# BARKCLOTH AND THE ORIGINS OF PAPER

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In terms of its importance to human advancement, the invention of paper must rank with the invention of the wheel and the invention of writing. History makes no attempt to attribute the latter two discoveries to one person, yet credits one man, Ts'ai Lun, with the invention of paper in 105 AD. That one man should "invent" something like this out of the blue is a remarkable proposition, and one I propose to question. I propose to suggest that the groundwork for his "discovery" was in place, developed over possibly thousands of years, and that the substance which he developed into paper was barkcloth. At the outset I should make it clear that the central idea behind this suggestion is not original. The initial research supporting such a proposition was the undertaken by Professor Shun-Sheng Ling and his daughter Mary Man-Li Ling, both of Taipei University, Taiwan. They published their findings in 1963, and even then Ling was modest about his thesis, writing "This is not a new discovery, since several colleagues have touched on this point before. In fact every ethnologist who has made enough study of barkcloth and its raw material as well as its making procedures, coupled with enough knowledge of the paper-making art, can come upon this same theory."(1) Consistent with such modesty, may I say that my contribution, if it is one, is merely to attempt to provide clues about the barkcloth technology of Ancient China, and suggest ways in which this may have led to the development of paper.

My interest in the connection dates from the mid-1970s. I have since then been involved in several aspects of papermaking, and since roughly the same time, I have been continuously engaged in research in Fiji (my home-country) into the manufacture of barkcloth, the most socially significant artform surviving there. In the course of this work I have read virtually everything that has been published about barkcloth manufacture throughout the world, and have seen most of the world's major museum collections of this material. In the following discussion, I will suggest that the evolution of barkcloth technology as Pacific man advanced both geographically and culturally in his new home, may offer important clues to the manner in which a similar evolution was occurring, though at a rather more rapid pace, back on the Asian mainland whence his technology had originally come.

Barkcloth and paper look and feel similar, and writers from the earliest European explorers to present-day anthropologists have commented on that similarity. Interestingly, though papermakers and paper historians have also long recognised a strong connection, they do not appear to have viewed barkcloth as ancestral to paper. Rather it has been anthropologists who have worried away at the matter. The reason may be simply the direction from which they have

approached the subject. Dard Hunter, for instance, included a chapter in his book on "the writing-substances of the ancients", and included Mayan *huun* and Aztec *amatl* with Pacific barkcloth or *barkcloth.* He apparently saw these, however, along with Egyptian papyrus and Chinese "rice paper", as dead-ends which, while interesting enough to pursue for over a year, he finally abandoned. His reason seems to have been that none conformed to the classic definition of papermaking, of disintegrating fibres and re-forming them on porous moulds, and since he considered that process to have been the offspring in China of silk-manufacture and felt-making, he did not pursue any connection with barkcloth. It is very possible that he did not know barkcloth had ever been made in China - certainly he did not mention it.

Everyone here knows what paper is, and how it is made, but since not everyone here will be familiar with barkcloth, I will spend a few minutes on a general description, with illustrations drawn from Fijian practice. Made until recently in many parts of the world, the process is always similar though it differs in detail. The bark of suitable trees is peeled off, and the outer dark layer separated from the inner light-coloured layer (the bast). This is soaked in water and then beaten on an anvil with a mallet - anvils and mallets may be made of either wood or stone. The purpose of the beating is to spread the fibres of the bast and make it into a thinner, wider and more supple fabric. Sometimes several layers of bark are felted together with further beating, sometimes a single layer only is used. Certainly the prolonged heavy beating causes a degree of fibrillation which aids felting. In societies where such fabric was made, it generally performed all of the cultural functions of both cloth and/or paper, functions both sacred and secular. It was probably made first as clothing, and as such would have been cooler and more easily made than animal hide garments. Since the single most widely-used family of plants throughout the world are members of the Moraceae, or FIG family, it is interesting to speculate on whether the Biblical reference, when Adam and Eve "knew they were naked; and .. sewed fig leaves together, and made themselves aprons" (2), is not in fact a misunderstanding by the later chroniclers, of oral tradition about the early manufacture and use of barkcloth by the people of the Middle East. The discovery in September 1991 of the 5000-year-old, remarkably-preserved body of a bronze-age man on a French alpine glacier, clad in finely-fashioned leather but *wearing barkcloth gauntlets*, is an interesting testimony not only to the existence of the craft in Europe, but to its continuing into an era of considerable technological development.

