corresponding phoneme.

Phoneme	Letters
/b/	ب
/p/	پ (ب)
/t/	ط (د) ت
/d/	د (ض) (ط)
/s/	ص س ث
/z/	ظ ض ز ذ
/k/	ك ق
/g/	گ غ
/h/	ه خ ح
/v/	و غ
/y/	ی (ك)

Figure 7

Immediately, one does notice two things about letters that correspond to more than a single sound in the Ottoman abjad. The first is that some of these letters include either the voiced or devoiced variant of the phoneme. This can be seen in *be* (ب), *te* (ت), and *dal* (د). This is often a result of voicing/devoicing rules in Turkish, which cause these letters to be pronounced differently as a result of the phonemic environment.

The second thing one notices about this list of phonemes is that many of them that correspond to more than one letter, while able to correspond to matching phonemes in Persian,

are also corresponding to phonemes in Persian that do not exist in the Turkish phonemic inventory. As such, it is likely that the reason why there are so many double correspondences for these letters is that these letters' partner phonemes are the Turkified versions of the phonemes the Persian letters originally represented. Additionally, where the Turkish letters are not representing the Persian letters' Turkified versions, they are sometimes representing the modified versions of Arabic letters.

	Phonemic Representation		
	Arabic	Ottoman	Persian
ب	/b/	/b/ , [p]	/b/
پ	-	/p/	/p/
ت	/t/	/t/	/t/
ط	/t:/	/t/ , [d]	/ts/
د	/d/	/d/ , [t]	/d/
ث	/θ/	/s/	/s/
س	/s/	/s/	/s/
ص	/s:/	/s/	/ʃ/
ذ	/ð/	/z/	/z/
ز	/z/	/z/	/z/
ض	/d:/	/z/ , [d]	/dz/
ظ	/ð:/	/z/	/ʒ/
ح	/ħ/	/h/	/h/
خ	/x/	/h/	/x/
غ	/ɣ/	/g/ , /ɣ/ , /v/	/ɣ/
ق	/q/	/k/	/g/
ك	/k/	/k/ , [] , [j] , /n/	-
گ	-	/g/ , []	/g/

Figure 8

VI. Neighborhood Density

Neighborhood density, or how much words look similar to each other in the orthography, can clearly be affected by the consistency of letters. Redhouse (1884) is quick to point out when discussing short and long vowels how since in Turkish vowels are almost always short, there leads there to be many words written alike. Two such examples are *bozulmak* (to be broken, ruined) and *büzülmek* (to shrink), which are both written identically save the final consonant, which is ق in the former and ك in the latter. Another similar example, though this time the words are all written exactly the same, is the word بوز , where it could be read as *buz* (ice), *büz* (gather, shrink), or *boz* (break, ruin). In the same vein, the words *toz* (dust) and *tuz* (salt) are also both written the same.

In all of the above examples, it is clear that a big reason why these words are written similarly to each other is due to the letter *vav*, which can stand in for all the rounded vowels in Turkish. It is clear that such confusion is most likely to occur with this letter, though as a result of many vowels not being represented, the same may occur with any vowel that it assigned to a phoneme assigned to multiple vowels and in a word that does not have a serendipitous suffix attached to it that might hint at the properties of the preceding vowels. For example, while in the example of *bozulmak* and *büzülmek* the infinitive marker -mak/mek being written differently in each form certainly clues the reader into which set of rounded vowels to read the word with, no such similar thing can be said for the other nouns in the aforementioned collection.

However, this form of marking preceding vowels' properties with the selection of letters in following suffixes continues in other grammatical forms, especially in suffixes that end with /k/. Some such suffixes include *-ecek/acak* (future tense) and *-erek/arak* (adverbial suffix), where the final /k/ phoneme might be represented by (ق) if the vowels are back vowels and (ك) if the

vowels are back vowels. This is especially useful as this particular phoneme, /k/, appears in many suffixes. In addition to those previously mentioned which attach to verbs, there are some suffixes that attach to nouns that can also be affected by this rule, namely the Turkish diminutive *-cık/cik*.

The following are some example sentences, written in the Ottoman abjad followed by a gloss and then a translation. What is worth noting is that even if the vowels might change, the way the suffixes were written allowed them to not change in form even if they changed in pronunciation. This can especially be seen in the last few examples, where the verbs *kaçmak* (to run) and *gelmek* (to come) are shown, where the vowel harmony rules become most apparent. Additionally, here one can also see the voicing/devoicing rules at work and still not affecting the written form.

قرنداشم گلدی

Kardeş-im gel-di
Sibling-POSS.1SG come-PST.3SG
My sibling came.

قرنداشمسن

Kardeş-im-sin
Sibling-POSS.1SG-SBJ.2SG
You are my sibling.

