

Textiles, Temples & Paper in China & Tibet

Presented by the President Rev. Dr. R L Hills

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Visits to the western parts of China and eastern Tibet in the late springs of both 2002 and 2004 organised by the Americans, Dr. Sydney and Mrs. Elaine Koretsky, took us to around fifteen places where paper is still made by hand. At each place, different techniques were observed, some of which could date back to the invention of papermaking by the court official, Cai Lun, traditionally in 105 A.D. These techniques may explain how the methods of papermaking evolved which were carried by the Chinese westwards, then by the Arabs from Samarkand after 750 A.D., and finally reached Spain soon after 1,000 A.D.

A primitive method of sheet formation was seen at the remote village of Dimen in South West China, perhaps about two hundred miles from the place where Cai Lun lived. Here the bast fibres from the bark of the paper mulberry tree, *Broussonetia Papyrifera*, were used. Our party was greeted by the village girls dressed in their colourful local costumes with tin headdresses and other ornamentation. The village pipe band also conducted us to the papermaking site. Initial preparation of the fibres was not seen, except for beating for a short period with a stout short hand-held stick. The fibres were dispersed in a bucket of water to which was added a formation aid, a sort of treacle-like viscous liquid derived in this case from a type of wild kiwi. Elsewhere, cactus, hibiscus, pine bark or roots and a variety of other plants might be soaked in water to obtain this liquid which delayed drainage of the water from the pulp.

The mould on which the sheets of paper were formed consisted of a rectangular wooden frame about 3 ins. deep, across the bottom of which was stretched a coarsely woven cloth to act as a sieve. The far side was suspended from a stand while the woman papermaker held the opposite side horizontal with her left hand. With her right, she scooped out of the bucket a ladle-full of pulp. As she poured it into the mould, she manoeuvred the mould so the pulp flowed evenly across it. Up to ten ladle-fulls might be necessary to obtain the required thickness of the sheet so that the whole process might take a good five minutes. Water drained away through the meshes of the cloth. The mould, with the sheet of paper still on it, was stood up to dry and, when dry, the sheet could be pulled off. The size was 32 ½ ins. by 32 ½ ins., so was larger than most paper made by hand in the West. The principal use for this paper was to line coffins.

A development of this simple pouring mould was seen in Tibet after a drive of 600 miles in three days which took us from Cheng Du across passes of 14,000 and 16,000 feet high to Dege. Here some paper is still made by hand for the place where Buddhist scriptures are printed. The root of the *Stellera Chamaejasme* is used, a plant which has a long tap-root. The outer brown surface had to be scraped off by hand before the inner fibres could be boiled for about half an hour in an alkaline solution of soda ash. The fibres were transferred to a stone mortar where two women beat them with heavy wooden hand-held mallets for over half an hour, a fatiguing task. The beating here was much more thorough than at Dimen so that the resulting paper was better quality. The pulp was dispersed in water in a plastic bucket and carried to the vat which was nearly filled with water. A wooden framed mould, with a much finer cloth across the bottom, floated in the water. Three ladles of pulp were poured into the mould and dispersed by the women papermakers evenly throughout the water within the mould. The mould was lifted out horizontally very carefully to avoid disturbing the even layer of pulp. The water drained out, leaving the new sheet of paper on the cloth. Once again the sheet of paper had to be left to dry on the mould, in this case overnight, before it could be pulled off. The sheet size was 39 ins. by 27 ½ ins. Production was ten sheets per day. This type of floating mould spread from southern China, into Thailand, then westwards to Burma and along the southern edge of the Himalayas into Nepal but not much further. Its advantage, like that of the pouring mould, was the large size of paper formed on it. No pulp was wasted through being left in the vat so less pulp was needed. But disadvantages were the time it took to form a sheet. While the paper was smooth on the lower side against the cloth, the upper side was rougher, caused by irregularities in the pulp. Then, because the sheets had to be left to dry on the mould, a large number of moulds was necessary.