In the Mayan empire, perhaps two thousand years or more ago, fig-tree barkcloth was used for tunics, and in time also formed folded books in which the priests could write the accumulated wisdom of their people, and store them in libraries. Such was its importance that the barkcloth assumed religious, even sacred significance. The Toltecs refined Mayan techniques, and handed them down to the Aztecs who elevated the manufacture to a veritable factory production, to provide ten metre long scrolls and folded sacred books - again stored in libraries, preserved for centuries until their almost total destruction in by the Spanish in the grossest act of biblioclasm since the destruction of the great library of Alexandria.(3) The vestigial remains of this craft are to be seen in the fabrication of *amate* paper in Mexico today - its religious importance also vestigial, in its use for witchcraft and spells. In some parts of Central America, too, barkcloth garments are still made and worn.

That there was a substantial barkcloth manufacture throughout China and the offshore islands is borne out by written records which began to appear (on wooden tablets!) about the 6th Century B.C., and by archaeological finds of stone beaters. The latter suggest that barkcloth manufacture

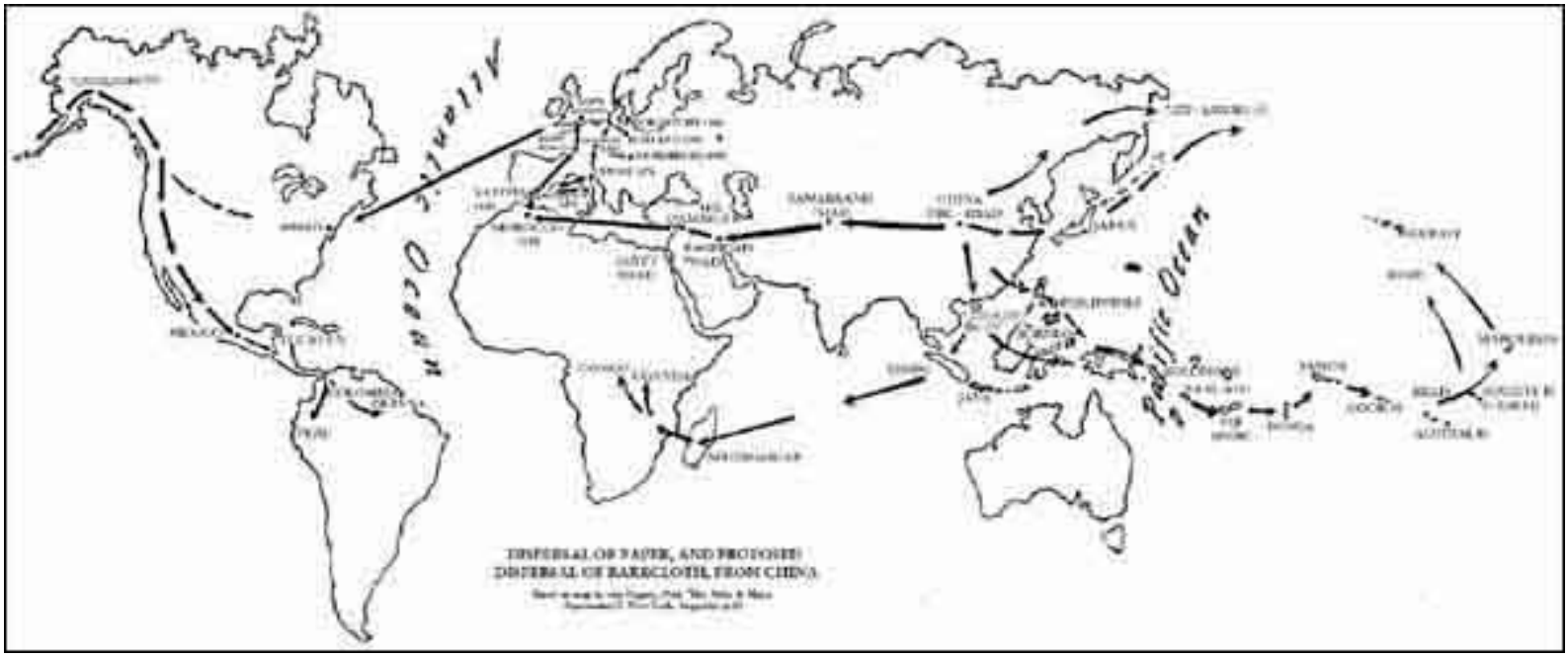
may have been in existence there for many thousands of years, and it continued right through to the 20th. Century in some places.(4) It seems likely that at least a principal bark-source, and very possibly the original one, was the indigenous paper mulberry - very probably *Broussonetia papyrifera,* closely related to the *kozo* (*Broussonetia kazinoki* ) still used for a large proportion of the handmade paper produced in Japan. The barkcloth was used, as elsewhere, for clothing, and even for a light armour with copious folds to trap arrows. This armour is said to have been made by people who "beat and connect bark into armours" - which strongly suggests that it was barkcloth rather than true paper.(5) Interestingly, with the development of writing in China, which may have occurred as early as 1200 BC,(6) the use of barkcloth as a vehicle does not seem to have happened automatically as it did in Central America. As in the Mayan empire, the script was initially incised on hard materials (in China, the shoulder-blades of sheep and tortoise-shells), but with the advent of writing in ink in China, the transition was to bamboo strips and boards, and later to silk. It does seem possible that certain particularly fine, small sheets of "document paper" which are referred to about 150 years before Ts'ai Lun (called *heh-ti* ) may have been a type of barkcloth, but this is inconclusive.

