

PAPERMAKING GLOSSARY-WESTERN

MARYLYN SWARD

- abaca A Philippine plant, related to the banana, the leaf stalks are the source of Manila hemp and a strong, usually buff paper called Manila paper. (Pulp available by mail)
- bast fiber The inner bark of plants which serves to distribute food to the plant. When separated from the outer bark, the remaining material provides fibers suitable for making paper and textiles. (e.g. flax, hemp, ramie, gampi, mitsumata, kozo, etc.)
- beating The process of cutting fibers to the proper length for sheet formation and bruising or roughing the wall of the fiber so that more bonding surfaces are available during the papermaking step.
- bleaching A continuation of the pulping process by trying to purify the fibers by removing lignins and by whitening. Usually done with chlorine compounds; excessive bleaching may weaken the fibers.
- calendering A process for imparting a smooth, glossy finish to paper by passing it through a series of metal rollers.
- cast paper A paper piece, usually three dimensional, made by pouring pulp into a mold or by patting pulp around a form. The dried paper is then separated from the mold or form and functions on its own as a bas-relief or sculpture.
- cellulose A carbohydrate and the chief component of the cell walls of all plants occurring as long hollow chains called fibers. The fibers have the unique property of adhering together to form a mat from a water suspension-paper.
- chain lines The widely spaced lines in paper made in a laid mold. The lines are created by the impression in the pulp of very thin wires or threads which are used to sew the numerous, narrowly spaced laid wires to the supporting ribs of the mold.
- close formation An even distribution of fibers throughout a sheet of paper.
- cotton fiber The soft white filaments attached to the seeds of the cotton plant. Cotton fabric is made from long fibers removed from the seeds by "ginning." Short fibers-called linters-unsuitable for cloth but good for papermaking, are left. Paper pulp may be made from cotton rags or linters. Cotton is the purest form of cellulose occurring in nature, so it requires the least processing before it can be used.

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- couching During the hand-papermaking process, the action of transferring the newly formed sheet from the mold to a dampened felt or other surface.
- deckle A wooden frame that fits over the mold to prevent the pulp from running off during the dipping and sheet-forming process.
- deckle edge The uneven, feathered edge caused by the deckle frame in the production of handmade paper. Originally this edge was trimmed off but now it is considered a sign of quality and is desirable.
- felt 1) A heavy piece of woven cloth, usually wool, upon which the newly formed sheets of paper are couched, or transferred from the mold. 2) The action of removing water from a sheet by hand with a sponge.
- felt finish The surface of a piece of paper resulting from pressing the sheets between pieces of felt. This is the surface of handmade paper if it is not calendered or sized after the pressing of the "post" (stack of sheets and felts) in order to remove excess water.
- fibrillation During the beating process, the fiber walls are bruised and roughened in order to create more surfaces for bonding during sheet formation.
- filler In papermaking, materials added to the fiber during the beating stage which fill the pores of the fiber mat to achieve a harder, whiter, or more opaque surface. Most fillers are minerals such as kaolin clay, calcium carbonate, or titanium dioxide. Filling is also called loading.
- flax fiber The bast fiber of the flax plant which is used in the production of linen and paper. Pulp can be made from the flax fiber or from linen rags.
- formation In papermaking, refers to the fiber distribution in a sheet of paper as it appears when held up to the light. Formation is related to the beating of the pulp and the action of distributing the pulp on the mold.
- furnish The combination of ingredients added to the beater in order to make a particular kind of paper. This would include pulped fiber, any fillers, and dyes.
- gelatin A colorless protein made from animal tissue and used as an external or internal sizing for paper so that it will resist staining and bleeding in the printing, painting or coloring process.

glazed paper Sheets of paper, each sandwiched by zinc or slick cardboard plates, are fed through rollers causing a friction of the plates and paper which polishes the surface of the sheets.

hemicellulose Cells similar to cellulose but more subject to destruction by chemicals or atmospheric conditions. However, since they bond more strongly than cellulose, they are desirable for making some papers.

hemp An Asian plant with fibers of high cellulose content and suitable for making textiles and paper. Hemp paper is one of the oldest kinds of true paper and was made in China during the first century A.D. Paper from hemp fiber is strong, white and lustrous.

Hollander A machine for pulping and refining rags of fibers for papermaking. Invented in Holland at the beginning of the 18th century, this machine replaces the stamping mill. It consists of an oval vat, partially divided in the middle. On one side, a cylinder fitted with blades rotates against a stationary base plate, also fitted with blades. The pulp is propelled around the vat, gradually being refined for the sheet forming process.

hot-pressed paper Paper finished by sandwiching sheets between preheated metal plates and passing them through heavy metal rollers. This results in a smoother surface than regular calendering.

hydropulper A vat with a power-driven agitator/cutter used to reduce and refine fibers to pulp and to "hydrate" the fibers, which increases the bonding potential for papermaking. (e.g. blenders, paint mixers on drills, etc.)

internal sizing Sizing added to the pulp during the beating process.

jute An Indian plant of the linden family. Jute became popular for making paper in Europe in the late 18th century when the supply of linen and cotton rags failed to meet the demand for paper. The cellulose content of jute is quite high and it makes a durable paper without extensive refining.

laid lines The impression or watermark left in paper formed on a laid mold by thin, narrowly spaced wires or bamboo strips spanning the frame in one direction, which support the wet pulp during the papermaking process.

laid mold A wooden frame for the forming of pulp into sheets of paper. The frame is spanned by narrow strips of wire or bamboo which are held in place by wire or thread worked in the perpendicular direction to the strips.

