# THE EVOLUTION OF

Exploring the history of papermaking, amount of paper produced and consumed world wide, and exploring the process in which paper is produced.

# A BRIEF HISTORY

The first paper-like substance was invented by the Egyptians over 6,000 years next 1700 years. ago. Papyrus, which is the root of our English word paper, was made by weaving reeds or other fibrous plants together and pounding them into a flat sheet. The Greeks and the Romans also used this technique, although some Ancient Greek paper makers were the first to create a kind of parchment paper made out of animal skins. Chances are, Aristotle, Socrates and other Greek philosophers originally wrote their books on the skins of dead cows.

But paper as we know it wasn't made until 105 AD. when a Chinese court official named Ts'ai Lun mixed mulberry bark and hemp with water and scraps of cotton and linen cloth (i.e. rags). This concoction was mashed into a pulp and pressed into mats that were left in the sun to dry.

Rags were the basis for paper for the

Bamboo PaperModern paper was invented in 105 AD by the Chinese when they used tree parts to make it. Some of the fine paper was made from bamboo fiber, such as the example pictured here. (Franklin Institute).

As the Chinese culture flourished and expanded to the edges of the Asian continent, paper went along with it, first to Korea and Japan and then to the Arab world which included Egypt and Morocco. Yet, it wasn't until 1009 AD that Papermaking reached Europe by way of Spain, where the first European paper mill was set up by Arabs in Xativa, near the Mediterranean port city of Valencia.

After that. the Italians and the French became notable paper makers and dominated the paper industry in Europe from 1250

to 1470 AD. After the invention of the moveable type printing press in 1453 by the German inventor Johannes Gutenberg and the subsequent boom in literacy rates in the 16th century, paper for books grew in demand. Paper mills began opening all over the European continent and eventually reached the new world where the first American paper mill opened in Philadelphia in 1690. That increase in demand and the upsurge in papermaking began to tax the raw materials used to make paper (which was still largely made with rags) and manufacturers began searching for alternatives. It wasn't until 1843 that ground-wood (or pulp) harvested from trees became the papermakers material of choice.

# TIMELINE

The birth of paper, as we know it today, took place under the Chinese Han Dynasty in AD 105. Ts'ai Lun, a court official, invented a papermaking process which primarily used rags (textile waste) as the raw material with which to make paper. Chinese papermakers subsequently developed a number of specialities such as sized (paper with special surface properties), coated and dyed paper. Further advances saw paper designed to be resistant to insects and the use of a fibre-yielding plant - bamboo - which was de-fibred by cooking in lye.

### <sup>-</sup>14th Century

European papermakers continue the innovation The export of the technique of papermaking to Europe, especially to Italy, has been well documented. From the 13th century onwards, papermakers at two early Italian centres, Fabriano and Amalfi, tried to improve upon the Arabian technique.

## 17th Century

Papermaking technology improves - demand for paper increases Technical progress continued throughout the 17th Century. The invention of the 'Hollander beater' confirmed the Dutch as being at the forefront of papermaking technology. It was a much more efficient way to make pulp compared with the stamping mill, which it began to replace, dividing papermakers into traditional versus modern camps.

Meanwhile, improvements in the printing process, namely the introduction of movable type, greatly increased demand for paper. It led to a serious shortage of raw materials and to regulations governing the trade in rags, the primary raw material for making paper.

### 19th Century

Emergence of wood based paper and increased mechanisation

The systematic search for substitute raw materials with which to produce paper in Europe proved difficult. In the early 18th century straw was used as a raw material but it failed to make headway due to quality concerns.

Flat screen and cylinder machines, which were first seen in the 19th century, were continually improved and extended to include a dryer section. This soon led to a considerable widening of the paper web and to an increase in production speeds.

### 20th Century

Today, intelligent paper used in packaging allows us to see clearly if products are past their sellby date by changing colour, printed electronic circuits can be used instead of traditional heavy circuit boards, scratch and sniff books bring learning to life, radio identification tags allow products to be traced at every stage, and even batteries can be made from paper.

AD 500



Packaging Paper Graphic Paper Other

2009

2007

Paper Making

oubbles to escape.

