

THE HISTORY OF PAPERMAKING

The paper was highly valuable at the time of its invention in the first years of the 2nd century A.D. The skill of its production was kept as one of the court secrets and the official inventor Ts'ai Lun enjoyed royal honours. Paper was produced from fabrics fibres. The procedure implied the pulping stage: disintegration in water with additives; sheet formation stage: pouring the pulp into the sieve for dewatering and random interlacing of fibres; finishing stage: drying and smoothing. Paper was produced in sheets and was not only used for writing but for packaging as well, for tea bundles in the first place. The fact that the papermaking technique remained secret for more than seven centuries tells more about the rigidity of the empire than about the value of the product. The other fact is that once the production skill found its way out of the court enclosures, it took centuries for it to spread over Asia and North Africa to Europe. This indicates that in other countries paper was not appreciated in the same way as it was in China. The production procedures as well as purchasing of fabrics that were used as raw material were not competitive with other writing substrates. The history of ancient civilisations discovered a variety of materials that were used for that purpose. During Sumerian, Babylon and Persian civilisations and even Egyptian, clay plates were used for engraving the data. In Rome, the most important documents used to be engraved into the metal plates. More often the palm leaves called *folium* in Latin were used as writing substrates; the term is still in use as *folio* for the book page. The tree bark was in use as well, the inner smoother bark side, called *liber* in Latin. Etimologically the term was later used in the meaning of book as *pars pro toto*. The Egyptian papyrus was the most similar product to the paper, but still it was not the paper by definition even if it was produced from the stalks of the papyrus plant. The stalk ribbons were knitted to form the mesh-like thin structure. It seems that for centuries the most preferable writing substrate in Europe was parchment or velum, the thin sheep skin with excellent physical properties. However, paper was used as the printing substrate for the first known printed book, the Diamond Sutra, a Buddhist text in Sanskrit, from the year 868, discovered in 1907 in the Mogao Caves in North China. It would be interesting to learn about the motives for using the paper. Was the unknown printer just being practical considering that if it was appropriate for writing it might have been good for printing as well? Or the unknown printer appreciated the paper and the Chinese manufacturing tradition and was familiar with its smoothness, softness, absorbency, colour or smell? Whatever the motives, neither the printing nor the papermaking were considered

as relevant civilisational development factors at that time and were not rewarded by the global fame. Only when the printing process was discovered for the second time in human history, at least according to our current knowledge, the social surroundings were mature enough for its acceptance and further development. There are no indications that Johannes Gutenberg had any knowledge about the printing technique used in China and Korea centuries ago. If Marco Polo was the most trustful liaison between Europe and Far East civilisations, there is a time gap of about 70 years between the Polo's death and Gutenberg's inventions. This makes the story even more exciting! Gutenberg conceived a series of inventions in an almost identical way as they were used centuries ago and thousands of miles away: movable types in the first place. Isn't it amazing? In both cases the wooden types were used firstly, to be replaced later by metal types. In Korea ceramic types were used between the two. Regarding the paper use, we are pretty sure that Gutenberg preferred the velum to the paper. Even if he used paper for his very first prints, the Indulgences, when it came to the book, there was the velum, mostly for its mechanical properties. Only, paper was affordable by price and quantity. Therefore, Gutenberg printed the Bible on both the velum and the paper, considering the velum part of the edition more valuable. This is obvious from the illuminations and decorations applied manually on printed sheets. Besides the Gutenberg's Bible, there is only one incunabula in the world printed on two substrates, velum and paper, the book that is specific for other reasons as well. It is the first Croatian printed book, the Missal from 1483, printed in Croatian language and in the medieval Croatian Glagolitic script. The specificity of the publication is its liturgical content combined with local language and script which was approved by the Roman Catholic Church of the time, an unprecedented decision in an otherwise Latin-dominated culture.

The speed of acceptance and spread of the printing ability across Europe and abroad influenced papermaking in at least two ways – the duration of the production process and the types of raw materials. Improvements in both, in conjunction with the civilizational development in general, led to industrial papermaking. In 1719 Ferchault de Réaumur suggested and about half a century later Friedrich Keller developed the use of wood fibres for paper production.

Nicolas Louis Robert invented the paper machine in 1798. The machine was able to produce the paper web, the endless paper web, as 15 meters of paper seemed at the time. However, the invention was in a way ahead of its time, for the printing was still sheet-fed, so the paper web

was cut to sheets to be printed. Further developments in printing technologies were closely followed by the development in papermaking and the paper gained an irreplaceable status. The permanent increase in the global paper production volume during the last century raised the awareness of environmental issues in a way that used paper was considered as raw material for further exploitation. Re-use of fibres in the production of recycled paper was the predominant option. Step by step the whole chain developed to form rational systems of managing the secondary fibre materials in papermaking: collection and transport, sorting and de-inking, social awareness and education.