AJEEP SYLLABUS
Introduction to Printing for Mass Communications

Course Description

An introduction to print production processes and design considerations by covering an overview of the history of Western printing, standard terms used to identify components and practices; ink and paper; the major printing process used for volume printing; and steps to working with commercial printing companies in an ethical manner. The six lessons are designed to be one-hour sessions but time may vary depending on the number of students, quiz reviews, and discussion times. Obviously, six hours of learning does not substitute for years of practical experience but it can be a start.

Course Goals and Student Learning Objectives

This course will give the student a basic understanding of printing and compatible design:

Western historical context
Terms
Major printing processes
Steps to working with commercial printing companies

Course Content Learning Outcomes

Upon successful completion of this course, students will be able to:

LO1 Identify industry standard commercial printing processes

LO2 Understand and discuss how production processes require planning (schedule and design) to meet deadlines

LO3 Learn and use relevant vocabulary for the industry

Required Texts/Readings

Textbook

There is no required text. There are many free books and articles about the printing industry.

Other Readings

The instructor's appendix section has further suggestions but talking with working professionals is the most interesting way to stay abreast of the industry.

Other Equipment / Material Requirements (Optional)

Enhanced learning can be realized with Internet access and by using a computer with publishing software like InDesign 2.0 or later versions.

Assignments and Grading Policy

Class instruction will include a lecture, discussion, and homework review. Lectures will be given based on the lesson information, discussion will be through student class participation, and homework will include answering the quizzes and bringing in print samples of newspapers.

Assignments will be given in each class and may be just a quiz or a quiz and other work. Assignments will be due the following class session.

Each class, except the first one, will cover learning objectives 1, 2, and 3.

Grading will based on earning a total of 100 points by the end of the six classes.

6 classes *x* 10 points for class participation = 60 points possible
6 quizzes *x* 5 points each possible = 30 points possible
1 final class newspaper critique by each student = 10 points possible

=100 points total

Any late work will receive a maximum of half credit. There is no extra credit. Participation in class involves discussion, critical thinking, use of relevant vocabulary, and questions about the material covered. An F grade is a fail.

POINTS	GRADE
100–98	A+
97–94	A
93–90	A-
89–87	B+
86–83	B
82–80	B-
79–77	C+
76–73	C
72–70	C-
69–67	D+
66–63	D
62–60	D-
59–0	F

Introduction to Printing for Mass Communications **Course Schedule**

Class	**Date**	**Topics, Readings, Assignments, Deadlines**
1		Overview of the printing industry
2		Terms
3		More terms
4		Ink and paper
5		Major printing processes
6		Working with a commercial printing company

The schedule is subject to change with fair notice by e-mail and in the previous class.

Introduction to Printing for Mass Communications
Learning module

Vocabulary

Anti-aliased images are those with a transitional blending from one tone or color to another.

Bindery is the finishing step of manufacturing, after printing.

Bit depth of pixels is a way to describe how much information is with each pixel.

Bitmapped image is a kind of image made up of pixels.

CMYK inks are standard four-color (or full-color) semi-transparent printing colors and the initials stand for cyan, magenta, yellow and black.

Color cast is a shift in overall color of an image compared to the original.

Color profiles are file-embedded, software-to-software communications to keep color looking the same independent of how it is being viewed.

Computer to plate (CTP) eliminates the need for film to make printing plates.

Densitometer for printing is a calibrated instrument that helps the press operator evaluate the amount of ink printing on the paper.

Digital printing is the use of computer-controlled presses that can instantly create new impressions of ink on paper with each turn of the printing cylinder.

Direct imaging takes CTP a step further by eliminating the need to process printing plates separate from the press.

Dither pattern results from spots/dots/pixels grouping in a random pattern to create tones.

Dot gain is the result of dots/ink/pixels expanding.

Dots per inch is a reference to image resolution. Image makers refer to their work in pixels per inch and printing companies describe their reproduction fidelity for halftones and line art as dots per inch and lines per inch.

Duotone image is a two-color (two-tone) reproduction usually using darker and lighter-color inks.

EPS is the filename extension and abbreviation for Encapsulated PostScript.

Flexography is a major printing process designed to print on very thin and difficult-to-print-on papers.

GIF (Graphics interchange Format) image files can display up to 256 shades or colors.

GCR (Gray Component Replacement) changes the way inks are used on a printing press to reduce the amount of color inks.

Line art is without intermediate shades or tones so it appears as one color and areas without color (probably the paper showing).

Grain of paper is the predominant direction of fibers in the paper.

Gravure printing is a process used for very large quantities of documents.

Grayscale is an image showing up to 256 tones from dark to light in one color.

Gripper edge is the side of a printing sheet that is pulled through the press.

Halftone screen is a breakdown of an image into spots or dots to simulate a continuous-tone image when printing.

Imposition (in pre-press) is the way pages are arranged on a printed sheet so they come out in the correct order after the bindery operation.

Ink offset refers to the way ink unintentionally rubs off one area and transfers to another on a page.

JPEG is an image type that can make smaller file sizes at some loss in quality.

Letterpress is a printing process that uses relief (3-dimensional) type and images to transfer ink onto paper.

Lossless images are ones that retain all of their original pixels if compressed to make for smaller file sizes.

Lossy images are ones that lose some of their original pixels if compressed to make for smaller file sizes.

Lines per inch specifies the resolution of the printing halftone screen with more LPI signifying smaller dots and more resolution.

Line-art images are represented by either black or white and no grayscale shading.

Mezzotint is a kind of halftone screen with a pattern of irregular dot placement.

Moiré is an undesirable pattern caused by overlapping halftone screens at incompatible angles to each other.

Offset lithography is a popular method of printing.

Pantone Matching System is a color identification system where printed color samples can be compared to other printed colors and specifically identified.

Paper swatch book is the presentation of paper samples so they can be selected for printing.

Paper certification indicates meeting certain standards of paper quality.

Portable Document Format (PDF) is a file type that allows consistent viewing of documents on different computer operating systems.

Perfecting presses are able to print both sides of a page at the same time.

Picking shows faulty printing with small white spots in areas of ink coverage.

Pixels are the smallest picture elements that make up a bitmapped image.

Printing plates are used in printing, on the printing press, to provide an image that will become the inked impression on the paper.

Posterized images have been reduced in tonal range so there are just a few range of tones representing the image.

PostScript language is a computer language that can describe all of the elements of a page in terms of images, text and their placement.

Press check is an industry term meaning an approval is made of the printed press sheet in the early stages of printing to set the standard for the remaining print run.

Proofs for printing are used to approve a simulation of the printed project before it is actually printed.

Raster images are bitmapped pixel-based images.

Registration of printing colors is necessary to ensure good quality printing and registration marks are used to observe the printed result.

RIP process (Raster Image Processing) is a pre-press function that takes the digital file and creates a final image for the printing plate for printing.

RGB (red, green and blue) are the basic components of projected light.

Saddle stitching is a bindery operation that holds pages together with wire staples.

Screen density of printing dots is a measure of the number of halftone printing dots per inch.

Screen printing (also called silkscreen printing) is a process of making inked images on materials, some of which might not be able to pass through a printing press.

Separations for printing are a pre-press function the printing company does to make plates that will print each ink color.

Sheet-fed press is a printing press that takes sheets of paper to print as opposed to rolls of paper.

Signature for bindery is a printed press sheet ready to go through the bindery process of manufacturing.

Specialty printing involves a variety of printing techniques for special appearances that cannot be achieved by one of the major printing processes.

Spot color is a color of ink beyond the CMYK inks used for full-color printing.

Stochastic screen produces printing dots that are randomly arranged instead of on a grid or matrix.

TIFF (Tagged Image File Format) is an image type that does not degrade if compressed and is able to portray line-art, grayscale and color images.

Transparency flattening converts overlapping areas into a single layer to preserve the original characteristics.

Trapping is a pre-press technique to avoid registration problems by overlapping one ink color over another.

UCR (under-color removal) in CMYK printing pulls color from the shadow areas so just black can print.

Varnish is a clear ink used for protection and to provide a sheen to pages.

Vector image works on mathematical information to create an image than remains sharp at any size.

Web offset lithography is like offset litho except that rolls of paper are used instead of sheets.

Work-and-turn is similar to work-and-tumble where a press sheet is printed on one side and the same printing plate is used again to print the other side of the press sheet.

Introduction to printing for mass communications
Learning module

Instructor's Guide

Lesson 1	Overview
Lesson 2	Terms 1 — **A**nti-aliased through **L**ine-art images
Lesson 3	Terms 2 — **M**ezzotint through **W**ork-and-turn
Lesson 4	Ink and paper
Lesson 5	Major printing processes
Lesson 6	Working with a printing company
Appendix	Instructor materials: appended slides, quizzes, discussion topics and un-edited video of an open, web-roll printing press in operation

Organization of PowerPoint content

The front section of the PowerPoint slide set contains the student-directed six lessons with instructor slide notes. The appendix is designed for the instructor with class materials.

The appendix contains quiz answers and discussion topics to enrich the class learning experience. Also included is an un-edited video of an open, web-roll press in action (turn the volume up to maximum to get some idea of the real noise level in the factory). Related to this topic are other learning module sets by Tim Mitchell for more on newspaper design, magazine design and typography.

Introduction

Printing remains a major industry although it has diminished since the development of the Internet and electronic documents. It is still an important communications tool and knowledge of appropriate ways to communicate is an advantage.

Two lessons cover many of the terms used in the printing industry. These terms are important for there to be a meaningful dialogue with the communicator, the designer and the printer so the audience will get the most out of the printed message. Major printing systems and how they work will be the focus of these six lessons.

It can easily take ten years or more of design experience to be a key designer at a larger metropolitan publication. This could be a starting point on that journey.

The material is prepared as Microsoft PowerPoint slides (.ppt) and their order can be changed based on the need to present and discuss material. As a result of varied student experience and knowledge, every class can run differently in terms of presentation and discussion times so the instructor should allow for variations. A lesson could stretch into two sessions and more.

Observations and discussions of printed material will enrich the learning experience. Bring examples into class for analysis because printing is a tactile experience intended for human interaction through sight, touch and intellect.

Students with access to computers and design software can use lesson 6 to create and experience some aspects of design for print. Those without computer access can observe the computer users and review printed samples.

The instructor can further enrich the learning experience by connecting with printing company representatives to discuss and show work in class. It is worth exploring the chance that a printing company will have unused space on a printing sheet, that would otherwise become trimmed waste, to allow class designs to be printed for a reduced price or even for free. It doesn't hurt to ask.

Teaching process

1. **Before class starts**

a. Before teaching each learning module, the instructor should review corresponding slide sets in the appendix. These slides are enhanced with additional information and callouts not visible on the student slides that are in the front six modules. An instructor with more background information is able to talk through bullet points with more detail and provide answers to questions raised during discussions. Without overwhelming the student with text-heavy slides.

b. For class, bring in physical print samples for analysis and discussion with magnifying loops (optical magnifying glasses) and add contemporary slides to the modules if needed to support to review. The order of the slides can be rearranged to meet your needs to encourage discussion and . As an extreme example, it is conceivable to use just one slide for the entire class if it is accompanied by meaningful student analysis of real print samples with extended discussion. More likely, multiple slides will be involved in each class.

c. Prepare any handouts including quizzes and printed samples. In future classes, encourage students to bring in samples so they can share their analysis. Frequently, assumed printing techniques are different from reality so it is good to see physical examples than just slides.

2. **At the start of class**

Write information on a class chalkboard, white board, or projection screen:

a. Introduce yourself and welcome students to the class

b. Take roll to know what students will be participating

c. Show your name and how you want to be addressed

d. In the first class, hand out the class syllabus

e. Step through the syllabus to inform students how the class will proceed including how grades are determined, when the classes meet and how to contact the instructor when away from class.

f. Give the class name.

g. Give the module name.

h. State key topics to be discussed,

i. Invite any questions and make the students comfortable asking questions that may interrupt a presentation — you want an open learning environment with full participation.

j. Hand out the quiz, the type ruler and any other items to be used in class.

3. **During class**

a. Present the slides, direct evaluation of samples and invite discussions.

b. Assign the quiz and any extra discussion topics. The quiz can be taken in class but it will impinge on the presentation and discussion time. It may be best to give the quiz as homework so it can be answered using notes and the student slide set. The quiz will provide feedback about what topics are not being understood. Plan on repeating or talking about these in new ways for the next class.

c. Tell the students when the quiz and any other assignments are due.

d. Re-state what topics were covered in class.

4. **After class**

a. Allow time to stay after class for students who have additional questions or concerns.

b. Bring any questions asked outside of class back to the next session so all students can hear the questions and their answers.

c. Check for e-mails or other communications from students and provide timely responses.

d. Grade quizzes and enter grades to monitor and report student progress.

e. Prepare for the next class by reviewing slides and supplemental information in the appendix.

