The History of Pre-Gutenberg Woodblock and Movable Type Printing in Korea

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Abstract

In this paper I will present the early history of printing technology, developed in Korea from the seventh through the fourteenth century A.D., centuries before Gutenberg's printing of 42-line Bible in Europe with a primary focus on the world's oldest extant Dhārani Sutra, called "무구정광 대다라니경 =無垢淨光大陀羅尼經= Unsoiled and Purified-Brightened Dhārani Sutra," which was discovered inside a pagoda at a Buddhist temple in Kyongju, Korea, during a renovation in 1966. The significance of my paper will be in presenting the arguments and evidences to prove its origin amidst heated debates between the Chinese and Korean scholars, while recognizing the active exchange of information and knowledge that have yielded enhancements upon each other's accomplishments despite the political, nationalistic, and colonialist atmosphere that existed in the region.

Keywords: Korean history, early printing technology, Dharani Sutra, early printing in China and in Korea

1. Introduction

Between 1011 and 1087 A.D.—approximately 375 years before German printer Johannes Gutenberg used movable metal types to print his famous 42-line Bible—the Koreans had printed the complete set of a Buddhist canon known as *Tripitaka Koreana*. They did this using woodblock printing technology during Koryō Dynasty. This happened not once, but twice. The first set was destroyed by fire during the Mongol invasion in 1232, and the second set was printed from 81,258 woodblocks in 1251. Although this *Koryō Palman Daejangyung* (Koryō Eighty-Thousand Tripitaka=고려팔만대장경= 高慮八萬大藏經), the world's "only complete canon still extant," has been kept in excellent condition in Hae-In-Sa Temple in Korea, and was designated as a UNESCO World Heritage in 2007, most Westerners, scholars and laypeople, are unaware of the pre-Gutenberg printing innovations in the Far East (Yi Kyu-Bo, 1913, pp. 14-15).

Furthermore, prior to the second printing of the Koryō Tripitaka, Choe Yun-ui, a civil minister, and sixteen scholars compiled and printed 50 copies of *Sangjeong Yemun* (상정예문= 詳定禮文), a collection of courtesies from ancient times in Korea, with movable metal type in 1234, about 220 years before Gutenberg's first printing (Sohn Pow-key, 1959, p. 98). This was followed by the 1377 printing of *Chickji* (직지 = 直指):*Anthology of Great Buddhist Priests' Zen Teachings*, which was certified by UNESCO as the world's oldest extant publication printed with movable metal type (Chon Hye-bong, 1987, n.p.). Nonetheless, the Gutenberg Bible, printed seventy-five years later, is still often incorrectly hailed as the first such printing.

My research on this topic has revealed that a few renowned historians, such as Thomas Francis Carter (1925), did recognize Asia's advancements in printing centuries earlier than those of Europe. However, there are speculations of "Orientalism" at play which may have kept the Chinese and Korean inventions in obscurity until the 20st century (Edward Said, 1979, 19). John M. Hobson (2004) wrote, "Eurocentrism suggests ... it was Gutenberg who first developed the movable metal-type printing press. But the fact is that the first movable metal-type printing was first invented in Korea in 1403 (a full fifty years earlier) (p. 185)." Joseph Needham (1954) also pointed out that "the Far West took no interest in the descriptive geography of the Far East, nor in accurate cartography," which may explain the western ambivalence in distinguishing China from Korea or vice versa (p. 222). It was as if they could not tell the two countries apart. Needham (1954) wrote clearly, "The first Chinese typefaces were made of earthenware; later, the Koreans, nearly a century before Gutenberg, used fonts of Chinese characters cast in bronze." Technical inventions from the East, however, made a "slow but massive infiltration" to the West unwittingly aided by Ghengis Kahn's troops during the first fourteen centuries (p. 231).