قرنداشن گلدی

Kardeş-in gel-di

Sibling-POSS.2SG come-PST.3SG

Your sibling came.

گلدیم

Gel-dim

Come-PST.1SG

I came.

گلدین

Gel-din

Come-PST.2SG

You came.

قاچدم

Kaç-tım

Come-PST.1SG

قاچدین

Kaç-tın

Come-PST.2SG

VII. Conclusion

In many ways, it can be tempting to look at all of this information regarding the opacity of the Ottoman orthography and expect a conclusion that claims it might be cognitively too demanding, or at least, more demanding than other orthographies. Unfortunately, as it is not the aim of this thesis to determine that, no such conclusions can be expected here. However, it is possible to look at some of the specifics of the orthographic system and reach a few conclusions.

The first thing that can certainly be surmised by looking at this is how much the Ottomans were aware of the complexities involved in adapting the abjad to Turkish. This point might be slightly undercut by the fact that much of the older Ottoman works are almost unreadable by the fact that many Turkish scholars simply refused to include any vowels (Redhouse, 1884), but the development of the orthography to the state it was in during the time which led to some of the most famous Turkish grammars being produced is astounding. Not only were the Ottomans aware of some of the hardest aspects to adopt the orthography to – a morphophonemic system that led to permutations of whole words – but additionally shows a rather ingenious way of dealing with the issue.

Additionally, where the orthography certainly shows the ways in which the script's unsuitability were recognized and ratified, the Ottoman abjad also demonstrates the effects of cultural influence on the whole literacy of an empire. Not only were the Ottomans aware of some of the struggles of readapting the abjad to their own language, but additionally, it is almost certain that they were aware of the Latin alphabet, among others surrounding the empire. And still, they made no move to try some of the other scripts prevalent throughout the region. A people well-suited and comfortable to a variety of religions and cultures historically, it might

seem surprising that they were still so insistent on a system that would inevitably need to be heavily modified to suit their purposes.

In this regard, the geopolitical environment of the Ottomans is reflected not only in their decision to adopt the abjad and maintain it, but additionally in the ways in which they modified it to deal with some of the challenges faced in describing not only Turkish words, but additionally Persian and Arabic. Beyond this, not only had this script to reckon with lexical items, but it also had to reckon with borrowed grammatical forms, though these latter are not expressly discussed in this paper. However, the adaptations made to accommodate both of these reflect themselves starkly in the way in which letters were assigned phonemes, sometimes many at a time. In many ways, when words were borrowed, they were borrowed spelling and all, thus resulting in the orthographic property of consistency being affected, the mapping changing over time to reflect the different environments in which a letter might be seen. And as such, some letters came to be written in convention with the origin of the word in mind rather than necessarily any phonemic property most relevant to it.

Indeed, there are certainly some ways in which the lexical makeup of Ottoman Turkish heavily influenced the orthography, forcing the Turks to find new ways to use letters that represented sounds in Turkish as well sounds foreign to Turkish. The fact that much of the orthography follows the Persian system is hardly surprising, not only because the *medreses* used in the Ottoman Empire were borrowed from the Seljuks, as was much of the education system, but additionally because of the long history of contact between the Persians and the Turks (McCarthy, 1997). Furthermore, the influence of Arabic, however, is also hardly surprising, not only because it is the language of the religion the Ottomans subscribed to, but additionally

because of the strategic way in which the Ottomans had to navigate trade and empire with their Arabic-speaking neighbors (Lindholm, 2002).

Finally, though it is true that the orthography led to many types of words being written either very similarly or entirely identically to one another, in some cases, these were dealt with by adding features to some letters that lead it to become present in some environments over others. Both Hagiopan (1908) and Redhouse (1886) discuss these properties, referring to them as responses to hard or soft vowels, though in some ways, it is not so much a question of the realization of the pronunciation of these in Turkish as it is a question of the etymology of the words borrowed and their pronunciations in their native languages (be it Persian, Turkish, Arabic, or eventually, French). Additionally, where these markers are not representing the original pronunciations of these sounds in their own native languages, they are sometimes marking properties of vowels that might help the reader distinguish between the different possibilities of words that any one grapheme might be.

In essence, when examining the transparency of the Ottoman abjad from the perspective of consistency and neighborhood density, it is clear that the script is certainly opaque. However, it is not so opaque as to be unreadable. Instead, where the system might lack consistency in a grapheme-phoneme mapping system, the system does attempt to rectify this through the assignment of some writing conventions that mitigate some of the opaquer features of the orthography. However, it can be certainly said that the neighborhood density of the orthography is indeed very high, especially as a result of the way in which vowels are represented in the script, when they are actually represented in the spelling or in practice on the page.

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