Introduction to Printing for Mass Communications

The Six Lessons

Lesson 1	**Overview**
Lesson 2	**Terms 1** — Anti-aliased–Line art images
Lesson 3	**Terms 2** — Mezzotint–Work-and-turn
Lesson 4	**Ink and paper**
Lesson 5	**Major printing processes** — letterpress, offset litho, gravure, flexography, digital/electronic, screen, and specialty printing (die-cutting, engraving, foil stamping, and lenticular)
Lesson 6	**Working with a printing company**
	Appendix

All photos and other images are by Tim Mitchell unless identified otherwise.


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"Before printing was discovered, a century was equal to a thousand years."

Henry David Thoreau,
American author and poet

Introduction
to printing
for Mass
Communications

Lesson 1

Overview

5000 years of impressions

- The Mesopotamian civilization is credited with starting printing about 3000 BCE (Before Common Era).
- Earliest printing, or multiple reproductions of images, was like a rubber-stamp process of duplication using hardened clay stamps and soft tablets for paper. The tablets retained the marks left in the clay from the master clay (relief) images.
- Woodblock printing masters carved out of blocks of wood were in use by 200 CE (Common Era) with ink and paper.

Johannes Gutenberg's contribution to printing

- Moveable type had been used about 500 years before Gutenberg in Korea and China but it wasn't viable.
- The main problem was the huge number of alphabet characters in these languages which took considerable time to set up on each page.
- Gutenberg was able to combine his knowledge of print manufacturing, a small alphabet, and abundance of paper to prove printing was sustainable.
- He knew about pressing equipment, metal alloys for durable type letters, type mold making, and ink formulations to get ink to stick on the metal type so he could succeed in the process.

Printing and design eras

- **Pre-Gutenberg** (<1455)
- **Gutenberg** (1456–1760)
- **Industrial** (1761–1890)
- **Artistic** (1891–1983)
- **Digital** (1984–present)

Printing

Pre-Gutenberg (<1455)

- Books were hand copied one at a time
- Information was slow to disseminate
- Books limited to upper class of people who could afford them and were literate
- Books were cherished

Printing

Gutenberg (1456–1760)

- Book printing flourished
- Called the incunabula period
- Information dissemination rapidly increased
- Books were not limited to the upper class of society
- Paper instead of vellum was viable

Printing

Industrial (1761–1890)

- Book volumes and production times were speeded up by mechanical automation (industrial revolution).
- Type was manufactured with more precision, durability, and speed
- Delivery was expedited by better transit: improved roads, rail, sea.

Printing

Artistic (1891–1983)

- Technical improvements allowed for more sophisticated “analog” reproduction.
- More and easier use of images integrated with text.
- Photo reproduction of words and images sped up mass communications assembly and delivery.

Printing

Digital (1984–present)

- Technical improvements using digital processes allowed for most sophisticated reproduction.
- More control for designer who could create all artwork (words and pictures) to print from a computer and other digital hardware/software.
- Printing files could be sent instantaneously to local printers for distributed printing.

Quiz

Printing Module 1

1. The Gutenberg printing era started an information explosion some say is like the start of the Internet. True or False?

2. Gutenberg was the first printer to use moveable type. T or F?

3. What print/design era gave the designer full control of creating and providing artwork for images and words to be printed?

4. What print/design era allows publications to be printed closer to destinations?

5. Why is it an advantage to “distribute and print” instead of “print and distribute?”

Introduction
to Printing
for Mass
Communications

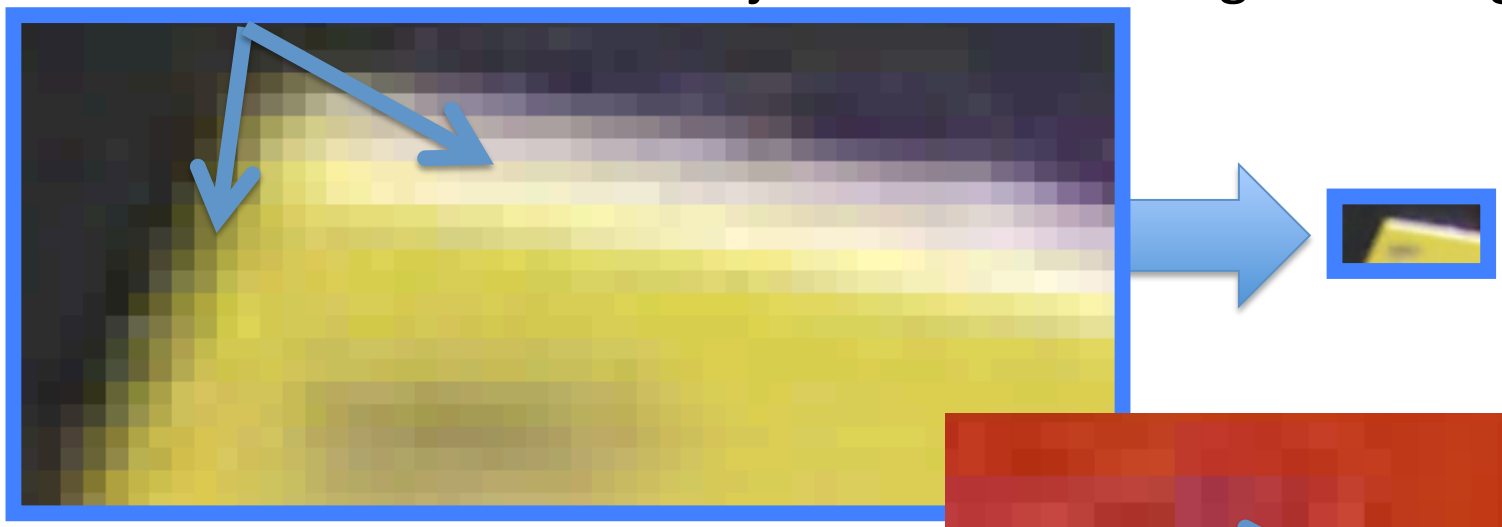
Lesson 2

Terms 1 — Anti-aliased–Line art

Printing terms

Anti-aliased images

Smooth transitions across adjacent areas through blending.



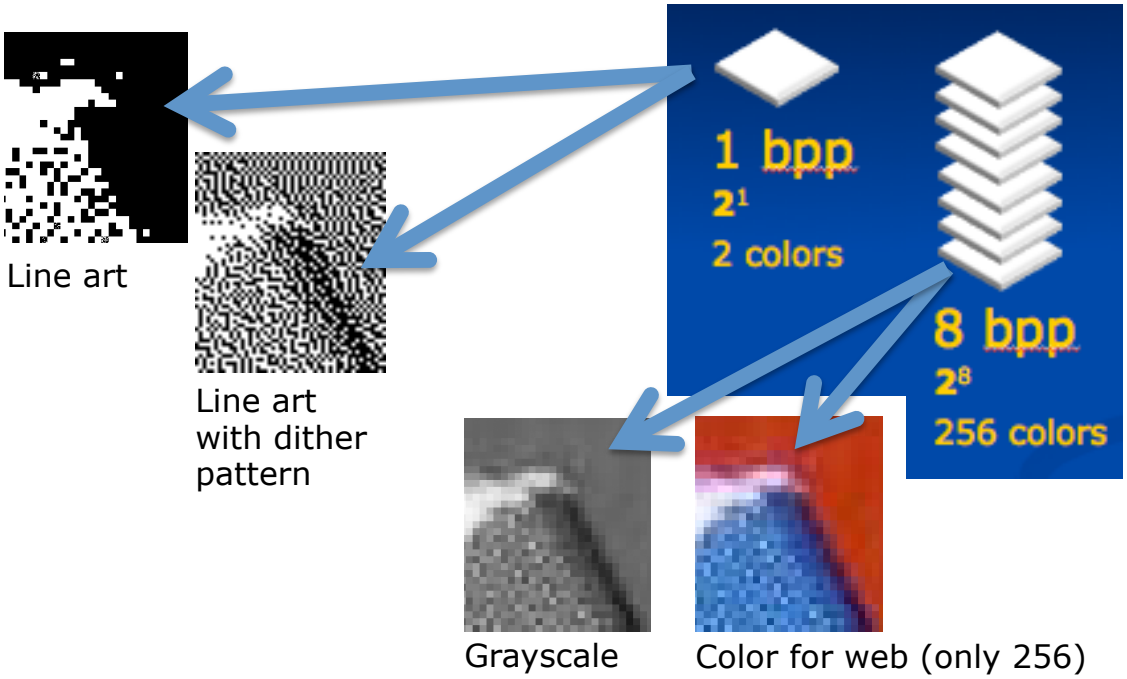
Artifacting of images

Image files showing neighboring pixel colors not true to the original.

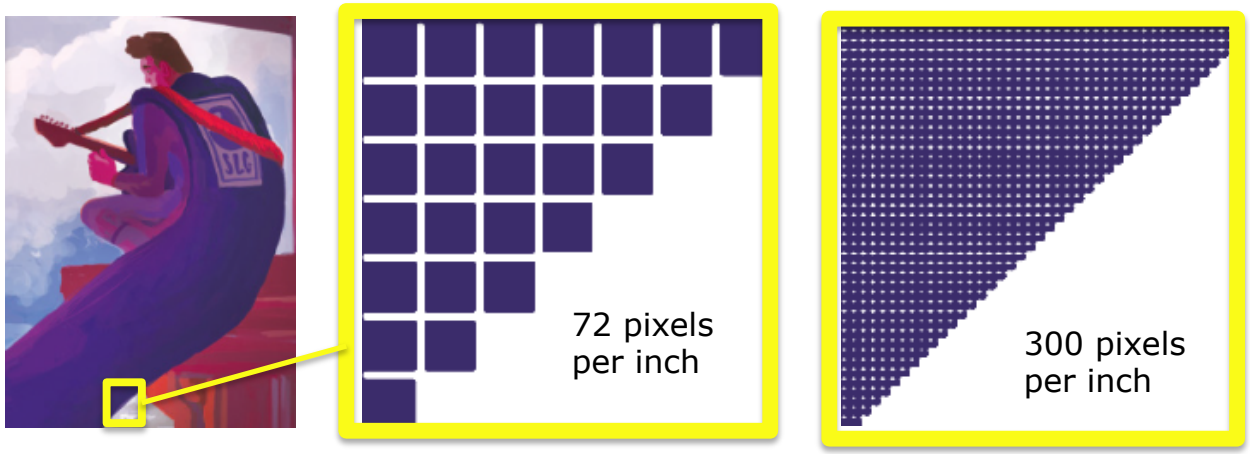
Bindery

The back-end of the print manufacturing process where printed pages are assembled into the final product. Bindery uses many techniques to finish the publication.

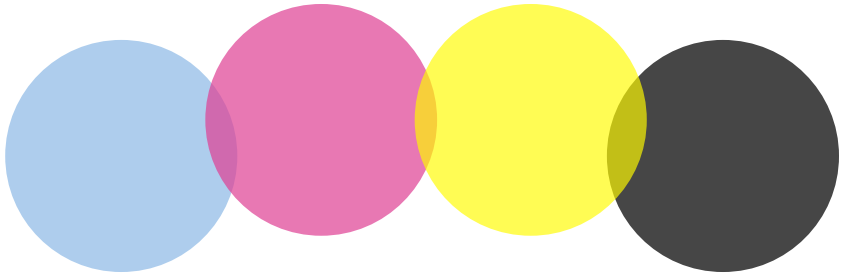
Bit depth of pixels
How much information is contained in each pixel.



Bitmapped image
A type of image made up of pixels.



CMYK inks
The initials for **c**yan, **m**agenta, **y**ellow, and **b**lack inks used in full-color printing.

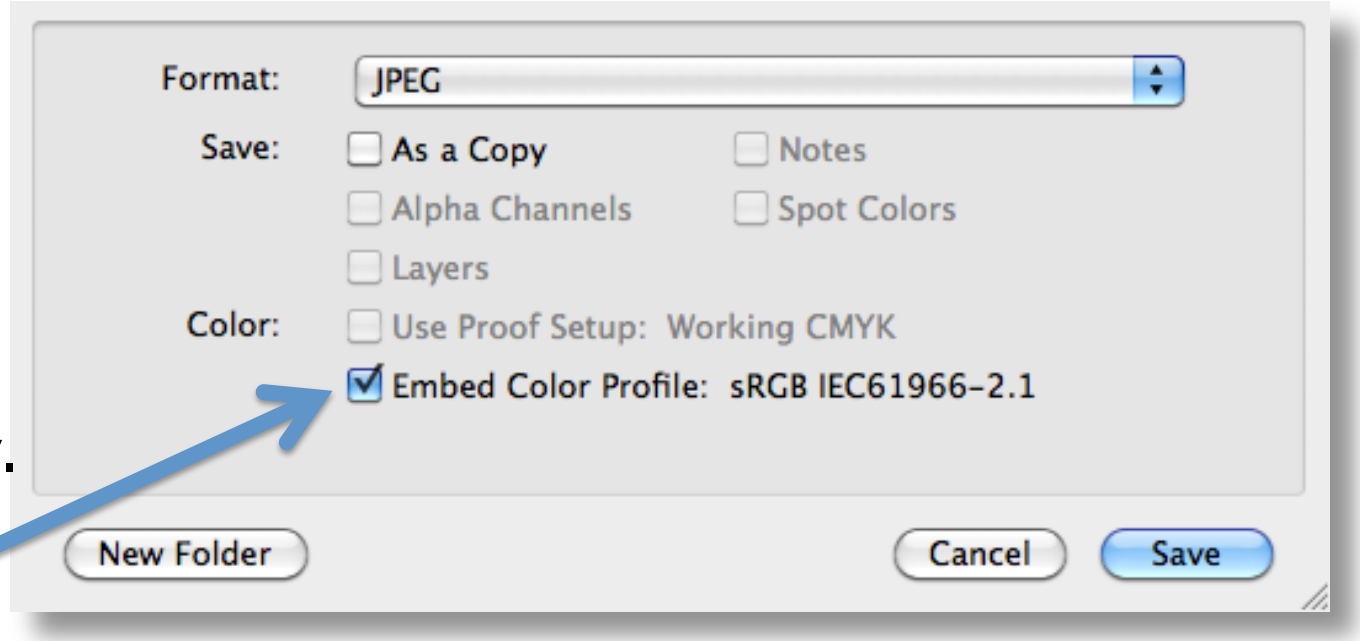


Color cast of image
An overall coloring of the image from too much of one color.