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- laminated paper A newly formed sheet of paper is couched on top of another wet sheet instead of a felt. The fibers of the sheets will mesh during the pressing and drying process, creating layered papers. (also called multiple couching)
- lignin A polymer that is the natural support for the cellulose fibers of woody plants. It rejects water and resists bonding and is, therefore, undesirable in the papermaking process and is removed from the cellulose during the refining process.
- linters The short fibers that remain on the cotton seeds after the first "ginning." They are used in the manufacture of paper.
- lumen The hollow core of the cell wall of a fiber.
- mold or mould The basic tool of papermaking. In Western papermaking a wire screen or mesh is attached to a wooden frame. In the Eastern process, a detachable screen is hand held on the wooden frame. In both cases, the mold is dipped into a vat of pulp. The pulp forms a fibrous mat on the screen and the water drains back into the vat. When a sufficient amount of water has drained, the newly formed sheet is couched off the screen and the mold is ready to make another sheet.
- parchment A writing or printing surface made from the split hide of sheepskin.
- paper A fibrous mat produced by a filtration process in which a dilute slurry of fibers in water is caused to flow across a screen allowing the water to drain out. The sheet is then removed from the screen, pressed and dried.
- papyrus A laminated writing surface made from the sliced stalks of the papyrus plant. The slices are arranged at right angles to each other and pounded together with a mallet. Although not paper, it was the first writing material with properties similar to paper.
- post A pile of newly made paper sheets separated by damp felts, which is ready for pressing to squeeze out excess water.
- protopaper Any one of several flexible substrates for writing which existed before the invention of paper about A.D. 105 such as palm leaves, papyrus, or silk cloth.
- pulp The product of the pulping process, which begins with fibers or rags and liberates or separates them mechanically or chemically. Mechanical pulping simply separates the fibers, while chemical pulping purifies them of lignins and other undesirable agents.

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surface sizing Sizing applied to the dried sheet. Commonly used materials are glue, gelatine, casein, and starch.

trunk fibers The main wood fiber of trees which provides the chief source of raw material for the commercial paper industry, wood pulp.

vacuum form In papermaking, pulp is poured over a mold inside an airtight chamber, which is attached by hoses to a compressor and water-collecting tank. When the chamber is closed, the compressor quickly sucks the air and water from the chamber, leaving a partially dried piece of paper in the form of the mold.

vat A tub that holds the refined pulp mixture (slurry) into which the mold is dipped for making handmade paper.

vellum A writing surface made from the hide of a calf, goat or lamb which is treated with lime, scraped to an even thickness, powdered with chalk, and rubbed with pumice.

waterleaf Paper that has no sizing. This paper will absorb fluids readily and thus is unsuitable for use with thin inks or paints. The term is also applied to a newly made sheet of handmade paper before it is sized.

watermark A translucent area in a sheet of paper which is the result of sewing a fine wire design to the surface of the mold screen. In this area, the screen is thicker, and there will be less pulp when the sheet is formed. Paper-makers often watermark their paper with a logo or identifying mark.

wild formation An uneven distribution of fibers or a clumping of fibers within the pulp of a sheet of paper, sometimes caused by excessive fiber length or inadequate stirring of slurry before forming a sheet.

wove mold A papermaking form of fine wire mesh, resembling a window screen which is attached to a wooden frame and is used to make handmade paper.

wove paper A sheet produced on a wove mold. It has a finer, smoother texture than paper made in a laid mold and when held to the light, the sheet will reveal a regular, slightly mottled appearance rather than the horizontal and vertical line pattern of a laid sheet.

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- quire A measure of sheets of paper that originally denoted four sheets folded together into eight leaves but now refers to 24 pieces of paper whether folded or unfolded. A ream is made of 20 quires.
- rag content A term describing the amount of cotton fiber relative to the total amount of material used in the making of certain kinds of paper. It is expressed as a percentage, such as 100% rag content or 80% rag content. The term, though popular, is losing its meaning since more and more high quality paper is made, not from rag, but from linters.
- ramie The bast fiber of the ramie plant is used in the production of paper while the whole stalk is used in making a "wove" mold in parts of China.
- ream A quantity of paper sheets, usually 20 quires or 480 sheets, though frequently 500 sheets.
- retting Before the use of the Hollander, rags were left to rot on wet stone floors so that the resins in the fibers would weaken sufficiently for the stamper to bruise the fiber. Retting is currently used to partially ready some plant fibers for the hand beating process.
- rice paper An erroneous name for a writing material made from cutting the inner pith of the fatsia plant in a spiral from the outside to the inside. It is not made from rice and it is not paper since it is not made from pulped fiber.
- seed-hair fiber Fiber such as cotton which is attached to the seed of the plant.
- sizing Additives to the paper fiber, either during the beating stage or after the sheet has been dried, which are intended to control the wetting of the sheet and the ability of the paper to accept ink without feathering.
- slurry The pulp from the beater is added to water in the vat and mixed to achieve the proper suspension for the sheet forming process. The thickness of the sheets will depend on the proportion of pulp to water in the slurry.
- stamper The primitive method of reducing rags and other raw materials to pulp for the papermaking process. The stamper is a mortar and pestle powered by water, wind, animal or, in its new modern version-an electric motor.
- stuff Pulp ready for papermaking.