In this paper I will present the pre-Gutenberg history of printing technology in Asia from the seventh through the fourteenth century A.D. with a specific focus on the world's oldest extant *Dhārani Sutra*, called "無垢淨光大陀羅尼經= *Unsoiled and Purified-Brightened Dhārani Sutra*," which was discovered inside Seokgatop pagoda at a Buddhist temple in Kyongju, Korea, during renovation in 1966. The significance of my paper will be in demonstrating the evidences to prove its origin being heatedly debated between the Chinese and Korean scholars, while recognizing the active exchange of information and knowledge yielding enhancements upon each other's accomplishments despite the political, nationalistic, and colonialist atmosphere that existed in the region.

After all, wrote Timothy H. Barrett (2008), Korea was the first country where "movable metal type was used for the printing of books in Chinese script even before the distinctive Korean script was invented" and "a possible source of inspiration for European printing"(p. 18).

2. Pre-Gutenberg Printing Technologies in the Far East

Historians over the years have learned that the strongest motives behind the invention of paper and printing were the religious zeal toward Buddhism and hunger for power and social advancement. The early invention of paper and printing techniques in Asia, specifically in China and Korea, played a pivotal role in emancipating the minds of people and accelerating the spread of knowledge (Jixing Pan, 1997, p. 36). As Judson Daland (1931) has aptly summarized, modern printing evolved in the sequence of seals, rubbings, wooden blocks, clay, copper, and bronze movable types, used as methods of authentication and later developed into a more complex printing for documentation purposes. Contracts would be made with terms written on each end of a piece of bamboo, which was broken in two and one piece retained by each party, matching of the broken pieces serving as proof of the agreement, similar to the practices of using wax seals as found in medieval and Renaissance-era manuscripts in England (p. 209).

Pan (1997) presented three specimens as evidences of early woodblock printing in China: a single sheet of a dhārani charm of *vidya-dharani-yana* in Sankskrit, printed in the early 7th century and unearthed from a T'ang tomb in Xi'an, Shaanxi province, in 1974; the *Miaofa lianhua jing* or *Lotus Sutra (Saddharma-pundariksūtra)* printed in Luoyang during 690-699 and unearthed at Turfan, Xingjiang, in 1906; and the *Mugou jingguang da-tuoluonijing*, or *Unsoiled and Purified-Brightened Dharani Sutra*" printed in Luoyang in 702 and discovered in Kyongju, Korea, in 1966 (p. 36)." The debate currently continues regarding the origin of the last item, as stated by Pan (1997) who maintained that it was printed in China, while others presented evidences, as enumerated below, showing it was printed in Korea (p.36).

3. Discovery of the Oldest Extant Dharani Sutra (ca. 690-750) in Korea

In 1966 during renovation of one of the two famous pagodas, Sukga-top and Dabo-top, in the Bulguk-sa Temple compound in Kyongju, Korea, a miniature scroll of *Dhārani Sutra* was found, as it had been tucked inside and remained there since the pagoda was constructed in 751 A.D. during Shilla Dynasty. This small scroll, 641.9 cm by 5.3-5.5 cm, comprises twelve sheets of woodblock prints pasted together, each sheet containing 55 to 63 lines of characters with seven to nine characters printed per line. This is the *[M]ugoujingguang da-tuoluonijing* [무구정광대다라니경 = 無垢淨光大陀羅尼經], *or Unsoiled and Purified-Brightened Dhārani Sūtra*, mentioned above by Pan (1997, p. 36).

After extensive research and examination of the uncovered articles, Korean historians have determined the scroll to have been printed in Korea and inserted into the three-story Sukga-top Pagoda sometime between the reign of Empress Wu (684-704) of China's Zhou Dynasty and no later than 751 when the construction of Bulgooksa Temple was completed and the Pagoda was sealed off (Sohn, 1982, p. 56; Sung-SooKim, 2000, p. 105). Carter (1925) wrote that prior to the discovery of this *Dhārani Sutra*in in Korea, the *Million Printed Charms Dhàrani* (百萬塔陀羅尼) found in Nara, Japan, was considered the earliest extant woodblock printed in 770 A.D. (p. 33). This new discovery makes the Korean version to be the world's oldest extant specimen. After over twenty years of careful research, it was bestowed a special status of Korean National Treasure No.126 in December, 1988, entitling it to proper attention and preservation treatment as a national treasure (Seong-Rae Park, 1989, p. 58).