Original image


Blue color cast

Color profile
Digital data describing image color to provide consistentcy.



Color profile on Photoshop dialogue box

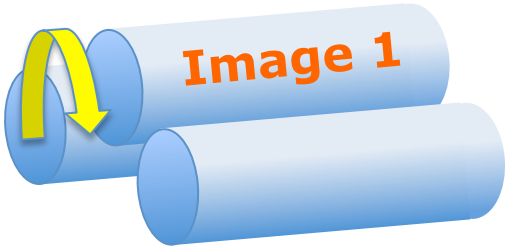
Computer to plate (CTP)
Digitally-produced printing plates for commercial printers.

40-inch wide metallic printing plate

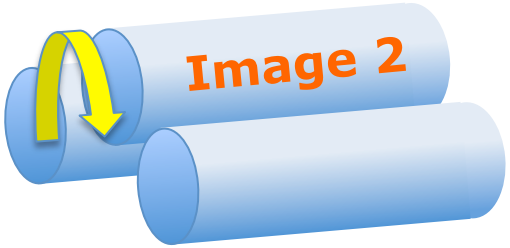
Densitometer for printing
An instrument used by the press operator to analyze the density of inks on the printed sheet.

Digital printing
A digitial-era printing technology that uses DI (direct imaging) to provide an image to a digital press so each turn of the image cylinder can be re-imaged (with variable-data input) without stopping the printing process.

Press cylinder rotation 1

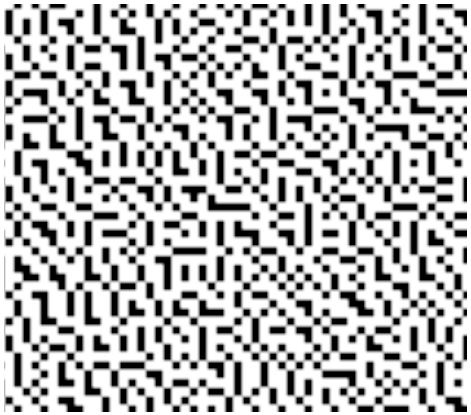


Press cylinder rotation 2

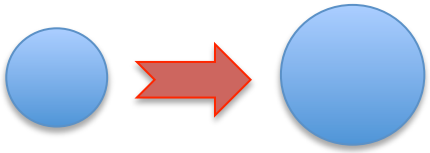


Direct imaging (DI)
Technology that eliminates film to directly create a printing plate while on the press

Dither pattern
Random pattern of pixels or dots that can create the illusion of tones or shades of colors when small enough



Dot gain
A change in the size of halftone dots when moved from one medium to another, for example, when printing on absorbent paper instead of coated paper because the ink dot expands as it soaks into the paper



Software compensates for dot gain if properly implemented.

Dots per inch (DPI) and pixels per inch (PPI)
The way to describe pixel resolution as the number of pixels per inch.

More pixels per inch provides more image detail

Duotone image
The name for an image displaying two colors, usually black and another color that gives a hue to the lighter parts of the image.

Black ink helps build density in the darker parts of the image while the color is in the mid-tones to the highlights.

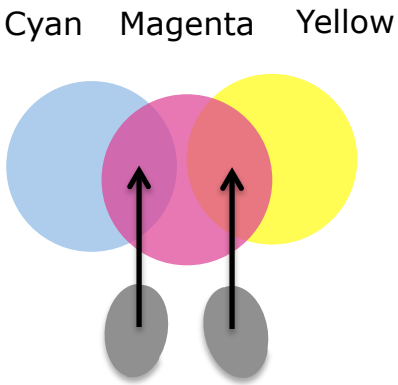
EPS (Encapsulated PostScript)
A file format that is usually vector but can also have bitmap/pixel components.

Vector images remain sharp at any output size unless they have bitmap components.

Flexography
A printing process using rubber-like plates to transfer images onto thin or non-porous substrates

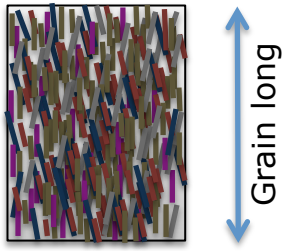
GIF (Graphics Interchange Format)
An image file format limited to 256 colors: works for the Web but not full-color printing

GCR (Gray Component Replacement)
An ink-saving and money-saving process in CMYK printing where black ink (K) replaces some of the other combined, gray-looking, CMY colors in a way that doesn't appear to change the image

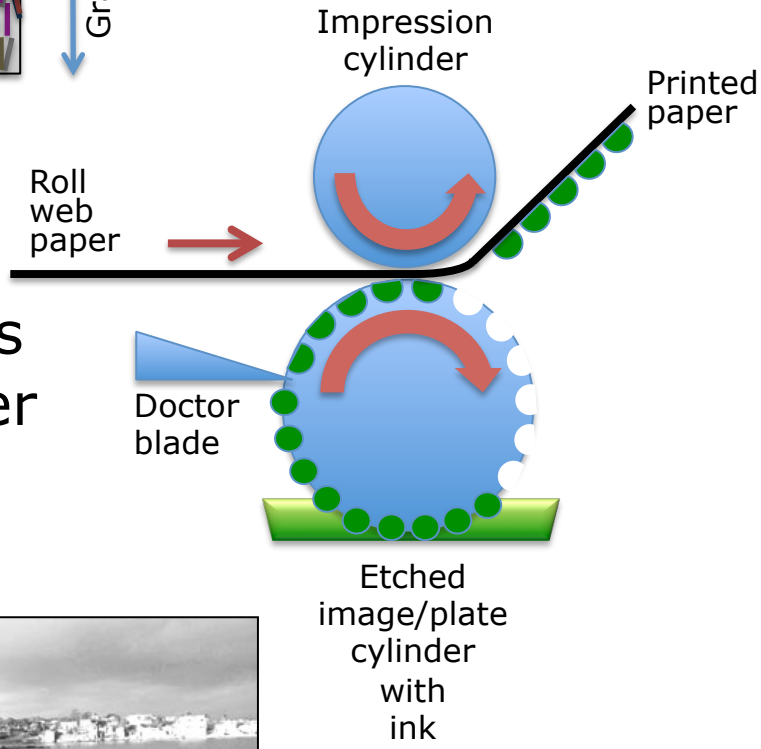


Black tints
to match and replace
gray areas

Grain of paper
The predominant direction of fibers in the paper



Gravure
A printing process for large-run printing (in the millions) that uses etched metal plates which transfer ink directly to the paper

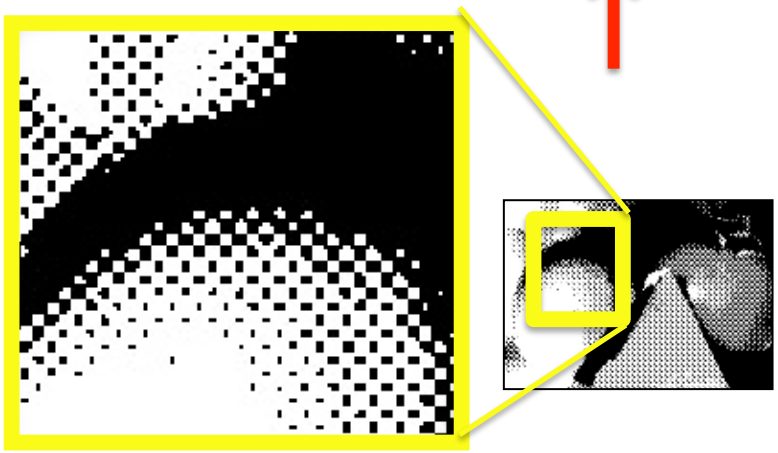


Grayscale image
A continuous-tone image with up to 256 shades of one color, frequently black

Gripper edge or gripper margin
The front edge of a printed sheet of paper where no image or ink can appear

Halftones help reproduce continuous-tone images that have shades of color or grays.

Halftone screen
An reproduction technique that breaks up an image into varying-sized dots on a grid lattice



Imposition in pre-press
A printing term for placing individual pages on a multi-page printing sheet so the final folded and trimmed signature will paginate correctly when assembled into the publication

Signature 1 16 pages

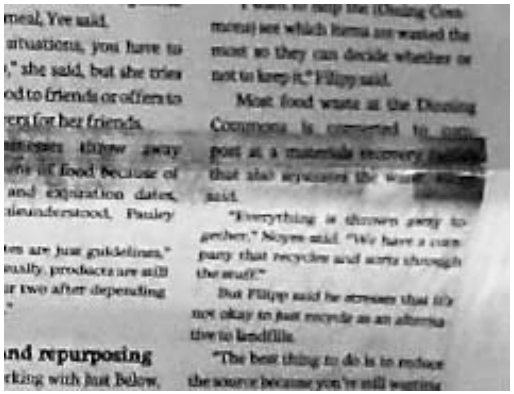
1	32	29	4
8	25	28	5

OUT

3	30	31	2
6	27	26	7

IN

Ink offset
A term related to ink transferring, unintentionally, to adjacent paper in a printed stack or across folds