GLOSSARY

ABACA. Manila hemp; also the name of the plant.

ABRASIVENESS. That property of a paper surface which may scratch or cut; undesirable for printing.

ABSORBENCY. The capacity of paper to absorb liquids.

ALPHA CELLULOSE. That part of a cellulosic material that fights solution by aqueous caustic alkalies at ordinary temperatures.

ALPHA PROTEIN. Soybean protein that used alone or with casein, makes an adhesive with which to coat paper.

ALUM. Aluminum sulfate. It is used in the beater to precipitate rosin sizing on to the pulp and provides water resistant properties to the paper.

ANILINE DYES. Derived from coal tar, they are arranged with regard to their brightness or fastness to light.

APPARENT DENSITY. The weight of a sheet of paper determined by dividing the basis weight by the caliper or thickness.

ASH. That which is left after burning a sample of paper to determine the amount of filler it contains.

ASP. See Ass.

ASS. A notched piece of wood which fits into the assboard to hold the mould at a particular draining angle. Also called Asp or Horn.

BASIS WEIGHT. See LBS and g/m²

BEATING. Process of macerating natural or manmade material into pulp.

BEATER PLATE. The bars or knives of the fixed plate in the floor of a Hollander-type beater directly under the beater roll.

BLANC FIXE. Artificial barium sulphate or precipitated barium sulphate.

BLEACH. Chlorine, or a similar chemical, used by the paper industry to whiten paper pulp.

BLEEDING. That phenomenon which occurs when the edges of a color begin to dissolve as a result of water or oil on the paper.

BLISTER. A paper defect that may be caused by any number of reasons including trapped air between the felt and the sheet.

BONDING STRENGTH. The property of a sheet that allows it to withstand "picking," the pulling away of part of the surface, especially in large, solid-printed areas. Of prime interest to printmakers.

BRIDGE. A platform across the vat.

BRIGHTNESS. Once associated with the hue and intensity of light reflected from the paper surface to the eye. Now scientifically measured by instruments.

BRITTLENESS. A paper defect evidenced when paper breaks or fails when bent.

BROKE. Waste pulp and damaged paper.

C1S. Coated on one side of paper.

C2S. Coated on both sides of the paper.

CALCIUM CARBONATE. A solid appearing in nature as calcite or aragonite and used because it is white to coat paper.

CALENDER BLACKENING. If the moisture of the paper is too high, dark streaks or dark areas result when trying to calender the paper.

CALENDERING. The passing of paper between metal rolls (as in an etching press) or the placing of

paper between metal plates and further squeezed to increase smoothness or gloss of paper.

CALIPER. Thickness of a sheet of paper, normally measured in thousandths of inches.

CANVAS. A triple cloth used as the base upon which large sizes of handmade papers are dried in lofts. Used to be made of Hessian trebles. Today, many substitutes are used.

CASEIN. A protein obtained from skimmed milk used as an adhesive in paper coating.

CELLULOSE. An inert substance constituting the chief part of the cell walls of plant materials, trees, paper, and so on.

CHINA CLAY. A fine clay used, while beating, as a filler for certain papers.

CLOSE FORMATION. A uniformly dense sheet of paper. Opposite of cloudy.

CLOUDY. A "wild" or flocculated sheet of paper. Unevenly formed, when held up to the light.

COATING SLIP. A slurry of pigment and adhesive used to coat papers.

COCKLING. A wavy effect caused by uneven drying.

COLLOIDAL. Any substance in a very fine state of dispersion.

COMPRESSIBILITY. That property of a sheet which allows it to withstand pressure, such as in printing.

CONTRARIES. Unwanted, unneeded bits of materials which become parts of the sheet.

CORNER UP. Dog-eared corners of sheets.

COUCH. The transfer of the layer of wet pulp on a mould to a dampened felt.

COW HAIRLINE. Lines on which paper was hung to dry in the drying loft. They were made of jute and wound around with cow hair to prevent staining on the backs of the sheet.

C.P. Cold-pressed paper: a polished, glossy paper with a hard surface. Obtained by sandwiching papers between zinc sheets in a wringer-type press.

CRACKING. Visible breaks along creases of sheets when paper is folded or embossed.

CRINKLED. Either a deliberate *crêpe* effect in industry or a defect in handmade paper due to movement at the time of couching.

CROSS. Resembles a T-square. Used, in the past, to handle papers for placing or removing from the cow hairlines in the drying loft.

CURL. Rolled-up edges caused by changes in temperature and humidity.