It seems probable from a careful analysis of early texts that a form of paper, made from macerating fibres and sieving them onto a porous mould, existed in China at least a century before Ts'ai Lun's time, and that the raw material was waste silk.(7) This would not have been paper, but something closer to felt, since no hydrogen bonding would have occurred with silk, and it may well be that some form of mucilage or surface-sealant would have been needed to give it a firm surface for writing and printing on. T'sai Lun's "invention", may have consisted rather of lateral thinking, to substitute for the relatively scarce and not wholly successful silk fibres, the far more plentiful and more robust fibres associated with the barkcloth industry which we now know to have been well established in his home province. There is mention in the traditional histories of his use of "rags", and these may well have also been barkcloth. With the fibrillation and hydrogen-bonding which would have resulted, the results would have been immediately and spectacularly more successful, and it would have been a fairly logical extrapolation to have then used the even cheaper hemp waste (in the form of the old rope and nets mentioned), with equally successful results. Indeed recent tests of ancient Chinese paper samples from the British Museum, dating from approximately AD 400 to AD 1000, consistently show hemp as the main constituent fibre. In the samples tested, paper mulberry occurs as the principal fibre only in papers from the two centuries AD 700 - AD 900.(8) This seems contradictory to the thrust of the argument above, but several factors should perhaps be born in mind when considering this. It is not known precisely where the samples tested were made, and regional availability of fibres would very possibly be significant; there were in the sample group no papers from Ts'ai Lun's time; and given the very small number of pieces of paper available for testing, it is dangerous to draw conclusions about whether or not they are representative of the wide-spread manufacture. Certainly paper mulberry would seem to have been the fibre source for the paper currency called *chu-pi* (*chu* means paper mulberry, *pi* means currency), and it appears that for this the bark was beaten manually.

I do not propose to elaborate further on the evidence presented by Professor Ling. It is copious and persuasive. As a student of barkcloth, what has caught my interest from all of the foregoing is a speculation on the nature of the barkcloth that was talked about. Certainly the paper-mulberry or *chu* formed a significant, if not exclusive, raw material. However the ancient literature which Ling has culled for information remains infuriatingly devoid of descriptions of

manufacture. To speculate about its nature, and its manufacture, all that is left is to infer from what are almost certainly its first, second or third cousins - the barkcloths of the Pacific. There is in fact some logical support for the proposition that a large number, though probably not all, of the barkcloths of the world are descended from those that originated in China or at least from Eastern Asia. The settlement of the Americas via North-east Asia seems well established, and the barkcloth found from Alaska (where the Eskimos used whale-bone beaters) to many parts of South America was in all probability brought with the immigrants. The barkcloth of Africa may well have entered via Madagascar, which was settled by people who voyaged there from somewhere in Southeast Asia, and spoke a language we call Austronesian. Another wave of people from the same language-group, probably about the same time, voyaged south-eastwards into the Pacific, and it was they who were the ancestors of the present Polynesian race. Modern archaeology and archaeological linguistics put this ancestry and migration-path beyond doubt, and while there may well have been incursions into the Pacific from South America along the lines of the "Kon Tiki" hypothesis, this was not, at the very least, the *main* way in which the Pacific was settled. It is with these people that my present interest lies.