JPEG image
(also written as JPG, Joint Photographic Exerts Group)
A continuous-tone image file type that can be a smaller file size than TIFFs.

```
Image 1.tif   6.3 Mb
Image 1.jpg   1.2 Mb
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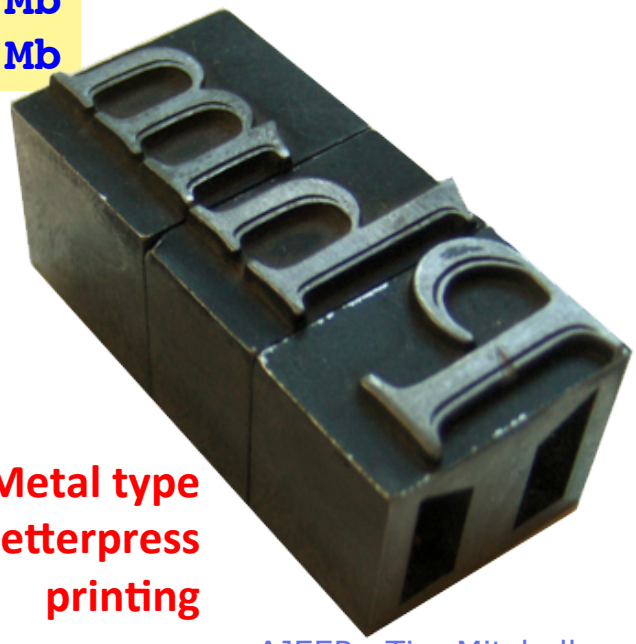
Letterpress
Printing by direct impression of inked type/images squeezed against paper as Johannes Gutenberg did in Mainz, Germany (circa 1456).



Metal type used for letterpress printing

Lossless image files

A file type that has no pixel loss compared to the original image when saved. Compressed TIFF files are lossless and their compression scheme does not always produce files as small as JPEGs.

Image file with no pixel loss

Lossy image files

A file type that has pixel loss compared to the original image when saved. JPEG files are lossy and the amount of pixel loss is increased the more the file is compressed to make it's file size smaller. Saving a JPEG with the least amount of compression results in almost un-noticeable pixel loss.

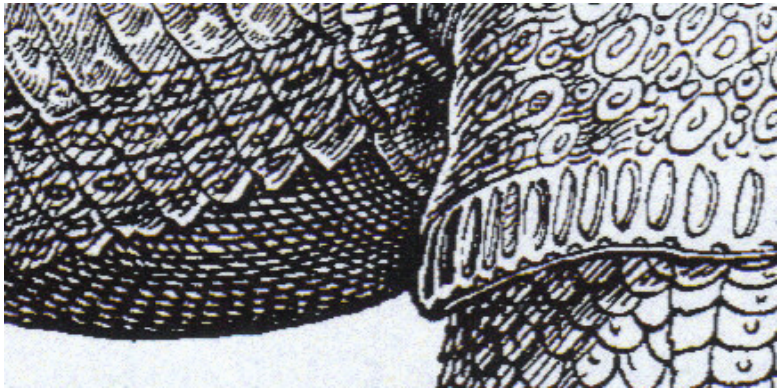
Image file with pixel loss

Lines per inch (LPI) or dots per inch (DPI)
LPI is the number of printed dots per row resulting from a halftone screen and it signifies the printed image resolution.

1 inch; 10 LPI

50% tint as a checkerboard pattern

Line art images
These are images with no continuous tones gradating from black to white so they are solid color or no color and can print at high resolution since no halftone screening is required. Solid black type is an example of line art as is a pen drawing, an etching, and a halftone with solid dots making up the image.



Quiz

Printing Module 2

1. What are anti-aliased images?
2. Is bindery done before or after printing a project?
3. Color bitmapped files are composed of pixels that carry color information. True or false?
4. What are the names of the four process-color printing inks?
5. A gripper margin is the non-printing area of a press sheet. True or false?
6. What is a halftone screen used for?
7. How is a line art image different from a halftoned image?

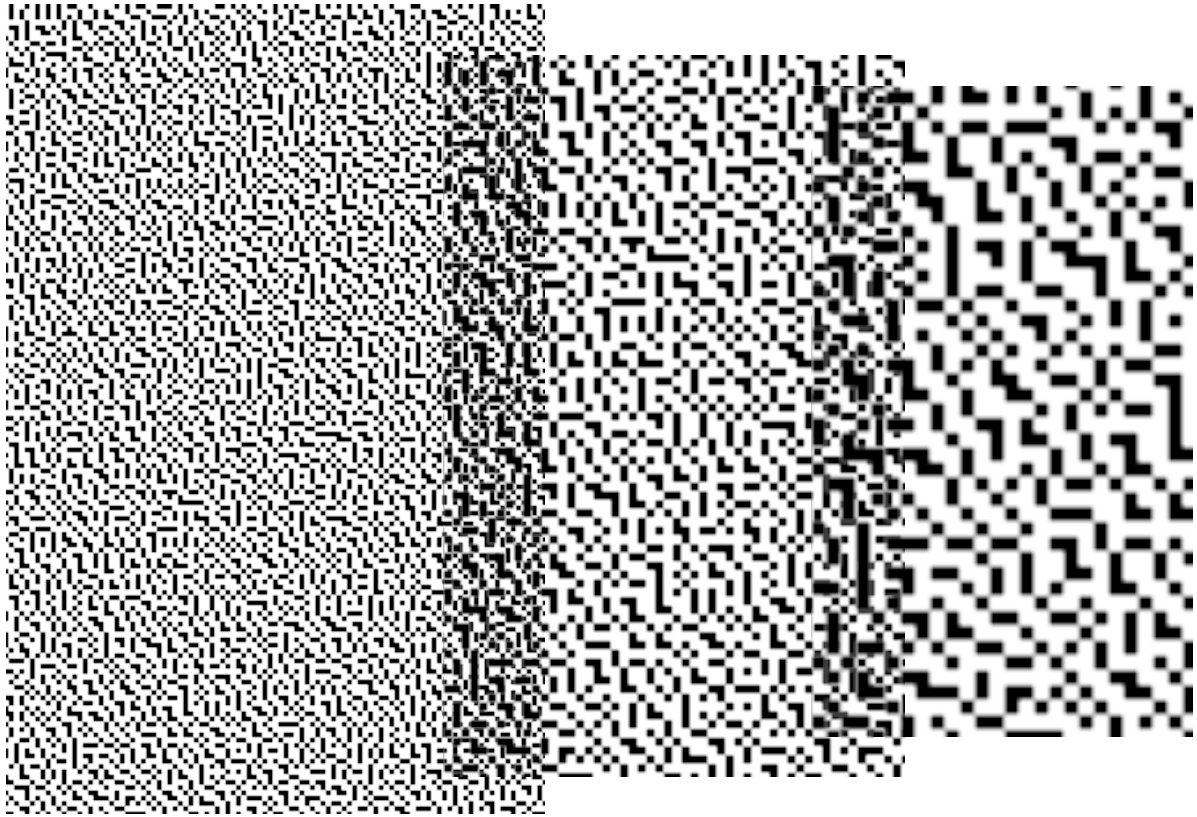
Introduction
to Printing
for Mass
Communications

Lesson 3

Terms 2 — Mezzotint–Work-and-turn

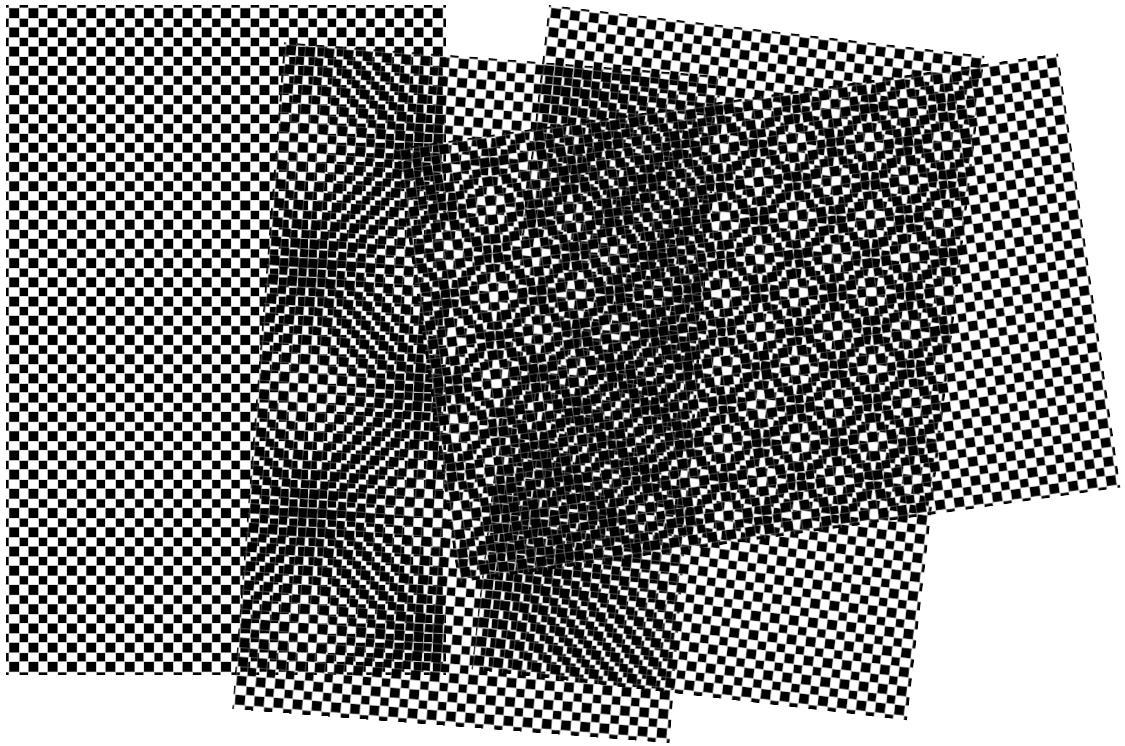
Mezzotint pattern

A style of dithering to simulate shades of gray or color with an irregular dot pattern.



Moiré pattern

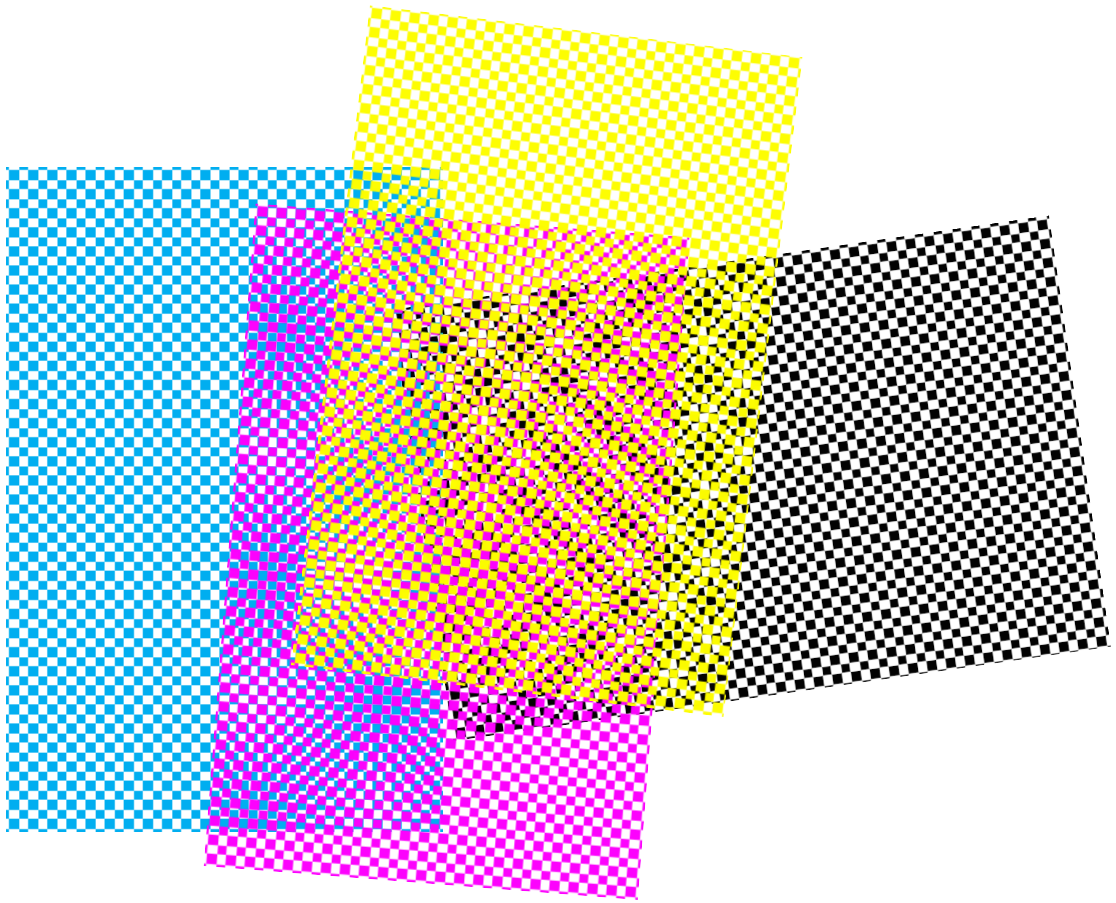
An undesirable, extra halftone pattern resulting from incorrect halftone screen angles combining and interfering during multi-color printing.



Note the interference patterns in areas of overlapping halftone dots..

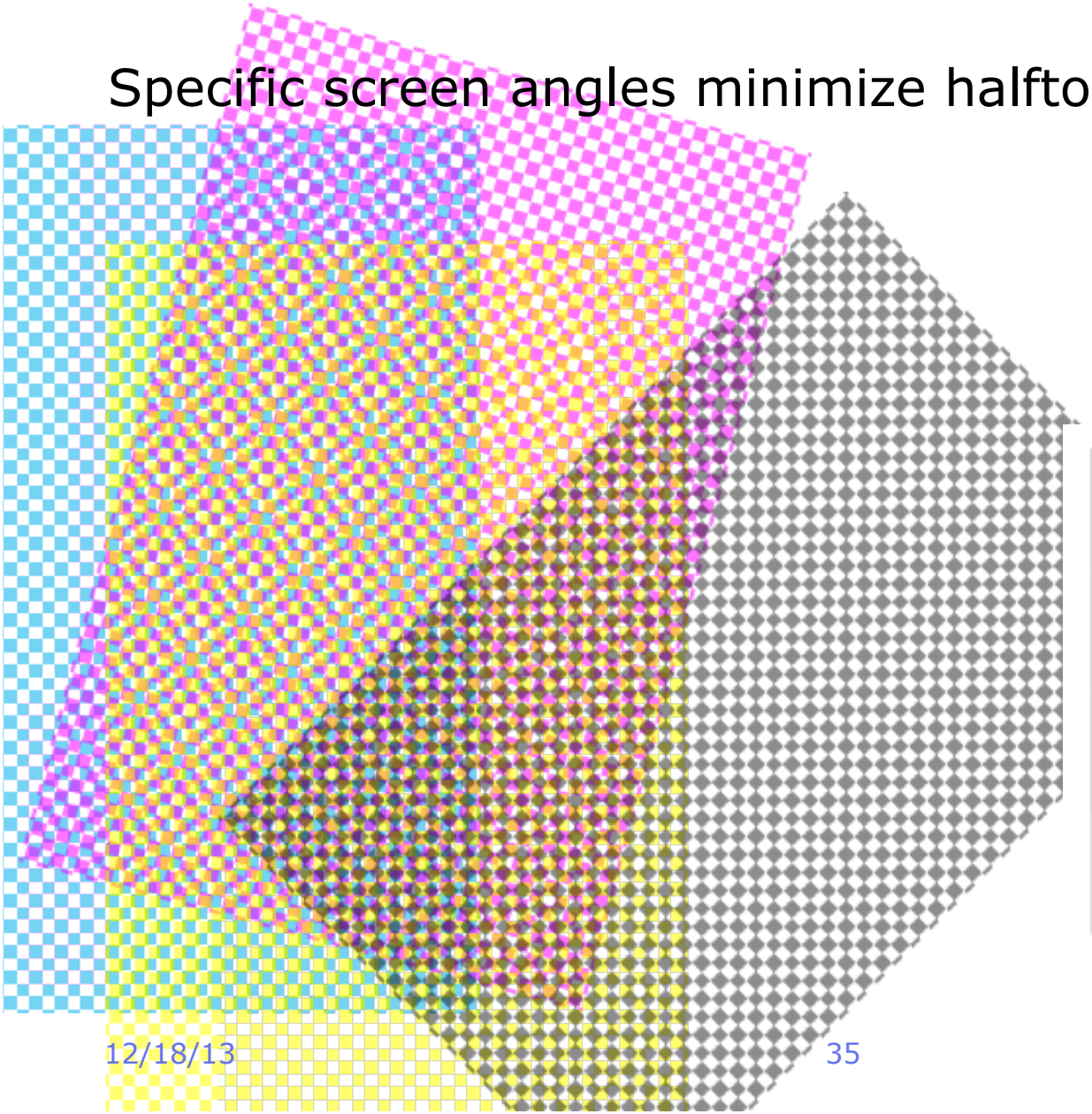
Avoiding a moiré pattern

Four-color printing requires four overlapping screens.
How do they avoid these moiré patterns?



Avoiding a moiré pattern

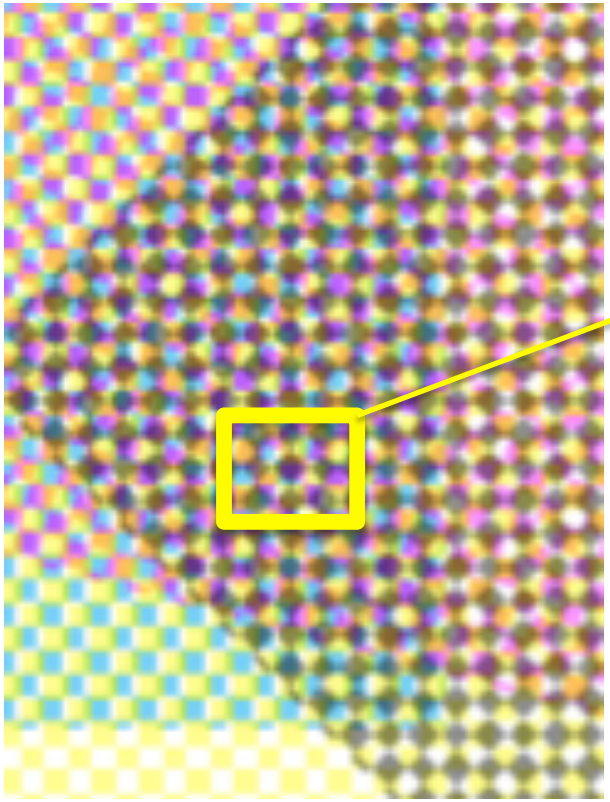
Specific screen angles minimize halftone moirés.



C	100°	15°	105°
M	15°	45°	75°
Y	0°	0°	90°
K	45°	75°	15°

Avoiding a moiré pattern

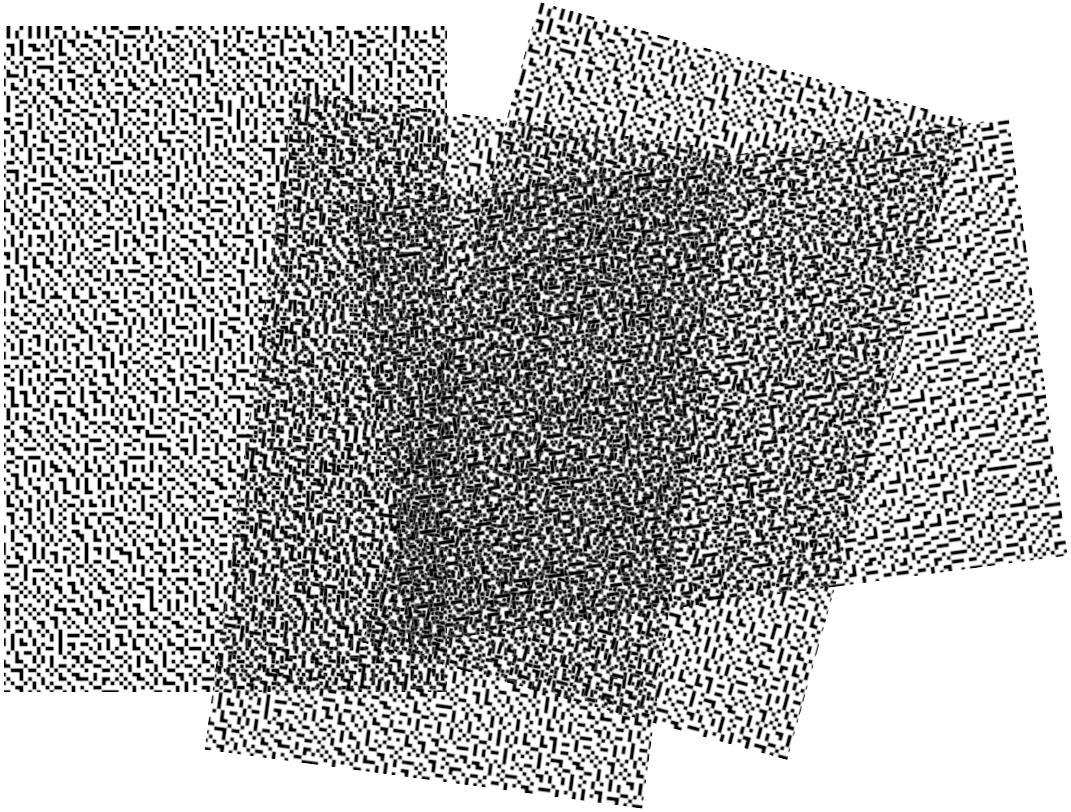
A rosette pattern forms where the four colors overlap. This is the sign of good registration and color printing with halftone screens.



A rosette pattern of four color halftone dots.

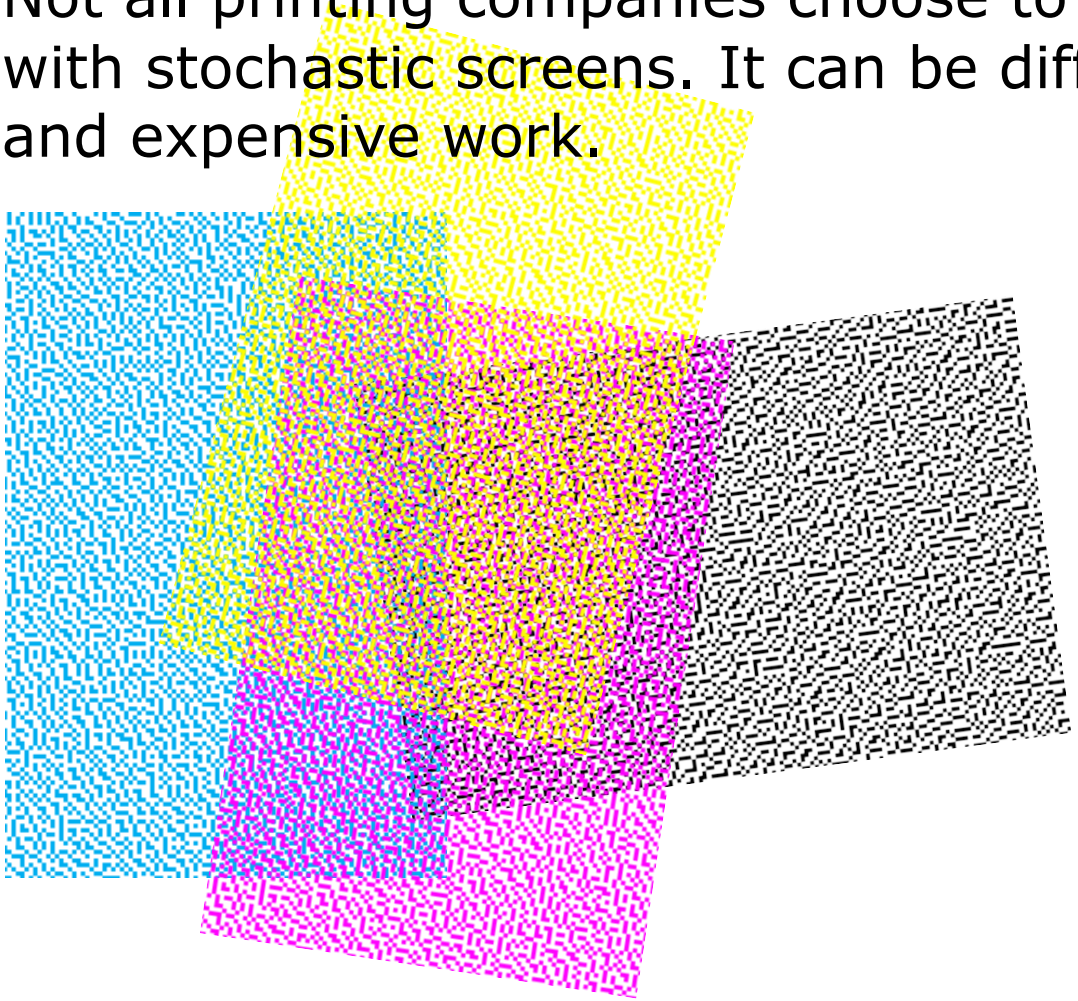
Avoiding a moiré pattern

Use stochastic printing (no screen grid) and get minimal moirés. Stochastic, instead of halftone screens have irregularly-placed dots that are not on a grid.

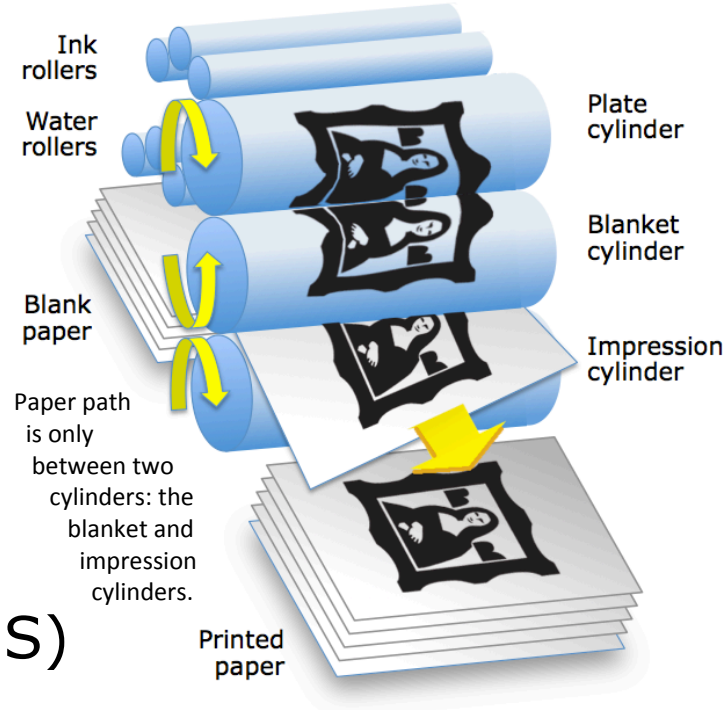


Avoiding a moiré pattern

Not all printing companies choose to print with stochastic screens. It can be difficult and expensive work.



Offset litho printing
The most prevalent kind of printing method where an image is printed by use of an image plate which carries ink to another offset roller that contacts the paper.