DANDY ROLL. In the paper industry, a large cylindrical roll on the "end" of the Fourdrinier, which impresses a watermark on the paper. This watermark, when the paper is held to the light, is darker than the ground around it. Opposite effect of raised wire watermark on a mould.

DECKLE. The removable frame that fits snugly on the mould and contains the pulp.

DECKLE EDGE. The feathered edge on all four sides of a sheet of handmade.

DECKLE SLIP. A slip of brass affixed to the underside of the deckle to prevent the pulp from getting under the deckle. Used with a new mould, especially.

DISHED. Refers to a stack of paper that lies in a decidedly concave condition rather than flat.

DROPS. Drops of water that truly make watermarks on newly formed sheets, thus creating a "defect" which may be seen by holding the

sheet to the light. Come from the arms of the coucher or vatman, if not well-trained.

DRYING. Usually refers to loft drying of waterleaf, though applicable to all papers including those just sized.

DRY PRESSING. The final pressing given a particular sheet of handmade paper before it leaves the press area and is counted and wrapped.

DRYWORKERS. Traditional term for those individuals who assist in drying paper in the lofts of paper mills.

EMBOSSSED. A noninked intaglio or relief design imparted to paper.

EXPANSION. The result of change in the dimensions of a sheet of paper due to excess humidity; worse across the grain, rather than with it.

FASTNESS. That evanescent quality sought for by all papermakers: resistance to change in color of dye used; paper should also be fast to acid and alkali.

FELT. A woven blanket on which paper is couching from the mould to the felt; also, to remove water from a sheet with a sponge (using the "easiest method" of paper-making).

FELT MARK. A defect in handmade paper caused by a worn felt.

FIBRILLAE. One of the effects of the Hollander upon cellulose fibers—separation of the threadlike elements on each fiber.

FIBRILLATION. The shredding and bruising of fibers by the beater bars in the Hollander.

FILLER. One method of filling in the pores of a sheet to improve its printing qualities. See also Loading.

FINISHING. Drying, sizing, and calendering papers to complete the manufacture of a given sheet or sheets.

FISH EYES. Defects in paper caused by foreign matter, slime, etc., which become translucent spots when the sheet is calendered.

FOLIO. Either a sheet of paper 17 x 22 inches in size, or a sheet which is folded in two.

FOURDRINIER. The term usually given the ubiquitous paper machine. It should apply solely to the *wet end* of the machine. The original instrument was designed by N.L. Robert and financed by the Fourdrinier brothers.

FREE. Pulp that drains quite readily from the papermaker's mould.

FUR. A defect caused by stuff, through improper couching, adhering to a previous felt and transferring itself to a newly formed sheet.

FURNISH. The particular ingredients that comprise a specific paper. One "furnishes a beater" with the items in a given formula.

FUZZ. Fibrous projection on a paper surface caused by lack of surface sizing, or insufficient beating. Lint may seem similar, save that it is not locked to the surface.

GELATINE. One of many sizings that may be used to make waterleaf papers less liable to bleed; a glutinous material obtained from animal tissues through continued boiling.

GLAZE BOARDS. Thick manila boards used to obtain a matte, eggshell finish on certain papers by running a "sandwich" of paper and boards through calender rolls.

GLAZING. Process in which a pile of sheets, between each of which lies a zinc plate, is submitted to the pressure of steel rollers causing a slight friction which glazes the sheets.

g/m². Grams per square meter (a preferred mode of expressing weight of paper). See LBS.

GRAINY. A rough finish on the surface caused by shrinkage of the

sheet, under certain conditions.

HALF-STUFF. Half-beaten stock purchased from a paper mill. It must be subjected to further beating in a hollander before proper pulp results.

HAND BASIN. A basin, secured to the vat, which allows the vatman to cleanse his hands of knots of pulp from time to time.

HESSIAN TREBLES. See Canvas.

HOG. A device for constantly stirring the pulp in the vat.

HOLLANDER. A seventeenth century-designed beater still employed by handmade paper-makers to bruise, or macerate, rags to fibers.

HORN. See Ass.

H.P. Hot-pressed paper; a polished, glossy paper with a hard surface. Used to be calendered between hot metal sheets passed through a wringer-type press.

HYDRATION. The process that, through beating, alters cellulose fibers so as to increase their water absorption capabilities.

HYGROEXPANSIVITY. Expansion, or contraction of paper due to changing conditions of humidity.

HYGROMETER. An instrument which measures the relative humidity of air in a given place.

HYGROSCOPIC. Water-loving; easily absorbs moisture.

INK ABSORPTION. That property of a sheet that allows it to "take" ink quickly (as in newsprint), or the reverse.

JORDAN. A machine which refines pulp after it has gone through a beater. Used in the paper industry before pulp travels to the Fourdriniers.

JUTE. Very strong, long-fibered pulp made from hemp, used burlap, and twine.

KAOLIN. White, fine clay used in some formulas for papermaking.

KNOTTER. An agitated strainer containing certain sized holes (for particular papers) that keeps out knots when the pulp is strained on its way to the vat.

LAMINATED PAPER. Two or more sheets couched one upon the other.