As mentioned earlier, Pan insists that this *Dhārani Sūtra* was printed around 712 A.D. during the T'ang Dynasty but transported to Korea before being put into the pagoda. Several convincing factors, as listed below, presented by other scholars, such as Needham (1954), Park (1989), Sohn (1982), and Kim (2000), support the theory that it would have been reprinted from the T'ang version with the xylography technology in Korea during Shilla Dynasty:

1. It contained four of the eighteen new characters created and put into use during the reign of Empress Wu (r. 680-704) in China. The use of these new characters was discontinued in China after the death of Empress Wu. Due to the distance and communication delays between T'ang (China) and Shilla (Korea) those characters may have still been in use in Korea at the time of printing this scroll. The sutra might also have been reprinted with duplicate copies promptly upon its arrival from T'ang in 704so that it could be enshrined in the pagoda before it was sealed off in 706 during the reign of Seondeok Empress of Shilla. There is an inscription on the face of the sutra that reads, "安置如是 = enshrined as such" (Sohn, 1982, p. 56).
2. Tsien Tsuen-Hsuin (1985) noted in Needham's book, "The scroll bears no date, but it includes certain special forms of characters created and used when Empress Wu was ruling in China. It is believed that this charm must have been printed no earlier than 705, when the translation of sutra was finished, and no later than 751, when the building of the temple and stupa was completed" (p. 149-150). In fact, a piece of paper found attached to the casing in another three-tiered pagoda, Guhwangli samchung suktop [九黃里三層石塔], also in Kyongju, bears a record that "Sunduk Empress hereby enshrines one copy of *Muguchungkwang-gyeong* [Unspoiled and Purified-Brightened Dharani Sutra] in memory of her father, King Hyoso, on May 30, 706." Kim (2000) wrote assuredly that this can be interpreted to prove its existence prior to May 30, 706 (p. 105).
3. New pieces of information deciphered from a large bundle of paper, which had been mangled up and found with the *Dhārani Sūtra*in 1966, have revealed that:
    a. The stone pagoda, currently known as the Seokga-top, was also called Mugujeonggwang-top [무구정광탑 = 無垢淨光塔], according to the enclosed maintenance record [佛國寺無垢淨光塔重修記];
    b. The Mugujeonggwang-gyeong [무구정광경 = 無垢淨光經], i.e. the *Dhārani Sutra*, had been continuously kept inside the sari case during the two restoration projects in 1024 and 1038 until it was discovered in 1966. This means that the *Dhārani Sutra* in question had been enshrined and left undisturbed since 742 A.D. when the construction of Seokga-top pagoda was completed and sealed, pushing up the latest possible date of printing to 742 rather than 751 A.D.;

    The results of analysis performed on the bundle of paper found in 1966 with the above findings were publicly announced on October 27, 2007 (Kim, 2008, p. 42).
4. The scroll was printed on traditional Korean paper made from the fibers of tak or mulberry tree (*Broussonetia papyrifera*) which had been commonly used in Korea, while the Chinese printed on papers made from hemp (Sohn, 1959, p.123).
5. The sutra was translated from Indian to Chinese by two Buddhist monks, Mi T'o-shan (彌陀山) and Fazang (法藏) (643-712) in 704, the last year of Empress Wu's reign. Immediately transported to Korea after its translation in 706 it was rush printed to be placed into the pagoda before 751 (Soon Chul Kim, 1998, p. 89; Barrett, 2008, p. 107) or 742 (Kim S.-S., 2008, p. 42.)
6. The style of calligraphy used in this dharani sutra shows the common, traditional style of the writings of the Three Kingdom Era (三國時代) as seen inscribed on the monuments of *Pongp'yōng Shillabi* (鳳坪新羅碑) and *Naengsuri Shillabi* (冷水里新羅碑) of the Shilla Dynasty of Korea (Kim, 2000, p. 298).
7. Although it has been acknowledged that "China was the first to develop woodblock printing earlier than other countries by 400-700 years," as Pan (1998) has argued, the xylography used in printing of the *Dharani Sutra* is believed to have been developed first in Korea in their religious fervor to duplicate and spread the teachings of Buddha as quickly as possible (p. 36). Chinese scholars Shen Kuo (1030-94) and Yeh Meng-T'eh (1077-1148) wrote that this type of printing was not developed in China until the end of T'ang or the beginning of Sung dynasties during 712-756 in China, probably unaware that Korea or Japan could have developed it earlier than China, reported Sohn (1982, p. 122).