Pantone Matching System (PMS)
A color identification and mixing system produced by Pantone, Inc. to aid printing color matches.

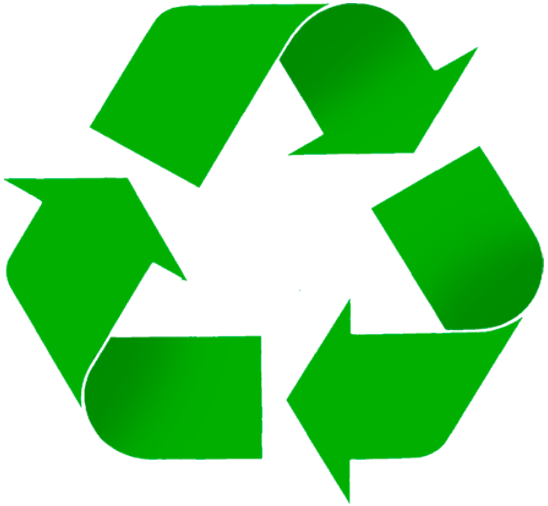
Paper swatch book
A sample book of printing papers naming different grades, textures, and colors with attached physical samples.

Paper certifications
Printing paper that meets various environmental standards gets certified for each.

FSC

Ancient Forest Friendly™

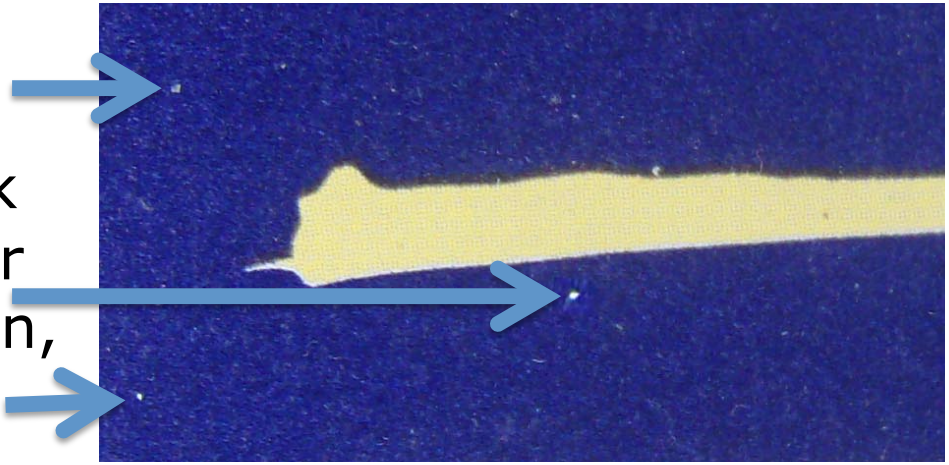
WE BUY 100% CERTIFIED WIND ENERGY
Green-e.org



Portable Document Format (PDF)
A type of computer image/text file that can look and print the same on any computer independent of other software. It avoids problems with fonts, page breaks, and formatting.

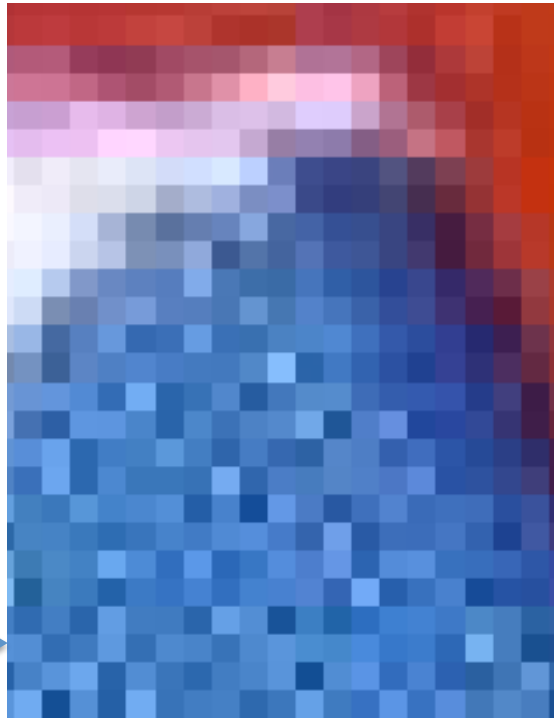
Perfecting press
A printing press designed to print on both sides of the paper in a single pass.

Picking problem
A printing term for inks that do not stick properly to the paper and create an uneven, randomly speckled coverage.



Pixels in images
The smallest picture element of an image and the number of them along an inch represents the resolution expressed in pixels per inch.

One pixel appears as a square



Resolution requirements

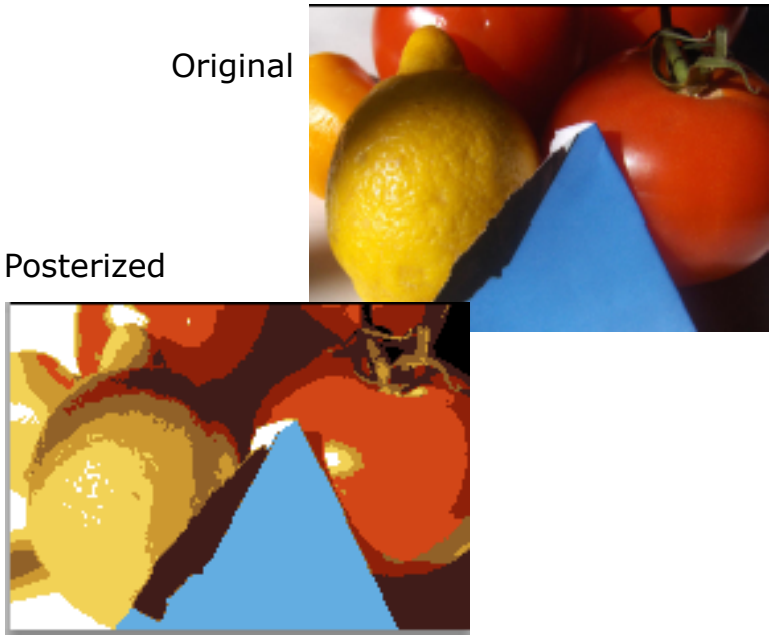
for image files that will be printed

Assuming 150 line halftone printing screen and images placed at the size they will print (effective resolution)

Bitmap File Type	*Effective Pixels Per Inch (ppi)*
Line art One-color	600–3600 ppi
Grayscale images	300 ppi
Color images CMYK, not RGB	300 ppi

Printing plate
The thin, flexible metallic sheet put on printing presses to carry the image.

Posterize image effect
Image rendering that produces little or no continuous tones and has tonal breaks because there are fewer colors or percentages of tones across the image.



PostScript language
A computer page-description language that describes images and text.

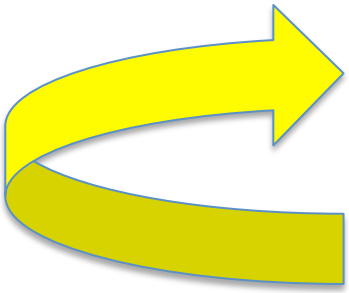
Press check
(when printing)
A form of printing approval where the designer/client attends the beginning of the press run to certify a correct color balance on the press sheet, pagination and other aspects that become the standard for the rest of the printing run.

Proofs for printing
A way for the printer to let the designer see how the files look after pre-press processing and before printing to get signed approval to move on to printing.

Raster images
A bitmap or dot rendered image as opposed to a vector image.

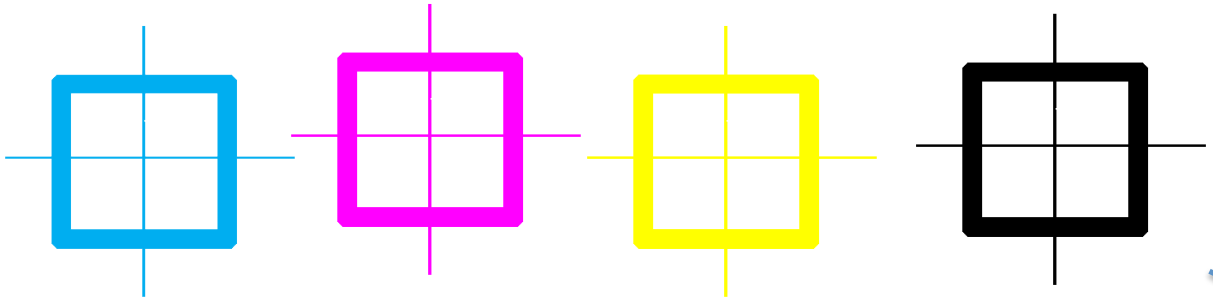
Bitmapped image

Vector image



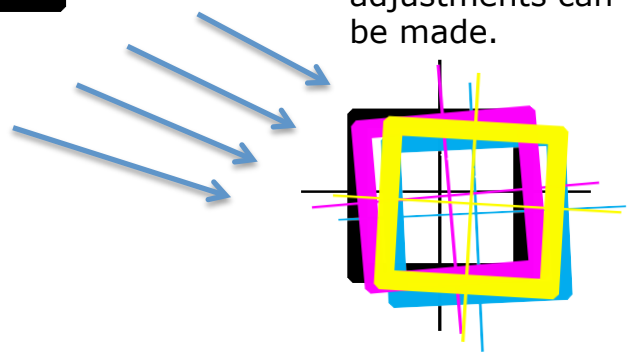
Registration of printing colors

Alignment of multiple colors of ink to keep the image and colors to simulate the the original image.



Four-color registration marks for each ink color: CMYK

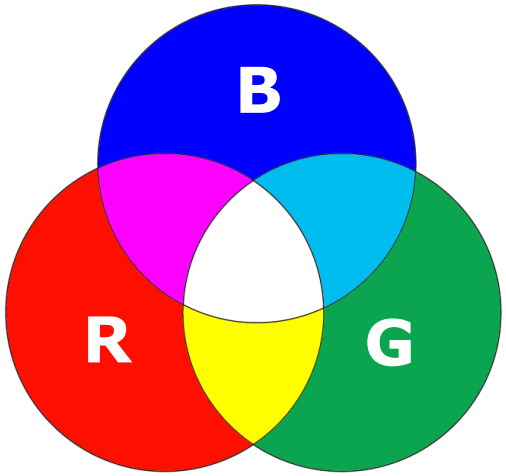
Overlapping register marks show when the press is not printing correctly so adjustments can be made.



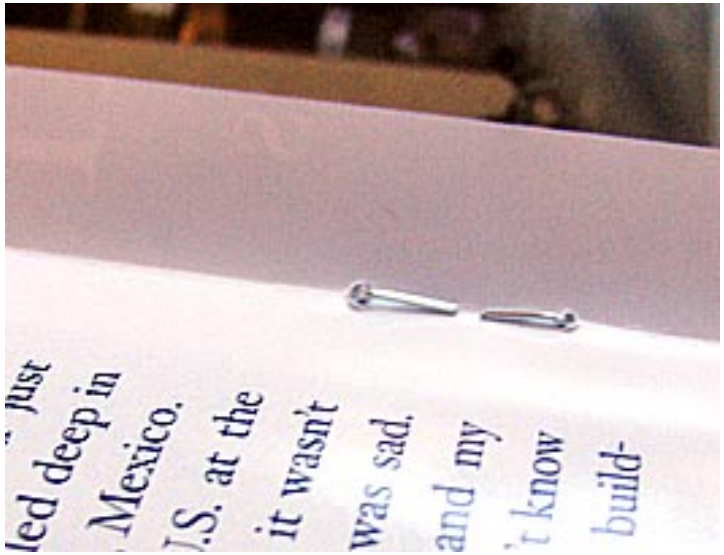
RIP process

The three initials stand for Raster Image Processing where image/text files are converted in pre-press operations to line art and dots for printing.

RGB (building-blocks of projected light)
The three initials standing for red, green and blue that are the basic triadic colors for the additive color model.

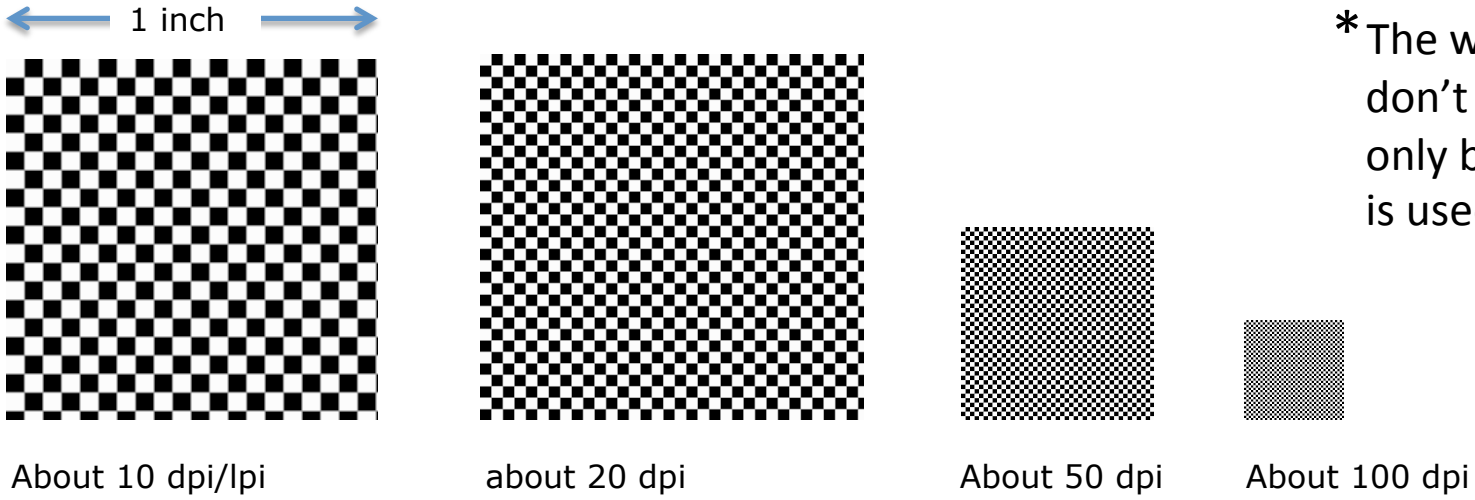


Saddle-stitching
A bindery process where pages are stapled along the spine for publications usually smaller than 64 pages.



Screen density of printing dots (dots per inch)

Also called line screen (lpi), it is a measure of how many printing dots, usually the 50%-size white* and black dots, per linear inch.



*The white dots don't print if only black ink is used.

Screen printing / silkscreening process

A method of printing where ink is pushed through a fine-mesh with masking on the screen where the ink should not print.