LAYER. In the trinity of vatman, coucher, and layer, the latter—after the paper is pressed for the first time—removes the felts carefully and lays each sheet of paper on a zinc plate covered with a felt and, one by one, creates another pack and another. . . .

LBS. The weight of a 500 sheet ream of paper of specified dimensions. The higher the number, the heavier the paper. Also called Basis Weight.

LINTERS. Usually cotton. That short, cotton fiber that remains after the ginning operation. Usually comes in three grades: first cut, mill run, and second cut.

LOFT. A large, airy room (capable of being heated) in which handmade has traditionally been dried.

LOFT TEMPERATURE. In loft drying, it has been considered a truism that papers not be submitted to temperatures above 90° F (32 degrees C.).

LOUVRES. Shutters in old paper mills in the loft drying areas that allow proper air circulation.

MACERATE. To bruise and separate individual fibers of natural or manmade material by beating by hand or machine.

MATURING. Aging of paper. Ideally, paper should age considerably before being used by painter, printmaker, or printer. Some idealists would like to wait 300 years!

MELAMINE RESIN. A chemical added to the stuff in the beater when wet-strength is desired in the paper.

MOISTURE CONTENT. A figure that

varies from day to day: the percentage of moisture in finished paper

MOULD, LAID. A mould made of vertical (laid) heavy wires bound by chain wires and supported by tapered, wooden ribs in a wooden frame.

MOULD, WOVE. A tautly stretched nonferrous woven wire screen across a wooden frame supported by tapered wooden ribs.

OUTSIDES. Paper with very bad faults. Usually repulped. Literally used (1 quire each) at the top and bottom of reams, at one time.

PACK FELTS. A zinc plate covered with felt. See Layer.

PACK PARTING. Separating pressed sheets from the zinc plates.

PACK PRESSING. Submitting a pack of dampened felts interleaved with newly formed sheets tremendous pressure, usually, in hydraulic press.

pH VALUE. On a scale from 0 to (0-7 is acid; from 7-14 is alkaline) the degree of one or the other may be obtained.

PICKING. The lifting, during printing, of portions of the paper surface—especially in large black color areas.

PILCHER. The term given to the three or four felts, sewn together and placed on top of a newly formed post of paper before it is taken to the press.

PINHOLES. Defects in sheets that appear, when held to the light, as pinholes. Caused by foreign particles pushing through the sheet when it is being pressed.

POST. A pile of wet, handmade sheets separated by dampened felts.

PRINTING OPACITY. That property of a sheet which prevents the printing on one side from showing through on the other.

PULP. That fibrous substance

sulting from the pulping process which still requires further beating before it is usable for forming paper.

Q. Usually, 24 sheets. One-twentieth of a ream.

RATTLE. The sound, made by shaking a sheet of paper, that indicates its rigidity, stiffness, or lack of dampness.

REAM. Usually 20 quires. Thus, there may be either 480 or 500 sheets in a given ream, depending upon the size of the sheets and/or practice in the given country.

REAM WRAPERS. The final act before a ream of handmade paper left the papermill was to affix the ream wrapper to the pack. Paper historians and collectors seek them.

REFINE. Used by some individuals instead of the word, beat.

RESILIANCE. The property of a sheet that allows it to return to its original format after distortion.

REE. Handmade sheets containing minor defects.

ROSIN. Used in sizing paper. Derives from the distillation of turpentine from the gum of the southern pine.

SHAKE. The vatman's stroke. A highly individualized movement from right to left, left to right, and from the body away to the vat. Takes strength, grace, and many years to master.

SHEARING STRENGTH. That property of a sheet which allows it to resist cutting.

SIZING. A water-resistant material added to paper.

SLURRY. Stock to which the proper amount of water is added to form a

suspension in which you can form paper with a mould and deckle.

SNOWSTORM. A term used by some to indicate a "wild," flocculated paper.

SPECIFIC VOLUME. Assuming standard conditions, that volume per unit mass measured.

SPUR. A particular number of sheets picked from a pack of paper and either hung to dry or placed on Hessian trebles to dry.

STANDARD SIZES. Despite so-called international sizes of papers, there does not appear to be uniform practice.

STAY. A board across the vat on which the vatman first places his mould after forming a sheet.

STOCK. Pulp ready to be formed into sheets.

STUFF. Untreated papermaking pulp.

SULFATE. In industry, the alkaline or kraft process of brewing pulp.

SULFITE. In industry, the acid process of brewing pulp; the pulp produced by this process.

TENSILE STRENGTH. The property of a sheet to withstand pulling.

TEXTURE. A difficult-to-describe "feel" of the surface of a sheet to your touch.

THICK EDGES. A couching defect caused by uneven pressure at one end during the forming of the sheet; the pulp end may double up on itself and form a thick edge.

TITANIUM DIOXIDE. A filler used in papermaking to brighten and opacify certain sheets.

TOOTH. A description of the surface of a sheet of paper implying a slightly rough texture having, per-

haps, too many "hills and valleys."

TRANSLUCENCY. That property of a sheet which allows light to pass through to a certain degree. *Not* transparent.