**Press Section** 

Headbox

2008

Pounds/ Kilos per person

This statistic depicts the total production of paper and board in the United States from 2003 to 2012 In 2011, the total U.S. production of paper and board amounted to some 81.52 million tons.

2007

2008

2009

2010 2011

2012

\* Excludes hardboard. Includes wet machine board and construction grades.

2006

This statistic shows the amount of paper produced worldwide, by paper type, from 2007 to 2013. In 2008, some 151.5 million metric tons of graphic paper were produced around the globe. Until 2013, this production decreased to under 135 million metric tons.

2010

2011

This statistic was assembled from several editions of this report. VDP stands for "Verband Deutscher Papierfabriken" (Association of German Paper Factories).

This map is demonstrating how widely paper usage varies from continent to continent.

Average

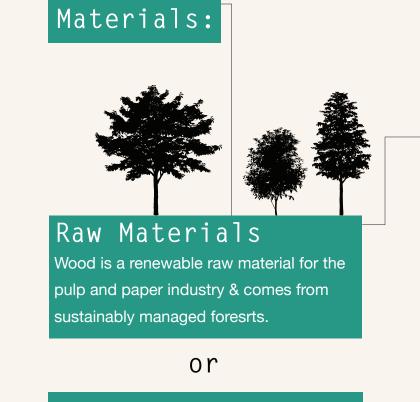
54.71k

l20.62 lbs

Sources: RISI, US Census Bureau, United Nations, Statistics Canada. Infograph © Environmental Paper Network

# THE PRODUCTION OF PAPER





70,000

2003

2004

2005

### Recycled Materials Paper for recycling is an important naterial for the pulp and paper industry.



De-barking/Chipping Bark which cannot be used for papermaking is stripped from the logs & used for energy. Striped logs are chipped nto small pieces and recovered.

> Chemical Pulping This pulp is boiled, bleached, strained, flattened and dried in a process that yields a continuous sheet of paper.

Mechanical Pulping Woodchips are ground to seperate the fibers. Pulps are used to make high commodity printing.

Pulping Paper for recycling is dissolved into pulp to seperate the component fibers.

> De-inking Adhesives and ink are removed.



In the end, the paper is either wound into a reel or cut into sheets, ready for printing or nsforming or "converting" these large parent rolls o smaller sizes consists of many different aspects It it's an essential part of the process of making the shed product. Since there are many different size ing presses, changing the roll's width and /or neter is required to accommodate the printing pre

2012

2013



### Vellum Bristol Popular colors: White and Color Popular weights: 57, 67, 100, 120 lb. Uses: Mailers, Posters, Advertising

Ledger Popular colors: White, Buff, Greentint Popular weights: 24, 28, 32, 36 lb. Uses: Business Forms, File Tabs, Records, Etc.

PAPER SAMPLES

**BELOW ARE DIFFERENT TYPES OF PAPER** 

**USED IN PROFESSIONAL DESIGN PROJECTS** 

Cover Popular colors: White and Color Popular weights: 50, 60, 65, 80, 90, 100, 130 lb. Uses: Booklet Covers, Mailers, Menus,

Posters

Index Popular colors: White and Color Popular weights: 90, 100, 140, 170, 200 lb. Uses: Record Cards, Tab Folders, Booklets



as ang/papan the facto	
cs.org/paper-the-facts	
nois.edu/publications/p10-cook.pdf	
nloads/eco-design-paper-facts.pdf	
blishers/digital-publishers-reviving-print-corpse/	
om/statistics/270317/production-volume-of-paper-by-type/	

Newsprint	Laser Bond	Offset	Digital Imaging
Popular colors: White	Popular colors: White	Popular colors: White, Ivory, Cream	Popular colors: White, Bright White
Popular weights: 90, 100, 140, 170,	Popular weights: 20, 24 lb.	<i>Popular weight</i> s: 50, 60, 70, 80, 100 lb.	Popular weights: 20, 24, 28, 32, 50, 60,
200 lb.	Uses: Laser printed Forms, Mailers,	Uses: Business Forms, Flyers, Books,	and 70 lb.
Uses: Record Cards, Tab Folders,	Stationery	Mailers	Uses: Brochures, Newsletters, Reports,
Booklets			Manuals, Magazines, Folders, Cards