It was a different type of mould, the dipping mould, that reached the West. Near Zhongdian on the borders of China and Tibet, papermaking has been revived again for the scriptures of the Naxi people with their pictograph writing. Their methods seem to be an intermediate stage, combining features of both floating and dipping moulds. At the village of Sanba, bark was stripped off the 'string bush', *Wikstroemia Delavaye* or *Lichiangensis*. The outer brown bark was cleaned off to leave the bast fibres which then had to be boiled in a solution of soda ash, washed and beaten by hand with a stout stick. The bottom of a wooden trough was filled with water and in it was placed a heavy wooden framed mould about 10 ins. deep. Its bottom was formed from a removable sieve or screen of strips of bamboo about ¼ ins. broad, the laid lines, sewn together into a mat with sort of chain lines. It was, in effect, a primitive form of the screen or cover on later moulds and could be lifted out of the bottom of the mould.

The papermaker, subsequently always male, placed the mould with the screen in it in the water in the bottom of the trough. He poured in the requisite amount of pulp to form a sheet and dispersed it with his fingers. Mould and screen were raised out of the trough. After the water had drained out, the screen, with the sheet on it, was removed from the mould. Then the screen was turned upside down and the sheet of paper pressed off onto a wooden board. The screen was removed, leaving the sheet on the board. The screen was then used to press more water out of the sheet. This also helped to smooth the upper surface of the sheet which was left to dry on the board. The sheet size was only 9 ½ ins. by 23 ½ ins. Pouring the pulp into the mould, the economical use of pulp only in sheet formation and drying on boards are features similar to the earlier pouring and floating moulds. Transferring the sheet from the screen to the drying board so that only one mould and screen were necessary and pressing are features of the art of papermaking which spread westwards with the dipping mould.

It was the dipping mould which introduced much greater productivity into papermaking. Fibres sources seen being used with it were the bast fibres of the paper mulberry imported from Thailand, bamboo of the order Gramineae and Dragon's Beard Grass. Processes for each were generally similar. Bamboo, which had grown twelve or fifteen feet high in about three months, was cropped before it started to flower. It was cut up into three foot lengths about an inch wide. These were left to soak with lime and water in a pit for a length of time which varied from place to place. A steaming process in large heated cookers with more lime was usual. For high quality mulberry paper, there could be a further cooking in soda ash. There would be washing at the different stages. Then followed pulping. At Long Zu, the bamboo was placed in the trough of a stamper operated by a man. He pressed down one end of a wooden shaft pivoted in the middle which had a heavy stone at the far end to act as the hammer head. A woman pushed the bits of bamboo under the head. The simplicity of the construction, and from similar stampers being used in India and Kashmir, points to this being the form of pulping unit transferred westwards. Various forms of edgerunners or Kollergangs were seen where the fibres were squashed under the heavy stone disc. Water buffalo, an ox, a horizontal waterwheel and electric motors were seen driving these devices. It was apparent that the circular bedstones as well as the vertical edgerunners would be much more expensive to construct than the foot-operated stamper.

The pulp was dispersed in a vat from where it was scooped up directly by dipping the mould into it. The type of dipping mould which was taken over by the Arabs consisted of a framing made of wood about 1 ½ ins. deep with thin bamboo ribs spaced from about 1 ins. to 2 ½ ins. apart, stretching from front to back. On top of the mould was placed the screen which consisted of thin strips of bamboo about 1/16 to 3/32 ins. thick running from left to right, the laid lines, held together with thread from front to back, the chain lines. Stouter strips formed the front and back edges.

The sides for the screen consisted of removable strips of wood, the deckle strips. The papermaker placed the screen on the mould and held it in position with these deckle strips. He dipped the mould with the cover in position into the pulp to scoop some up which he evened out across the surface of the screen to form the sheet of paper. To obtain the correct thickness in the sheet, he might dip a second time. He allowed the water to drain away by placing the nearer edge of the mould on the side of the vat and the further one on a bamboo pole placed across the vat. Sheet formation with the dipping mould took only a fraction of the time needed with the pouring or floating moulds.

When most of the water had drained out, the papermaker lifted the screen off the mould framing and turned round to a press. He aligned what had been the front edge of his screen against vertical posts and couched the newly formed sheet off. If it was the first of the day's production, he couched it onto a board or, if later ones, directly on top of those already finished. The sheets were not separated by any felt blanket, as became the practise in the West. When a sufficient number had been made, the post of wet sheets had boards placed on top which acted as the fulcrum for a lever. The shorter end of the lever fitted under a cross bar on the framing of the press while a rope was attached to the longer end so that end could be pulled down by a winch. At some of the mills where good quality paper for calligraphy was manufactured, a metal frame was erected over the post and a large hydraulic jack used to create the pressure.