TRANSPARENT. That property of a sheet which allows you to see and to distinguish objects *through* a sheet.

TREBLES. See Canvas or Hessian Trebles.

TUB-SIZED. Paper sized in a tub or vat after it is formed as opposed to paper sized by adding the size to the beater.

VATMAN. The keystone in the trinity of individuals who make handmade papers. On the vatman's skill and stroke rests the quality of the operation. See also Coucher and Layer.

VAT. A rustproof, waterproof tub holding a sufficient amount of pulp with which to make paper.

WATER ABSORPTION. That property of a sheet that allows or discourages water to be soaked up or repelled.

WATERLEAF. Unsized paper.

WATERMARK. The logo or identifying mark of the papermaker or mill at which a sheet of handmade paper was formed. It may be seen by holding the paper up to the light.

WAVY EDGES. A paper problem that occurs in a pack when the edges of the sheets have acquired moisture and expanded.

WILD. See Snowstorm.

XX. The package marking some mills employ for retrees.

XXX. The package marking some mills employ for outsides.

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Glossary

Prepared by Trisha Garlock

ABACA—also called Manila hemp, is a plant cultivated primarily in the Philippines, but also in Asia and South America for rope, textiles, and paper. Abaca is not a true hemp, but is related to the banana. The leaf stems and veins provide exceptionally strong and durable fibers which can be used, from either old rope or fibers, to make a very strong paper.

AMATL—a pounded mulberry bark paper, similar to tapa, made by the Aztecs from various ficus or fig trees. Amatl is still made by the Otomi Indians of southern Mexico.

BAST FIBER—the category of fiber which comes from the white inner bark of numerous shrubs and trees including gampi, mitsumata, kozo, flax, and hemp. When the inner bark is separated from the dark outer bark and in some cases woody cores, it yields long strong fibers which are excellent for papermaking.

BEATING—the fundamental method by which fiber is transformed into refined stock suitable for papermaking. Beating alters the physical form of the fiber by bruising and cutting. Bruising frays or unravels the fibrils of the fiber, increasing the surface area and therefore the bonding potential. Bruising also swells the fibers with water in an action often called "hydration." Beating must be carefully controlled to obtain desired properties, as beating ultimately determines the quality of paper produced. In Western papermaking, beating is done by machine. In Japanese papermaking, beating was traditionally done by hand, but more and more papermakers are using Western and Japanese adaptations of the Hollander beater.

BONDING—the inherent ability of cellulose fibers to adhere to one another. Fibrillation, hydration, pressure exerted upon the wet sheet, and drying, are all factors in promoting bonding. The addition of adhesive agents also increases bonding.

CAST PAPER—a process for making three-dimensional paper pieces. In the most common method, pulp is poured or patted in or around a mould or form. The pulp is felted together, and the excess water removed through sponging. Once the paper has dried, it is separated from its mould and can function independently as a relief or sculpture. Many variations of the process have been developed. See note 37, page 16

CHAIN LINES—the widely spaced watermark lines left on paper made in a laid mould. They are the result of impressions left in the pulp by the "chain wires" during the papermaking process. Chain wires are twisted around the perpendicular closely spaced "laid wires" to keep them in place. See also laid lines and laid mould.

COLLAGE—the use of different materials (e.g. paper, string, fabric, found objects) adhered together to create an image.

COLORING—the addition of color to paper. This can be accomplished through the addition of natural or chemical dyes, pigments, paints, colored rags, or a combination thereof, to the pulp. Coloring can take place prior to, during,

or after beating. Methods of surface coloring include the embedding of colored materials in the sheet, staining the surface of newly couched or dried sheets, and the traditional methods of painting and printing.

COTTON FIBER—the soft white filaments attached to the seeds of the cotton plant. The long staple fibers, removed by ginning, are used for textiles. Industry cuttings provide excellent fibers for papermaking. The short fibers, or "linters," which are still attached to the seed after ginning, are removed separately and are also used for papermaking. Cotton is the primary fiber used for Western hand papermaking, as it is the purest form of cellulose in nature and thus requires less processing than other fibers.

COUCHING—the process of transferring a sheet of pulp from the mould to a surface. In Western papermaking, each sheet of pulp is couched onto a dampened felt. In Japanese papermaking, no felts are used. See also laminating.

DECKLE—a removable, open frame (usually wooden) that fits over the mould to form a rim for the sieve area. This controls the size of the sheet and prevents the pulp from running off during sheetforming.

DECKLE EDGE—the feathery edges of a sheet of handmade paper formed naturally during the papermaking process by a small amount of pulp washing between the mould and the deckle. This can be minimized or exaggerated for artistic or other purposes. Not a torn edge.

EMBEDDING—the process of incorporating materials or objects such as threads, papers, leaves, twigs, or any foreign substance into paper so that it is the fibers, rather than glue, that hold the materials in place. There are many methods of embedding objects. In one method, a sheet is couched, the materials or objects placed, with a second sheet couched over the applied objects. Areas may also be partially peeled away, revealing the objects beneath.