4. Woodblock Printing Artifacts Found in China and Korea

In 1908, 960 pieces of movable wooden types in the ancient Uyghur language of alphabetic writing were found by Paul Pelliot (1908) at Dunhuang, Gansu province, in what is believed to have been the library of the Buddhist cave-temple monasteries at Chien-Fo-Tung (the Thousand-Buddha caves) (pp. 525-528). They are preserved in the Musée Guimet, Paris. According to a recent study, they were made and used by Uyghur nationals in Xingjiang sometime between the end of the 12th century and the beginning of the 13th century (Needham, 1965, p. 45; Pan, 1998, p. 37).

Among others recovered by Aurel Stein was a beautifully printed scroll, *Diamond Sutra*, dated 868 and now preserved in the British Library. The other manuscripts were of varying dates from +406 until the time when the library was walled up, shortly after 1000. As Denis Twitchett (1983) documented, the remainder of the original 21,000 are said to have been collected by the Chinese Government in 1910 according to Salles G. Farai (p. 20).

Woodblock printing prevailed in Korea between the 10th and 11th centuries, as Pan and other scholars have agreed. The earliest extant printed matter of Korean origin, per Pan (1998), is the *Baoxiayintuoluonijing (Dhatukaranta-dharani sutra)* printed by the Buddhist temple Ch'ongji-sa in 1007, as reported by An Choon-Keumin 1990 (An, 1990, p. 42; Pan, p. 38). Han Moon-Yoon (1993) and Pan (1998) supposed that it was reprinted from the master copy published in Hangzhou by the ruler of Wuyue in China in 956 (Han, p. 9; Pan, p. 38).

Around this time the Korean xylography started, closely related to the establishment of national institutes for higher education and the rise of private schools, called Suh-dang (書堂), in the eleventh century. The latter were established and staffed by more learned and independent scholars than the national institutes. Growing number of these schools increased the demands for books to be more readily available than could be met by manuscript copies. In 1056, an office of a provincial capital requested for copies from the royal collection for the schools of the district. The government records show that local officials presented many titles of newly carved woodblocks to the royal library and asked the government to prepare more woodblocks for local printing. Koryō undertook extensive printing by establishing a new printing office in Kukchagam [國子監=National Academy) in the early twelfth century and reversed the practice of receiving printed materials from China by donating a set of Tripitaka printed in Korea back to Sung and Liao (Sohn, 1959, pp. 97-98; N.C. Paik, 1951, pp. 65-68).

What further intensified Korea's needs for printing was the unsuccessful coup by a clan of ruthless royal relatives which reduced the palaces and its library to ashes. This disastrous event, coinciding with the evacuation of Sung Dynasty to the south during the Chin invasion in the same year (1127), the only other source of book supply available, put an extra demand for printing replacement books in a quick and easy fashion. Korea needed "many titles in limited editions" rather than a large quantity of limited number of titles as China did (Sohn, 1959, p. 98).

5. First and Second Printing of Tripitaka Koreana in 1087 and 1251

According to Yi Kyubo (1168-1241), a large-scale printing of the complete Tripitaka occurred from 1011 to 1087, based on the Sung version (Yi, 1913, pp. 14-15). Unfortunately, the plates from the first printing of 5,000 rolls were burned to ashes during the invasion of the Mongols in 1232. Another push to republish the Tripitaka was launched even during the Mongol invasion. This began in 1236, and by 1251, 81,258 wood blocks were finished. The second version of the Tripitaka was carved from birch-wood brought from the southern island Koje by water and stored at Haein-sa temple, where they remain to date. Exporting of copies of the *Tripitaka Koreana* continued to the Mongol court and to Japanese feudal lords (Sohn, 1959, p. 99).