Separations for printing

Original image

Separation: a color image into four ink colors

Cyan plate

Separations for printing

Original image

Separation: each is made into a printing plate

Cyan plate

Magenta plate

Separations for printing

Original image

Separation: each plate is a line-art halftone

Cyan plate

Magenta plate

Yellow plate

Separations for printing

Original image

Separation: each plate will deliver its ink color

Cyan plate

Magenta plate

Yellow plate

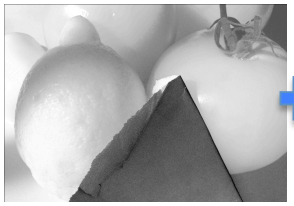
Black plate

Separations for printing

Original image

Separation: more image density brings more ink

Cyan plate



Magenta plate

Yellow plate

Black plate

Separations for printing

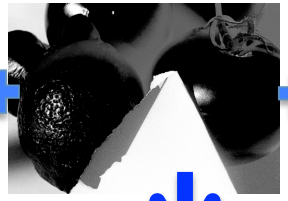
Original image

Separation: on-press colors

Cyan plate

Magenta plate

Yellow plate



Black plate

On the press

C (cyan) ink

M ink

Y ink

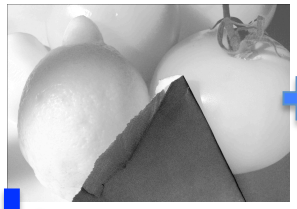
K ink

Separations for printing

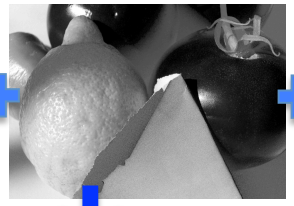
Original image

Separation: colors combine on the paper

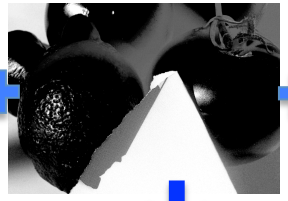
Cyan plate



Magenta plate



Yellow plate



Black plate

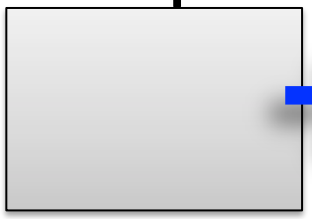
C (cyan) ink

C + M inks

C + M + Y inks

C + M + Y + K

On the press



Blank page
to enter press

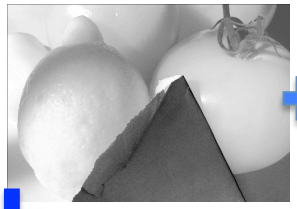
Blank page
receives cyan ink

Separations for printing

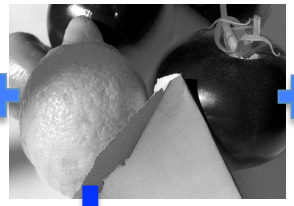
Original image

Separation: four printing plates to ink on paper

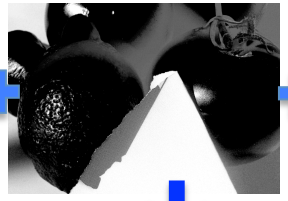
Cyan plate



Magenta plate



Yellow plate



Black plate

C (cyan) ink

C + M inks

C + M + Y inks

C + M + Y + K

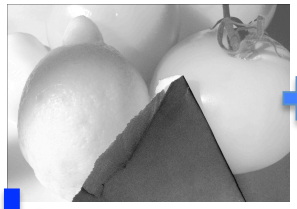
On the press

Separations for printing

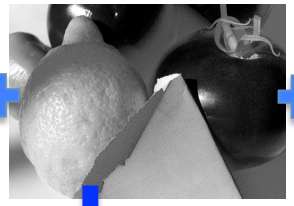
Original image

Separation: four printing plates to ink on paper

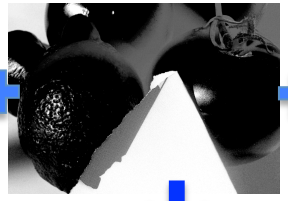
Cyan plate



Magenta plate



Yellow plate

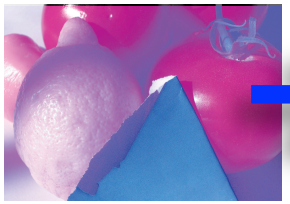


Black plate

On the press

C (cyan) ink

C + M inks



C + M + Y inks

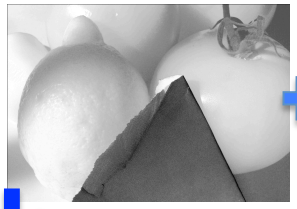
C + M + Y + K

Separations for printing

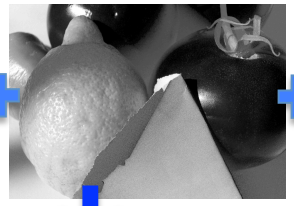
Original image

Separation: four printing plates to ink on paper

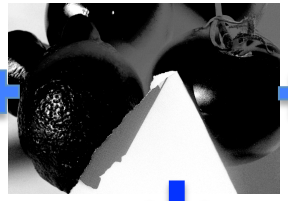
Cyan plate



Magenta plate



Yellow plate



Black plate

On the press

C (cyan) ink

C + M inks

C + M + Y inks

C + M + Y + K

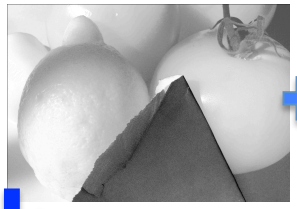
Final printed image

Separations for printing

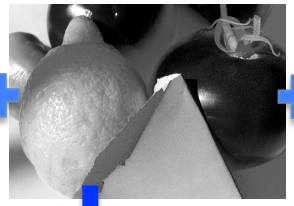
Original image

Separation: four printing plates to ink on paper

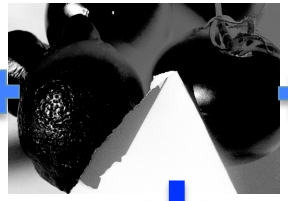
Cyan plate



Magenta plate



Yellow plate



Black plate

On the press

C (cyan) ink

C + M inks

C + M + Y inks

C + M + Y + K

Final printed image

Sheet-fed press

A kind of printing press that accepts sheets of paper as opposed to a web-roll press that only prints on a continuous roll. This press can handle sheets up to 40 inches wide.

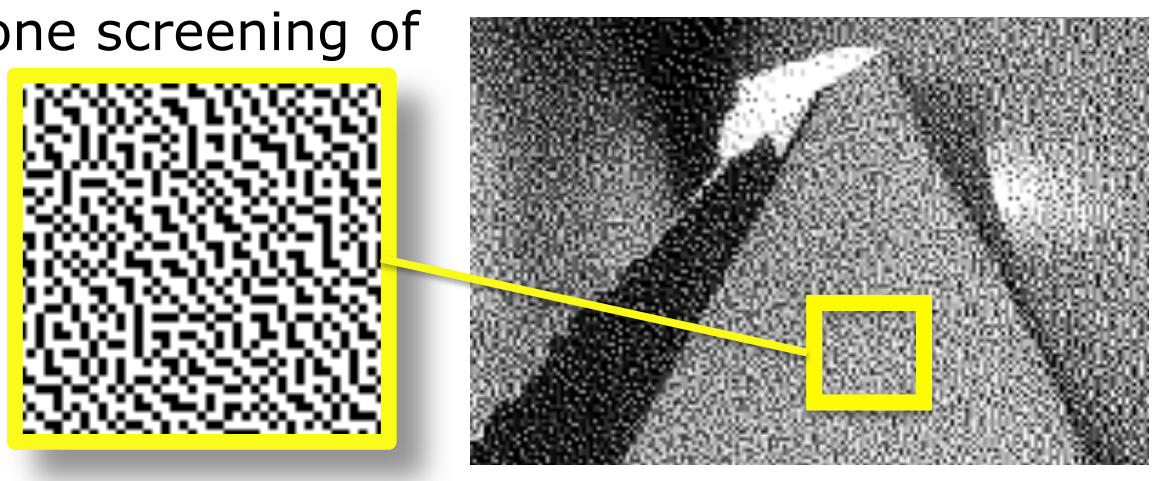
Signature for bindery
A full printed sheet that has been folded down to page size, sometimes joined with other signatures, for final bindery and trimming operations.

Specialty printing
A collection of printing techniques and equipment that can do foil-stamping (metallic foil), die-cutting (cut outs), thermography (heat-raised ink), rubber stamp laser engraving, and other techniques.

This is an example of gold foil stamping on a paper candy wrapper.

Spot color
A single ink separate from the CMYK colors often named by the PMS color system.

Stochastic screen
An alternative dot pattern structure to the standard grid-style halftone screening of images.



TIFF (tagged image file format)
An image file type known for its ability to not degrade or lose pixels when saved, able to handle line art, grayscale, and color images, and to be compressed through lossless techniques.