EMBOSSING—a process to create a raised or depressed design in an already formed sheet of paper. Generally, a deeply grooved or built up plate is used to create an image. Through the pressure of the press, dampened paper is forced into or around the recessed or raised areas of the plate, imparting a relief image in the paper. Embossing may be used without ink (blind embossing or inkless intaglio), over ink, or in combination with ink.

FELT—in Western papermaking, a heavy blanket (usually woven and usually wool) onto which a newly formed sheet of paper is transferred, or couched, from the mould.

FIBER—the slender threadlike structures from which papermaking pulp is made. Though synthetic fibers are available today, most fibers used in papermaking are natural fibers and are classified according to the manner in which they grow, i.e., bast, leaf, seed-hair, trunk. Natural fibers are composed chiefly of cellulose and tend to bond or adhere strongly together when wet. The degree of bonding is dependent upon the type of fiber used and their proper preparation. See also beating.

FIBRILLATION—the bruising, fraying, and alteration of the fiber during beating increasing the number of bonding surfaces between fibers.

FLAX—a bast fiber plant, cultivated since prehistoric times, which is the source of linen. Pulp for papermaking can be made from either flax fibers or linen rags.

GAMPI—a shrub which produces one of the three primary bast fibers used in fine Japanese papermaking. It is characterized by fine, tough, long, glossy fibers and produces a very strong, translucent and lustrous paper. Gampi is nearly impossible to cultivate, and is therefore very precious.

HEMP—a bast fiber plant, available in many varieties throughout the world, used for making textiles, cordage, and paper. Hemp paper was made in China from the 2nd century BC to the 10th century AD, and was the most important papermaking fiber in Japan during the Nara period of the 8th century. Hemp was also an important papermaking fiber in the Middle East.

HOLLANDER—a machine, invented in Holland in the late 17th century, for beating and refining rags or fibers for papermaking. The pulp is circulated around an oval-shaped vat while passing between metal blades which cut and refine the pulp for the sheetforming process.

HUUN—a pounded bark paper, similar to tapa, used by the Central American Mayans.

HYDRATION—the alteration of cellulose fibers during the beating process causing the fibers to swell with water.

KETA—the hinged wooden frame that holds the removable screen or "su" in a Japanese paper mould.

KOZO—a general name for a variety of mulberry tree used in Japanese papermaking. The bast fiber of kozo is characterized by strong, sinewy, and long fibers and produces a very strong and dimensionally stable paper. It can be cultivated, and accounts for 90 percent of the bast fiber used for hand papermaking in Japan today.

LAID LINES—the closely spaced linear impressions left on paper made in a laid mould. The impressions are the result of the pulp being thinned in a natural watermarking process by the wires which support the pulp during the sheetforming processes. See also chain lines and laid mould.

LAID MOULD—a mould in which the screen or sieve area is constructed of closely spaced wires or bamboo strips "laid" parallel to each other and held in place by more widely spaced perpendicular "chain" wires or threads which are twisted around each closely spaced wire.

LAMINATING—the process of combining layers of paper by pasting one or more sheets of paper, or couching one or more layers of wet pulp, on top of each other. In the latter process, also called multiple-couch, the fibers of each layer bond during the drying process, creating a single-layered sheet or work of art.

LINTERS—see cotton fiber.

MITSUMATA—one of the three primary sources of bast fibers for Japanese papermaking, it is characterized by soft, absorbent, and slightly lustrous fibers and produces a paper with a very smooth flat surface.

MONOTYPE—a printing process which does not employ a fixed matrix and therefore cannot be duplicated as in an edition. Generally a unique image is painted on a plate and transferred to paper through the pressure of a press.

MOULD—the basic piece of equipment used for sheetforming. In Western papermaking, it is a wooden or other frame over which a porous screen or other cloth is stretched. A second removable frame or "deckle" fits exactly over the edges of the sieve, and acts as a rim to control the size of the sheet. In Japanese papermaking, the screen or "su" is made out of bamboo strips and is removable from its frame. In both processes, the mould is dipped in the pulp, and the screen acts as a sieve, allowing the water to drain, leaving a mat of fibers on the screen. *See also* laid mould, wove mould, deckle, su, keta, and sugita.

NAGASHIZUKI—the Japanese term to describe the hand papermaking technique developed and practiced in Japan. *See* Tim Barrett's article page 44

NERI—in Japanese papermaking, a vegetable starch derived from the roots of various plants, traditionally the tororo-aoi or hibiscus, which is added to the papermaking solution to increase the viscosity of the mixture and aid in the distribution of fibers.

PAPYRUS—the quasi-paper made by placing two layers of thinly sliced stalks of the papyrus plant at right angles and pressing, thus laminating, the layers to create a flexible writing surface. The process was developed by the Egyptians over 4,000 years ago. This is not a true paper.

PARCHMENT—a writing surface made from the scraped and treated hides of animals, especially sheep, goats, and calves, which was developed by the Persians as an alternative to papyrus. Parchment was more durable than papyrus and could be folded into book form.

RAMIE—a bast fiber plant in the nettle family, also called China grass, which is native to Southeast Asia. It yields long, silky, and durable fibers which are difficult to extract, but excellent for paper, fabric, and cordage.