**[Click on map to enlarge]**




Exactly when the Austronesian people began moving out of the Asian mainland is uncertain but it may have started between 7,000 and 9,000 years ago. The exact route is uncertain - certainly there are Austronesian affinities in the languages of Taiwan, but there are also clear indications of a migration route through Indonesia. By about 5,000 years ago they were established in settlements along the north coast of New Guinea, and they remained coastal dwellers. Certainly they were not the first people to settle New Guinea - that land was settled at least 30,000 to 40,000 years ago, by Australoid peoples related to the Aboriginal peoples of Australia. Nor, in all probability, were they the first Mongoloid peoples to move south from Asia - that had probably been occurring gradually over millenia. However the great impulse which occurred about 5000 years ago was remarkable, and by 1500 years ago the descendants of those people had spread halfway around the world. From New Guinea they moved east and south via the Solomons, Vanuatu and to Fiji by 3,500 years ago. Thus far they may very well have been following Australoid settlement, but from there on - Tonga and Samoa, and thence the islands of Eastern

Polynesia - they were very probably the first settlers. In New Zealand, and last of all Hawaii, they certainly were. The migration must rank as one of, if not the greatest, epic of exploration and settlement in history. In great double-hulled sailing-ships which would carry perhaps a hundred people together with their belongings, they undertook voyages of hundreds of kilometres into the unknown. At the time of Cook's voyages, the descendants of these craft were longer than his own "Endeavour", and a great deal faster. These "vikings of the sunrise" as they have been romantically called, took with them pigs and chickens, (dogs may or may not have gone with the first migrants - certainly they followed before long) and certain plants essential to their lifestyle, including, as linguistics show, the paper mulberry. Wherever these Mongoloid peoples went, there went their paper mulberry, gradually adapting to the tropical climate, but losing its deciduous habits, no longer flowering, and dying off before reaching large tree dimensions even when not cropped.

I have dwelt on the epic nature of the settlement because the significance to them of the plants that were taken can be gauged by the measures that would have been necessary to ensure their survival, protecting them from killing salt spray, and using precious drinking water to keep them alive. Of all the plants they took, the paper mulberry was in some ways the most important, as throughout the cultures of the Pacific, barkcloth was not merely functional, but played a vital role in religion and ceremony, and was one of the most prized items of ritual exchange. Its significance was indeed profoundly spiritual, and where it is still made something of this significance persists. Where it is no longer made, and in some cases co-existent with it, there has been a transfer of spiritual meaning to European cloth, which now figures prominently in ritual exchange and rites of passage. A similar significance attached, as we know, to paper in many parts of Asia. In Japan, indeed, the word *kami* can mean both "paper" and "god". Paper played, and still plays, an important role in rites of passage, and is prominent in religious observance. "Effigies" made of paper have long been burned at funerals in China, and this practice may well have started with barkcloth. As Dard Hunter puts it, "The fibrous substance called paper is regarded in a vastly different light in the Orient from what it is in the Occident, for in the far East it has a spiritual significance that overshadows its practical use."(9) Given that the Austronesian migration from the Asian mainland began many millenia before paper was developed, this strong coincidence may suggest that the reverence for barkcloth had already developed there, and with the development of paper was merely transferred to it. The spiritual significance of Mayan, Aztec and other South American barkcloth may well derive from the same origins, and in some places there, woven cloth came to assume similar significance - again a logical extension, as occurred in the Pacific. That there were mystico-religious parallels in Africa, is suggested by the fact that at the turn of the Century in Uganda, even after the widespread adoption of European cloth, an observer wrote "it is considered the right thing in royal or aristocratic circles for the princesses or wives of chiefs to wear barkcloth rather than calico. The 'royal' barkcloth is often covered with striking and tasteful designs, roughly stencilled on it with a black dye", and went on, "It is.. the custom in Unyoro that a man and woman of whatever rank must, for at least four days after the marriage ceremony, wear native-made barkcloths."(10) On a related level, an interesting phenomenon is the "wedding garment" paper still made in Japan and used in truly traditional ceremonies. This is a thick, white, purposely crumpled and very tough paper which is remarkably like barkcloth, and I would suggest that it is quite possibly an attempt to sustain a form of ritual barkcloth centuries after the technology for its proper manufacture has disappeared.