Until the end of the 16th century Japanese printing was entirely dominated by the presses in the Buddhist temples, and the spread of printing outside Buddhist circles only began during the brief flourishing of movable-type printing. From 1592 to 1595 the Japanese warlord Toyotomi Hideyoshi unsuccessfully attempted to conquer Korea, and among the war booty he took back to Japan was the equipment for movable-type printing, many fonts and technicians. They were used until about 1650, being popular among the court, individuals, and the temples, reported Needham (1954, p. 341). Nagazawa Kikuya (1952) and Thomas Carter & Luther Goodrich (1955) wrote that this Korean contribution subsequently combined with Western techniques gave the Japanese a start in typography (p. 135; p. 236).

6. Movable Metal Type Printing in Korea

About 400 years after the woodblock technique was developed in China, Bi Sheng (fl. 990-1051) invented movable type printing during 1041-48 according to his cousin, Shen Kuo, who gave a detailed description of the technique in his *Mongxibitan* (農書 = Dream Pool Essays) in 1088 (Needham, 1954, p. 201). Bi Sheng's movable type was made of clay mixed with isinglass glue, carved and baked to be hardened, a "revolutionary idea which provided the first step in typography," however, too fragile and short-lived, inadequate for the repeated use that Koreans desired (Sohn, 1982, p. 126).

Because hardwoods such as pear-wood and jujube which were used in Chinese xylography were very rare in Korea, Yi Yuwon in his un-paged manuscript *Imha p'ilgi* described, the type of wood used for carving in Korea was the birch (*Betula Schmidtii)*, which was "firm, cross-grained and heavier than water" (cited in Sohn,1959, p. 98). But the birch grew mostly on steep, mountainous terrain, too rare to be harvested for large-scale printing. This limitation of Korean xylography due to the lack of proper wood for carving largely contributed to Korean invention of type-casting with molds.

While the technique of mold-casting was an ancient Chinese art, Korea refined it into a high art of metallurgy during the Shilla dynasty, producing excellent bells and statues by the end of the 8th century. Cast iron coins of Koryō in 996 were produced by adopting a new method of coin-casting (ku-chu, drum-mold casting) introduced from China. Koreans produced coins that were praised by Sung Chinese coin experts for their "dignified form" and "excellent workmanship" with "clear and even characters." According to M. Ichihara (1913) this green-sand casting was used when they first cast Koryō coins, Haedong t'ongbo [해동통보 = 海東通寶], in 1102 (as cited in Sohn, 1959, p. 100).

Song Hyon (1909)'s description in *Yongjae ch'onghwa* helps us to understand the cast-type process employed by the Koreans (as cited in Sohn, 1959, pp. 99-100):

> *At first, one cuts letters in beech wood. One fills a trough level with fine sandy [clay] of the reed-growing seashore. Wood-cut letters are pressed into the sand, then the impressions become negative and form letters [molds]. At this step, placing one trough together with another, one pours the molten bronze down into an opening. The fluid flows in, filling these negative molds, one by one becoming type. Lastly, one scrapes and files off the irregularities, and piles them up to be arranged.*

This process of mass production of casting and printing required a division of labor from "letter-cutter, caster, storing boy, collator, and typesetter, filled by young literate boys of the artisan class" as it required the types to be placed on the manuscript in exact correspondence with the written form of characters. Song Hyōn (1909) remarked that this "mass production technique was an advantageous aspect of Korean typography which the Sung clay-type did not have (as cited in Sohn, 1959, p. 100)." Koreans found it "more economical and practical to use movable type to print a limited number of copies of many different books" rather than to print many copies of a few books with block printing as did Chinese who had plentiful material resources and a large population. Kim Won-yong (1954) explained that a book was rarely printed in more than 100 copies in Korea, therefore, "all Korean book[s] could be called 'limited' editions from the very beginning (p. 2 in Korean; p. 6 in English Summary)."