These sheets of paper were compressed into a seemingly solid damp block. It is still a mystery why they did not become fused into one solid lump. But this pressing helped to give the paper a smooth surface on both sides. The block was carried to the drying house and placed nearly vertical. The sheets were peeled off generally one at a time and brushed onto the surface of the drying stove. These stoves consisted either of a pair of brickwalls, tapering towards each other with plastered surfaces, or near vertical sheets of steel. A fire at one end provided the heat. The paper took on the character of the surface of the stoves, those with the steel sheets giving a much smoother surface which did not need further calendering. Paper for calligraphy did not have to be sized owing to the type of ink used by the Chinese. The coarse yellow bamboo paper might be cut into shapes of gold coins for burning as offerings in ancestor worship.

The size of paper formed on the dipping mould described so far was limited by the stretch of the papermaker's arms. Another type was seen at various places which overcame this problem. This type was also used for small sizes of paper which was the case in the first mill seen in 2002 where we were the first non-Chinese visitors. The framing of the mould was similar to that described for the dipping mould except that a little way in from one end was a pivoted handle. A screen was placed on the mould and held in position with one hand at the opposite end to the handle. The handle was swung across the mould and screen and caught under a catch but remained clear of the screen. The mould was dipped in such a way that it was drawn towards the papermaker so that the screen was always pushed against the framing to keep it in position.

On large moulds, part of the weight was taken by a counter-balance system. After the sheet had been formed, the mould was supported on poles across the vat while the water drained out. The handle was swung clear, enabling the screen with the newly formed sheet to be lifted off to be couched, pressed and dried in the way described earlier. There were two advantages with these moulds with handles. One was that the screen did not have to be the same size as the mould. The more important one was that the mould could be much larger than the stretch of the arms of the papermaker. A variation was seen with a pair of handles which probably gave a better balance.

At Jia Jiang near Cheng Du in North West China, sheets 60 ins. by 33 ins. were being made regularly by one man on single-handle moulds. Two men were needed to manipulate moulds 8 ft. 6 ins. by 4 ft. 3 ins., taking about two minutes to form a sheet. They even produced sheets of handmade paper about 13 ft. by 6 ft. Such sheets were far too large to handle in the usual way for drying so that, after pressing, the block was taken to the drying house and placed horizontally. One by one, each sheet was rolled around a pole from which it was unwound and brushed onto the steel plates of the stove. These must be the largest sheets of paper made by hand. This method may also give a clue about the way the large sheets of paper seen in eighteenth century Chinese wallpaper were made which were bigger than any manufactured in the West at that time.

The opportunity was taken to visit other craft industries and see early techniques. Rice fields were seen being irrigated by 'norias', undershot waterwheels which had their rims fitted with additional buckets that filled with water at the bottom and emptied it into a trough at the top. Sometimes the buckets were made from old plastic bottles. On the way to Tibet, streams were often diverted to power simple corn-grinding mills with small horizontal wheels turning the upper stone directly. Some were housed in stone buildings but others were found in wooden structures similar to those in Scandinavia, Shetland or Switzerland.

Looms for weaving plain cotton cloth about 18 ins. wide were demonstrated. One old lady had a very fast rhythm for sending an ordinary shuttle across and beating up the weft which was almost as quick as a weaver with a flying shuttle and picking stick. We were taken to a showroom in Shanghai to see fine silk carpets being woven and trimmed. The prices were well beyond what most of us could afford but an American did buy one.

Then there was dyeing fabrics with both batik and tie and dye methods. In both cases, the design was cut into a sheet of plastic so it could be transferred and marked out on the cloth. In batik, a sort of pen traced out the design, leaving wax on the cloth. Dyes for other colours were painted in the appropriate places of the pattern before the cloth was immersed in the indigo vat. The indigo could not penetrate the wax or the painted areas so that the indigo did not take on these parts except where the wax had cracked, leaving faint blue lines across the cloth following the cracks. In tie and dye, the indigo was prevented from reaching parts of the cloth by tying it up tightly with cotton thread. After dyeing, the threads were cut and pulled out to open up the cloth so that the pattern was revealed. The contrast between the dark blue indigo and white cotton was startling.