Transparency flattening
A software process to convert images with overlapping elements into a single layer during PDF creation/output.

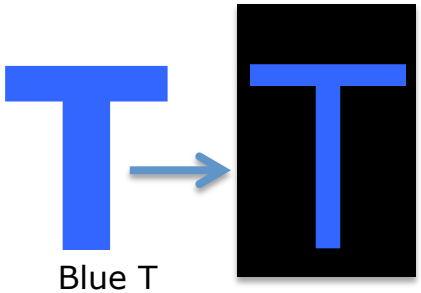
JESSIE JONES PHOTOS

Color image

Grayscale image

Line art image

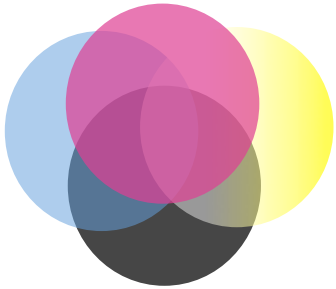
Trapping
A technique to cover slightly out-of-register printing problems by making adjacent colors overlap.



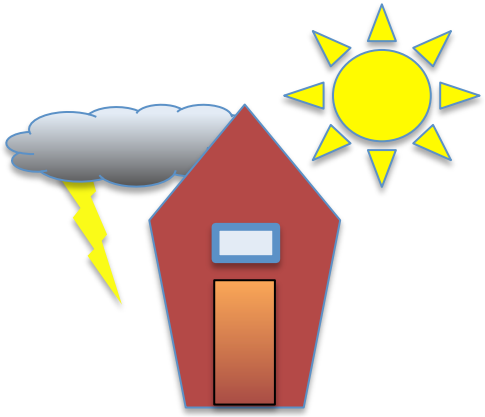
Blue T before black ink overlaps

Black ink overlaps blue T making it narrower

UCR (Under Color Removal)
Amounts of C,M, and Y inks only in the darkest shadow areas are replaced with equal tones of K (black) ink.



Vector image
An image type made up of mathematical information as opposed to bitmaps — a pure vector image has no pixels

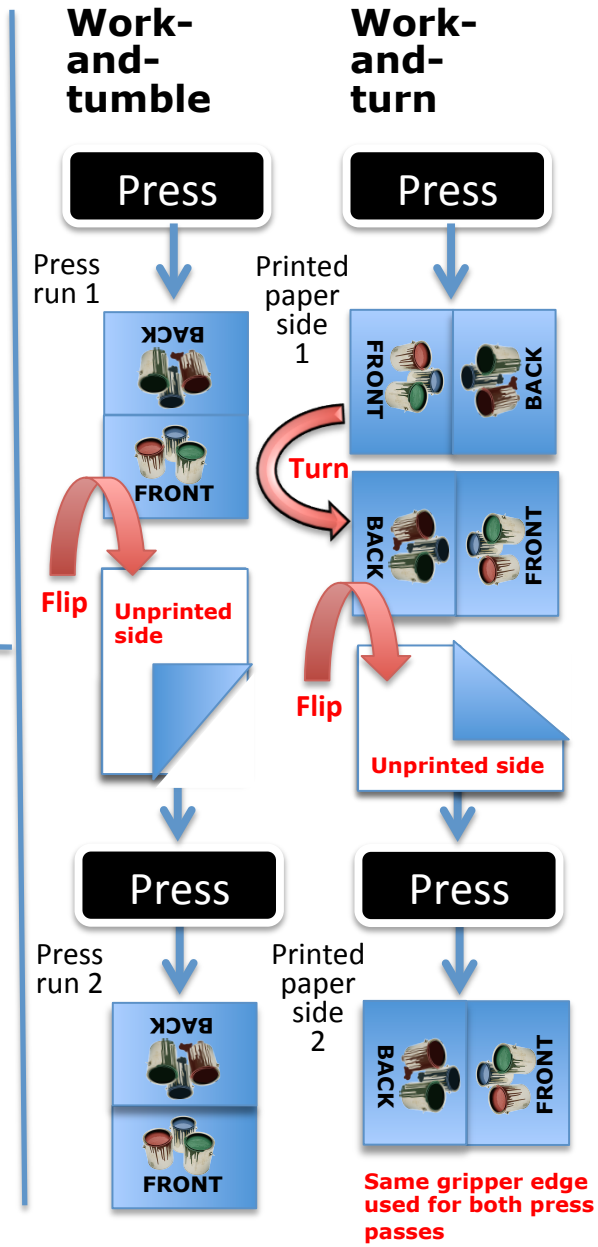


Web offset litho

An offset lithography printing process characterized by use of web-roll paper instead of individual sheets. This is an advantage over sheet-fed presses because larger print runs are more economical, faster, and can provide some form of inline bindery.

Work-and-turn / work-and-tumble

Two ways to print sheets of paper using one plate where the paper is turned (flat rotation of 180 degrees) or tumbled (flipped or flopped over) and run through the press again to print on the other side.



Quiz

Printing Module 3

1. A mezzotint can simulate shades of a color using just one solid ink color, like line art. True or false?

2. Describe what a moiré pattern is.

3. Is offset printing a widely-used commercial printing process?

4. What's the advantage of using PDF files?

5. If an image is going to be enlarged, which image file will look best: bitmapped or vector?

6. A JPEG image can be color, grayscale, and line art. True or false?

Introduction
to Printing
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Communications

Lesson 4

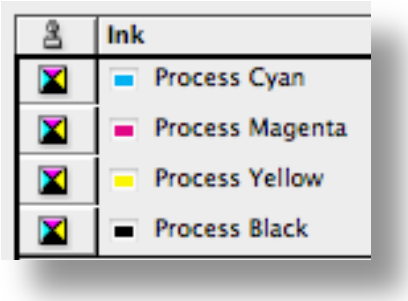
Ink and Paper

Printing inks

Printing inks

- Pigments and coatings with viscous properties carry visual information to print surfaces and add protection.

- The four process inks (CMYK) simulate full-color images but cannot match all colors, even when combined. >



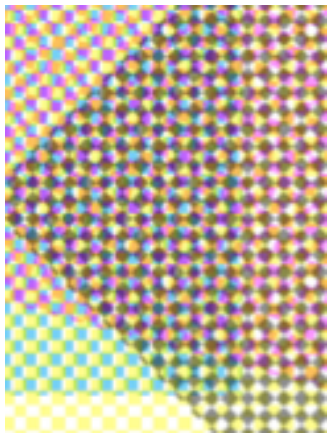
- PMS or other spot-color inks can print as solid colors (without tint mixes of more colors) and can extend the range into metallic and fluorescent colors. >

Printing inks

- PMS inks provide more printing options
  - Keep a color consistent through a print run, where process color mixes may vary slightly depending on densities and registration
  - Match to a specific color
  - Bring some color to a one- or more-color printing job
  - Less expensive to print with a PMS color than four process colors
  - Extend image-color range by combining with four-color separations

Printing inks

- Process colors create optical illusions by printing small ink spots that combine to look similar to the original, continuous-tone image.
- Inks can be glossy or dull. Combined with varnishes that are glossy or dull, they can create subtle emphasis on the printed page.
- Example of colors resulting from overlapping process-color ink spots are shown in this enlargement.



Printing inks

- Varnishes can be clear or tinted.
- Printed varnishes can become slightly yellow over time.
- A two-varnish printing run can use gloss varnish ink and a dull or satin varnish ink where the gloss does not print to achieve more contrast between shiny and dull. Newsprint paper does not show varnishes as well as coated stock.
- More of a gloss effect can be achieved with UV ink. It is an ultraviolet-curing ink that dries quickly and has an almost plastic quality.

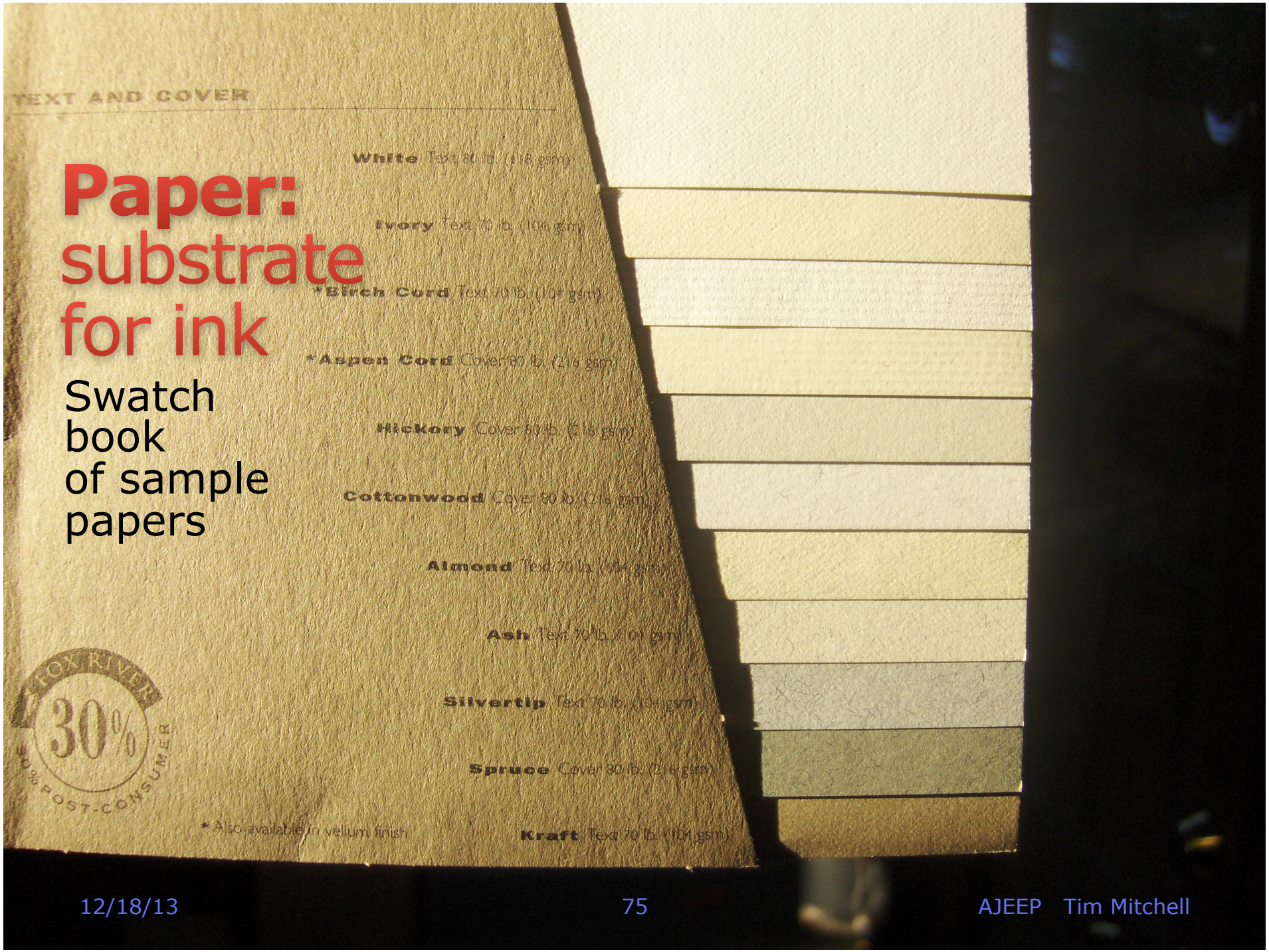
Printing inks

Utilizing more than four inks on a press