In other words, the Koreans whose alphabetic writing system used a simple character set preferred printing with movable type for its flexibility, whereas the Chinese – whose character set typically required thousands of characters – found the woodblock printing more economical for "printing on demand" once the blocks were produced with texts and illustrations. Twitchett (1983) reported that popular printers of Fukien in China published many illustrated books, such as novels, plays, medical books, handbooks on agriculture, etc. using woodblocks (pp. 85-86).

7. Movable Metal Type Printing of SangjeongYemun (상정예문 = 詳定禮文)

The first masterpiece produced with the newly-developed movable metal type printing technology in Korea was *Sangjeong yemun* [Compendium of Rites], the collection of all courtesies from ancient to contemporary Koryō, published by Choe Yun-ui and 16 scholars in 1234 –1241. It was printed in religious appeal to Buddha to help resist the Mongol invasions on Kanghwa Island where the government and the court were in exile from 1232 to 1259. Twenty-eight copies were printed with cast-type around 1234 and the re-carved wood block edition was made in 1239, of which one copy is extant.

The reason for the re-carved edition, as explained in its postscript, speaks for their religious determination to never allow the book to be out of circulation. Sohn (1959) suspected that most of the books and "veritable records" kept by royal historians were destroyed by the Mongols, resulting in the lack of historical documentation on the invention of cast-type printing during this exigent period in Koryō dynasty (p. 98).

In 1392 General Yi Sung-gye overthrew the last king of Koryō and his corrupt weak court, and enthroned himself as King Tai-Jong of the new Yi Dynasty (also called Chosun). What followed was a century of the most productive and prosperous period of Korea with strong rulers and patrons of literature when Korea led the world in printing and developed the use of metal type to a high degree, commented Carter (1925, p. 224). King Tai-Jong took a strong position to get rid of Buddhist influence which had pushed the Koryō court into its ineffective state and instead established the Neo-Confucian ideology with harsh criticism toward Buddhist theory. Consequently Koryō's strong support of printing Buddhist scripture was quickly replaced by the printing of Confucian classics as well as other books of history, literature, and philosophy, witnessed by bountiful praise to the kings and their glorious reigns for fostering the great invention (Sohn, 1959, p. 100).

8. Chickji (직지 = 直指), the Earliest Extant Typography used in 1377

Wooden-type and metal-type printing appeared in Korea almost simultaneously at the end of Koryō dynasty in the 14th century. One of those specimens is *Chickji* (or *Jikji*), the world's oldest extant book printed with movable types as certified by and included in UNESCO's Memory of the World Programme in 2001.Written by a renowned Koryō priest, Paegun [白雲] (1299-1375), *Chikji* was printed posthumously by his disciples in 1377, 75 years prior to the printing of the Bible by Gutenberg (Kyonghan, 1996, unpaged). Originally it was printed in two volumes totaling 307 chapters at Heungdok-sa Temple in Cheongju, Korea. Only the second [下] volume is extant but was collected and taken to France in 1887 by Collin de Plancy, the first French Consul to Korea, who passed it onto Henri Véver, a collector. Upon Véver's death in 1950 it was donated to Bibliothèque Nationale de France where it has been since (Pan, 1998, p. 38).Its presence in France, rather than in Korea, has been a topic of some controversy in both countries.

In *Chickji*, a collection of analects of Buddhist monks, Paegun gave an explanation of how Buddhism was transmitted through Seon [仙 = zen] monks to Koryō. While only one of the volumes of the metal-print version of *Chickji* published in Heungdok-sa is extant, the other woodblock version printed in Chwiam-sa comprises the complete two volumes and is preserved in the National Library of Korea. The metal-printed Chickji was exhibited at the UNESCO-sponsored book fair in Paris with an introduction by Maurice Courant (1901) as being the "earliest metal movable type printed book" in his Supplement to the 3-volume Korean Bibliography [*Supplement* à la *Bibliographie coréenne*] in 1972 (p. 70; Sohn, 1959, p. 149).