Cultural sites such as temples were also visited. Dimen village with the pouring mould had the traditional architecture of the Dong people, an ornate entry arch, a pagoda with dragons on the roof, ornate bridge over the river and their typical tower which was possibly a sort of temple. At Lijiang, there was an open air museum in the Green Dragon Park with temples and other buildings brought from elsewhere. One highly decorated and ornate temple had been turned into a war museum but others had become centres for preservation of cultural material from local tribes such as papermaking from Sanba. At Dali, we stopped to admire the three very tall pagodas of the Chongsheng Temple. The two smaller ones were built in the twelfth century A.D. at a mere 42.19 meters high but the central one built around 850 A.D. was an impressive 69.13 meters. Their historic importance was recognised so they were not destroyed in the Cultural Revolution as was the associated temple. This has now been entirely rebuilt with its golden Buddhas.

At Zhongdian, 11,000 feet high on the Tibetan borders, afternoon tea was taken in a traditional private house made of mud. Interior wall decorations were highly colourful especially in a room which appeared to be a sort of temple. Yak butter tea is an acquired taste. Zhongdian is noted for its Buddhist monasteries which are undergoing something of a revival with numerous monks. After passing the rows of prayer wheels at the entrance gate, we were faced with a stiff climb up a long flight of steps, quite breath-taking at that height. In the main courtyard, some monks were dancing to the band playing trumpets at least 12 ft. long as well as drums. The colourful interiors of the temples were very dark in the areas used for worship. In the two years between visits, much restoration had been carried out with fresh gold leaf applied to the finials on the roofs as well as the roofs themselves. The Chinese are encouraging tourism to bring employment to these poor remoter parts of the western region and have now renamed Zhongdian as Shangri La.

What was undoubtedly the highlight of both visits to China was going to the Buddhist printing house at Dege in Tibet. As our coach struggled up the mud roads over the high passes, we had plenty of time to admire the skill of the engineers who laid out the routes to maintain a steady gradient, twisting around mountain spurs and zigzagging up the steep rocky sides. But this had been achieved at great loss of human life, in some parts one person for every meter. We made the journey after the snows had melted but even so had to battle through snowstorms to reach Dege. There we were able to see a temple being reconstructed. Adzes as well as electrically driven routers and sanders were being used to fashion the new tall wooden pillars supporting the roof. These were magnificent pieces of timber. Again the interior walls were painted with brightly coloured scenes, contrasting with the normal darkness of the interior. Parts of the walls might be covered with fabulous textiles woven with seemingly gold threads.

The printing house was founded in 1729 by King Tempa Tsering and later enlarged so it now has over 270,000 wooden printing plates. This treasure was almost destroyed in 1966 during the Cultural Revolution but was saved by two people locking themselves in the library. It was authorised to reopen in 1979, printing on Chinese machine-made paper, and in 1987 reopened for worship. The handmade paper here is used for larger plates. One of the smaller ones takes about a day to carve by hand. Red ink is used for Buddha's words translated into Tibetan and black for most other texts. The ink is water-based so the plates are washed before being put back into storage. The printers of the narrow plates for texts, which are regularly

read in the monasteries, work in pairs seated opposite each other. One bends over to ink the plate. As he straightens up, his partner bends over and places the paper on the plate. As he straightens up, the first runs a roller across the paper, pressing the paper onto the ink, bending over and straightening up again to allow his partner to bend over once more and lift the paper off. With this alternate bobbing back and forth, they could print about a thousand sheets a day. The printed sheets were dried and checked in a neighbouring room. As in other buildings connected with Buddhism, the interior walls were generally colourfully decorated. The exterior walls were painted reddish brown with a black strip around the top. Flat roofs were plastered with mud.

The presentation was illustrated with slides taken on the trips. Samples of the various types of paper made at the different mills were put on display. There were also examples of the textiles including a small Tibetan carpet with a design of a pair of dragons. A longer account of the papermaking places seen in 2002 was published in the British Association of Paper Historians journal, *The Quarterly*, Number 54, April 2005 and that for 2004 in *The Quarterly*, Number 56, October 2005.