SHIBUGAMI—Japanese paper treated with persimmon juice to waterproof and strengthen the paper.

SISAL—second to Manila hemp in strength, it is an important cordage fiber from the leaf of the sisal hemp plant and is also used for making paper.

SIZING—a process in which an agent is added to provide paper with more resistance to water and penetration by aqueous substances. Sizing added before the sheetforming process, either in the beater or vat, is known as "internal," "stock," or "beater" sizing. Sizing added after the sheet is formed is called "surface" or "tub" sizing.

STAMPER—a water-, animal-, or wind-powered machine developed in Southern Europe in the 13th century, which reduced rags and other material to pulp through the use of large trip hammers in a mortar-like trough. The stamper was replaced by the Hollander beater in the

SU—the removable flexible screen of a Japanese papermaking mould. It is usually made of very thin bamboo strips which are held in place by silk threads.

SUGITA—the Japanese papermaking mould comprised of both the su (screen) and the keta (frame).

TAMEZUKI—the Japanese term for the Western sheetforming process.

TAPA—A Polynesian pounded bark paper or cloth made from the inner bark of a variety of plants, most commonly of the mulberry family which includes the Japanese kozo. Tapa is widely known as Hawaiian bark cloth. Various forms of tapa were used throughout the Pacific basin, Central and South America, the northwestern United States, West Africa, China, and Japan.

TENGUJO—an extremely thin but strong kozo paper.

VACUUM FORMING—a process for forming flat, collaged, and bas-relief paper pieces. A sheet of pulp is couched or pulp is poured onto a vacuum table, often over or into a relief form or mould. Other materials may also be embedded in the pulp. The table is covered with a plastic sheet and a compressor draws the air and water from the area creating a "vacuum" which sucks the pulp around or into the mould or form. This process also presses the fibers into closer proximity, which helps to bond the fibers in much the same way as a press is used for flat sheets. The process removes a major part of the water from the pulp and leaves it in the shape of the mould.

VELLUM—a fine grade of parchment prepared from the skin of calf or kid. The term was applied to any parchment used in manuscripts during the Middle Ages. *See also* parchment.

WATERLEAF—unsized paper. It is generally very absorbent.

WATERMARK—the more translucent area(s) of a sheet of paper which are especially visible when the paper is held to the light. These areas are the result of the impressions left in the pulp by fine wire or metal relief designs which are sewn to the screen. When the sheet is formed, less pulp lies on the design since it is in relief, resulting in thinner and thus more translucent areas of the sheet. Watermarks are primarily used today as logos or trademarks to identify a particular paper, papermaker, artist, or mill.

WOVE MOULD—a Western mould in which the sieve area is a woven wire cloth or screen, as opposed to a laid mould, which consists of parallel wires. Paper made on a wove mould is distinguished by a regular appearance when held to the light, rather than the ribbed appearance on laid paper.

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Barrett, Timothy. JAPANESE PAPERMAKING: TRADITIONS, TOOLS, AND TECHNIQUES. Rutland, VT, Tuttle, 1983. 320 pages. Hardcover. 176 illustrations. Glossary, Appendices. Bibliography. Index.

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Cockerell, Sydney. MARBLING PAPER. Hertsfordshire, England, Russell Bookcrafts, 1980. Third edition. Illustrated with two original samples and with line drawings.

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Diehl, Edith. BOOKBINDING. ITS BACKGROUND AND TECHNIQUE. New York, Dover, 1980. 400 pages. Paperback. 2 volumes in one. Plates, glossary, Index.

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Easton, Phoebe Jane. MARBLING. A HISTORY AND A BIBLIOGRAPHY. Los Angeles, Dawson's. 1983. Cloth over boards, with specimen of Rubovits' paper inset into front cover. 216 pages, with 12 additional pages of plates, including 6 original samples of marbled paper.

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Greenfield, Jane and Jenny Hille. HEADBANDS AND HOW TO WORK THEM. New Haven, Edgeworth Publishers, 1986. Paperback. 80 pages. Bibliography. Handsewn.

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Ho, Mei-lan and Mary Worthington. CALLIGRAPHY CRAFTS. Seattle, Ptarmigan Press, 1981. Spiral Bound. 104 pages. Illustrated with line drawings.

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Ikegami, Kojiro. JAPANESE BOOKBINDING. INSTRUCTIONS FROM A MASTER CRAFTSMAN. Adapted by Barbara Stephan. New York, Weatherhill, 1986. 127 pages. Hardcover. Illustrated with line drawings, photographs.

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Kantrowitz, Morris. THE PROCESS OF MARBLING PAPER. Washington, GPO, 1948.

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Schleicher, Patty. OIL MARBLING. Self published. 1984.

Presents a short introduction to the process of marbling with oil colors. Written with enthusiasm the booklet prints a set of diagrams for creating several standard patterns.

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Weimann, Christopher. MARBLING IN MINIATURE. Dawson's, Los Angeles, 1980. 2 X 3 inches. Handmarbled paper over boards. Bound by author. Illustrated with original samples. Limited to 350 copies and nearly out of print.

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