9. Explosive Effects of Printing Technology on Publishing in Europe

As the Mongol army swept its way westward and opened up the Asia-European land passages, some of the Chinese inventions were transmitted westward as well during the 13th to 14th centuries. Pan (1998) documented a few such evidences: the paper money issued with woodblock technique by Mongol Il-Khanete (1260-1353) in Tabriz, Persia, in 1294, and a detailed description of Chinese printing technique by Rashid al-Din (1247-1318), a Persian scholar, in his *Jami al-Tawarikh* (Collected Histories) in 1311. He also chronicled the spread of the new technology from Il-Khanete to Egypt during the Mameluke dynasty (1250-1517) founded by the Turks, and the discovery of Islamic Koran printed in Arabic during 1300-1350, unearthed in el-Faiyum area. Pan (1998) also noted that there were printing activities in "West Asia and North Africa" by the 14th century, unbeknownst to the Europeans (p. 40).

Historians, such as Carter (1925), have conceded that inventions of paper making and printing started in China in the form of woodblock printing, developed into movable metal type printing in Korea, and entered into Europe through the Mongols and Arabs who served as "agents" of providing the pathway, the Silk Road, to Europe (p. 185). However, Barrett (2008) observed, the "Eurocentric education systems in much of the English-speaking world" are still influencing many people to grow up believing Gutenberg was the father of early printing (p. x).

Gutenberg was indeed the "great founder of movable metal-type printing in Europe" and made improvements to the existing movable type printing technique from the East, such as using oil-based ink. While conceding that Gutenberg improved upon the Chinese technique and his methods spread to continental Europe and England, Pan (1998) also declared that Gutenberg's technique was the best of his time but not the earliest, "because before him China and Korea had already developed typography (p. 41)."

In contrast to the relatively slow adoption of paper manufacture in Europe, printing advanced very rapidly once it landed on European soil, radiating outwards from Germany with 260 printing press houses opening in Europe by 1500. The next thirty years saw a quick spread of printing by press in Italy, France, Spain and England, the innovation in the latter country being marked by William Caxton's famous press at Westminster Abbey. In 1540 the first press in the New World was established in Mexico City. In 1636 the first printing press was set up in the English colonies of North America. Tens of thousands of titles and ten million volumes, half of which were Bibles or other Christian texts and the other half literary, were printed (Carter, 1925, p. 101). Books printed before 1501 in this early period are known in Latin – both in libraries and among collectors and scholars – as *incunabula*, which means 'from the cradle', i.e., from the formative years just after Gutenberg's work – again, a reflection of strong Eurocentric ideas about the origins of printing.

The affordability and popularity of printed books, and their wide and consistent distribution, stimulated scholarship and popular reading in Europe, and was accepted by church leaders, both Catholic and Protestant. A lively book trade flourished around Basel where Erasmus, the leader of northern Humanism, had formed the Basel Group (*sodalitas Basiliensis*), fostering further collaboration between printing and scholarship. Don Heinrich Tolzmann, Alfred Hessel and Reuben Peiss wrote (2001) that from Basel the commercial publishing activities spread to Lyons and Venice, the chief printing cities of Western Europe, putting many affordable printed books into the hands of common people as well as the wealthy (p. 63).

10. Meager Effects of Printing Technology on Publishing in China and Korea– Why?

Whereas printing with movable type metal type was closely associated with the spread and penetration of widened knowledge to the public in the West, it failed to have such an impact in Asia. In Japan, Barrett observed (2008), printing was available for nearly thousand years "before it had any detectable popular impact (p. 23)." In China, where block printing originated, almost two centuries passed without any further developments. Barrett (2008) attributed this phenomenon to their collective hatred toward a woman, Empress Wu, who had "discovered printing" early on and given her full support, upon her death in 704 (p. 23). In Korea, where the world's first book was printed with movable metal type in 1377, printing remained largely under the monopoly of the government without benefiting the ordinary people's lives. During the early history of Korea "Chinese learning was as essential to the Korean as Latin was to the European," related Sohn (1959, p. 96). In the fourth century the Chinese education system was introduced to the Koguryo state of Korea and a modified civil service examination system was adopted after the unification of the three Korean states by Shilla in the seventh century. As stated earlier in this paper, the proliferation of private schools fueled the demand for books, more specifically Chinese books. Up until the tenth century, woodblock printing of Buddhist canons in a religious plight to repel the Mongols remained active in Koryō dynasty, as documented in *Koryōsa* (1976), the chronicle of histories of the dynasty (as cited in Sohn, 1959, p. 96). During the following Yi Dynasty, Koreans' interest in Confucianism replaced Buddhism, and government- sponsored printing of books took a firm foothold, manifesting yet again in a vigorous convert's zeal, while suppressing the entrepreneurial adoption of printing of popular reading materials for the common people (Sohn, 1959, p. 96).