One striking thing I have noticed in the course of my Pacific research, is that barkcloth technology, along with numerous other craft skills, improved as the migration moved eastward, and reached its high-point in Hawaii, the last-settled group. History repeatedly shows that emigrants, as well as being the the most adventurous, are among the most innovative members of their parent society. Unimaginative conservatives stay at home! However, small islands have limited resources, and inevitably much time and energy was spent colonising successive places between "hops". Thus, while it is perhaps not surprising that Hawaiian *kapa* was finer than Tahitian, Tahitian finer than Western Polynesian/Fijian, Fijian than Solomons, and so on, it is also not surprising that this development was slow. Given that the development was over thousands of years, it was perhaps somewhat faster in China, which had relative continuity of life, no new voyages and settlements to undertake, and a massive population to throw up inventors. It may well be, however, that the basic thrust of development was similar.

The barkcloths of Melanesia tend to be rather coarse and thick, and while in places paper mulberry is used, other, less delicate barks are common, and are processed relatively little, the bast being spread somewhat and sometimes felted to achieve thickness and size. It may be that this is the craft in its original form, little changed, and consistent with that of Africa. In Fiji, Tonga and their near neighbours (including the Polynesian Outliers of the Solomons) the beating is far more extensive, mulberry is used almost exclusively, and the resulting felted sheets are considerably finer and more consistent. They are also edge-joined to make sometimes huge ceremonial pieces. The Samoan cultural area abandoned felting, substituting a method of gluing layer upon layer, but this was a sideways if not backward step, not advancing the craft. In the Austral, Society, and Marquesas Islands, a breakthrough occurred with the simple expedient of retting the partially-beaten bark under leaves for a period of time. This caused some breakdown of the fibres and interstitial tissue, so that when the barks were subsequently beaten together, a certain amount of fibre rearrangement, and greater facility of felting, permitted much more delicate and even-textured fabric to be produced. Here also, observing the marks their ribbed beaters made on this more fragile material, they developed the concept of controlling this to produce simple parallel "watermarks".

Woodcut of Japanese women beating mulberry bast into pulp for paper

Barkcloth-makers, Vatulele Island, Fiji, beating mulberry bast into sheets

The process was brought to its logical conclusion in Hawaii, where so carefully was the bast beaten, retted and re-beaten, that the result was often similar in weight and feel to light cotton cloth such as poplin, and its evenness of texture could vie with that of much handmade paper. They elaborated the process of "watermarking" by the use of myriad designs carved on their

"finishing" beaters, and developed also a system whereby they impressed the finished cloth into grooved boards to make a ribbed fabric rather similar in appearance to "kraft" wrapping paper.

It is interesting to speculate on whether some parallel evolution might not have occurred in China, and whether the barkcloth craft so widespread in Ts'ai Lun's time might have been as highly developed. If so, it would help explain his discovery. Certainly the Hawaiians were, when their society and its remarkable crafts were fatally disrupted by European intervention, at a point where very little was required to reach the stage of making "true" paper. A little further retting of the fibres to allow their total pulping rather than mere felting of the still intact sheets of bark, the flotation of these and their formation on a woven mat, and they would have been there. They possessed all of the necessary technology, but did not reach the final step. Perhaps it is doubtful whether they would ever have made that small but crucial step that Ts'ai Lun made. They had no writing, and the beautiful printing they had developed was decorative and perhaps heraldic rather than documentary, and it was perfectly adequately catered for by the fabric they had. They lacked the craft of felting separate fibres to make patent sheets, whether of wool or silk floss such as existed in China. If Ts'ai Lun had these factors in conjunction with a barkcloth industry comparable with that of Hawaii, all that was left for his creative mind was not so much a leap, but rather a deft sideways step, into immortality.

## NOTES:

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## LINKS:

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