11. Conclusion

Fifty Pieces, Bearing Chinese Characters and Cast in Seoul in 1403, Are in Exhibition at National History Museum- Four newspaper articles about Korea, re-typed (Kungminhoe, 2000, p. 1).

> *Included in a collection of rare objects having to do with Asiatic civilization, now on view at the American Museum of Natural History, are fifty pieces of type bearing Chinese characters, a part of the first movable type font ever made. They were cast in Seoul, the capital of Korea, in 1403, and are the property of the Government printing office. It is to Korea that the distinction of having invented move-able metal type belongs, quite a while before Guttenberg [sic, Gutenberg] founded his press in Europe. The other half of this ancient of fonts is now in England.*

The above article, I believe, succinctly sums up how cross-national exchange of ideas has promoted further development of technology and culture, and the resulting cultural and historical assets are shared by nations across the globe. Carter and Goodrich (1955) observed with curiosity, "It is ironic that after originating in Korea and spreading to China, typographic technique probably went from China to the West... it took three centuries to get to Japan, arriving at about the same time as Western typographic techniques (p. 183)." They attributed this roundabout flow of technology to the official relationships surrounding political hegemony among the three countries in the Far East. For the same reason, Sugano Gimpachi (1924) wrote, although the Japanese received forty-three xylographic copies of the Tripitaka from Korea, they did not gain the techniques of typography which remained in the exclusive control of typography by the government in Korea from the fourteenth to the sixteenth centuries (as cited in Sohn, 1959, p. 102).

On the other hand, Korean typography migrated to Yuan China due to the amicable ties between the two countries during the late 13th century and spread to Arabian countries as a means to print playing cards before reaching Europe. "So what we can say about the history of printing," Sohn (1959) reiterated, is that, although the idea of typography spread from China to Korea, the Korean invention of sand-mould casting of metal type and printing migrated back to China, and then to Arabia and Europe (p. 103). Korea developed the bronze and lead ferrous alloys for type casting, but Gutenberg found new lead alloy for his types. A further innovation was made in the printing process by the use of a pressing machine. The invention of this pressing machine was yet another enhancement to printing. "From seal, stone place, woodblocks, clay type, metal type, to typewriter and computer, there was a continuous human effort for the invention throughout the history of civilization regardless of their national origin," summarized Sohn (1959, p. 183).

I conclude this paper by quoting the ending remarks of Hobson (2004): "Since Korean typography underwent so remarkable a development just before the appearance of the process in Europe [by Gutenberg], and there were possible lines of news transmission between the Far East and Germany, the burden of proof really lies on those who assert the complete independence of the European invention (pp. 185-186)."Not only was Korea first with movable metal type, it did so in the face of greater structural obstacles, ranging from political obstructions to the newness of a usable Korean character, Hangul, set to religious and dogmatic barriers in the forms of Buddhism and Confucianism. None of these impediments were good for those who would have ultimately benefitted most from widespread printed works: the large masses of the population, especially the women, rather than the elites. As Sohn (1959) concluded, "the monopoly of science in any country by and for a limited group of people does not benefit the people in general (p. 103)." Consequently, the publishing industry of Korea stayed dormant for several centuries until the early 1900s when the early modern classics of the West as well as Korea's own popular literature were first introduced in the mass market. Only then, the great inventions of Korean movable type printing and Korean written language system could play a role in breaking down the barriers in a highly stratified classist society and motivating the subalterns to open their minds and liberate themselves for better lives.

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