- Printing with inks that can expand the color range (gamma) through pre-press separations
- Add a second black ink to control ink density independent of four-color images
- Add PMS colors
- Insure better solid coverage by mulitple hits of one color (minimize picking and ghosting)
- Add multiple kinds of varnishes (dull and gloss)
- Add a flood-coat of an aqueous, non-colored coating

Paper: substrate for ink

Swatch book of sample papers



Variety of colors, weights, textures

Paper

- Many materials can carry printed ink.
- Natural and manmade materials are used.
- The U.S. government set standards for calling paper “recycled.”

Paper

Minimum requirements to call paper recycled

U.S. standards allow naming paper **recycled** if

- COATED paper =/>10% recycled content
- UNCOATED paper =/> 30% recycled content

Some recycle labels

- **PCW** (Pre-Consumer Waste)
  - Trimmings from making paper
  - Before ink is printed on it
  - Can have virgin fibers
- **PCW** (Post-Consumer Waste—duplicate initials of pre-consumer waste so it can be confusing)
  - Starting with used paper
  - De-inked from prior printing
- **PCF** (Processed Chlorine Free)
  - Recycled paper processed without chlorine
  - Brightened instead with eco-friendly methods

Types of paper

Natural fibers

- Trees
  - Softwoods (pine, spruce, etc.)
  - Hardwoods (oak, maple, birch, etc.)
- Grasses
  - Bamboo, papyrus, kenaf, linen (flax), etc.
- Other plants and animal skins
  - Cotton, vellum (calf's skin), etc.

Stacked
paper rolls
for web-roll presses

Paper

Sustaining natural fiber sources

- Trees need forest stewardship
  - Supplies limited
  - Compete with other commodities (lumber)
- Grasses
  - Easy to sustain with fast growth
- Other plants
  - Compete with other commodities (cloth)

Paper

Man-made materials

- Mass communications requires light and manageable materials to carry ink (like paper).
- Printing can be done on almost anything that can hold ink like plastics, rubbers, metals, glass, fiberglass, masonry, painted surfaces, etc.
- Electronic displays simulate ink on paper

Specifying paper

- Paper swatch libraries are available through printers, design agencies, and paper merchants.
- Almost half the cost of a printing job can be attributed to paper costs so choose wisely.
- Paper is identified by its **manufacturer name, brand name, weight, type** (cover, text, etc.)**, color** and **texture.**
- Large orders of paper need to be made in advance of the print run.

Quiz

Printing Module 4

1. CMYK printing inks can simulate any color. True or false?
2. Spot colors are named for printing in specific places on the page. True or false?
3. Web-roll presses are designed to print images directly from the Internet. True or false?
4. Recycled printing papers are made up of 100% recycled fibers. True or false?

Introduction
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Lesson 5

Major printing processes

"There's nothing like working on a large print run in the millions and after it is printed finding a typo."

Tim Mitchell,
Designer

Major print processes

	ADVANTAGES	*PRINT-RUN SIZES*
Letterpress	Custom look/feel/die-cut	Short runs
Offset litho	Cost effective, popular	Medium to large
Flexography	Print on thin substrates	Medium to large
Gravure	High-quality	Largest runs
Silkscreen	Print flat/dimensional items	Smaller runs
Digital/electronic	Variable-data printing	Smaller runs
Specialty printing	Special effects*	Small to large

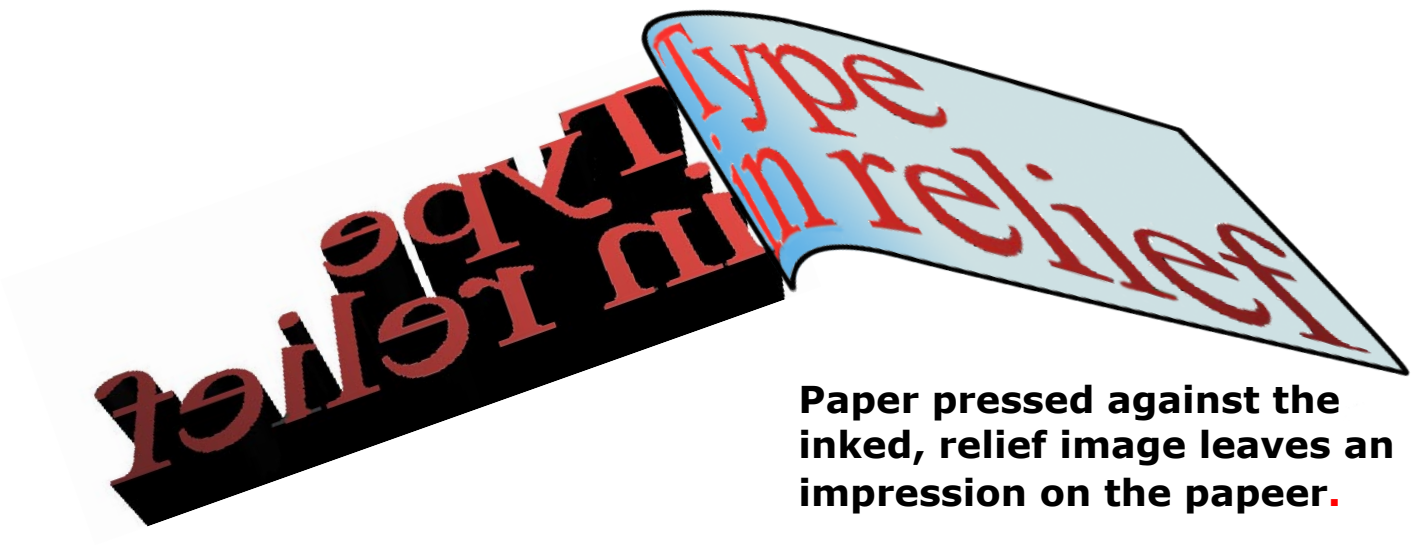
*Die-cutting, engraving, foil-stamping, lenticular, etc.

Letterpress

This is a working reproduction of the original Gutenberg printing press.

Letterpress printing

- A relief printing process
- Image-making elements are made backwards.



Paper pressed against the inked, relief image leaves an impression on the papeer.

Letterpress printing

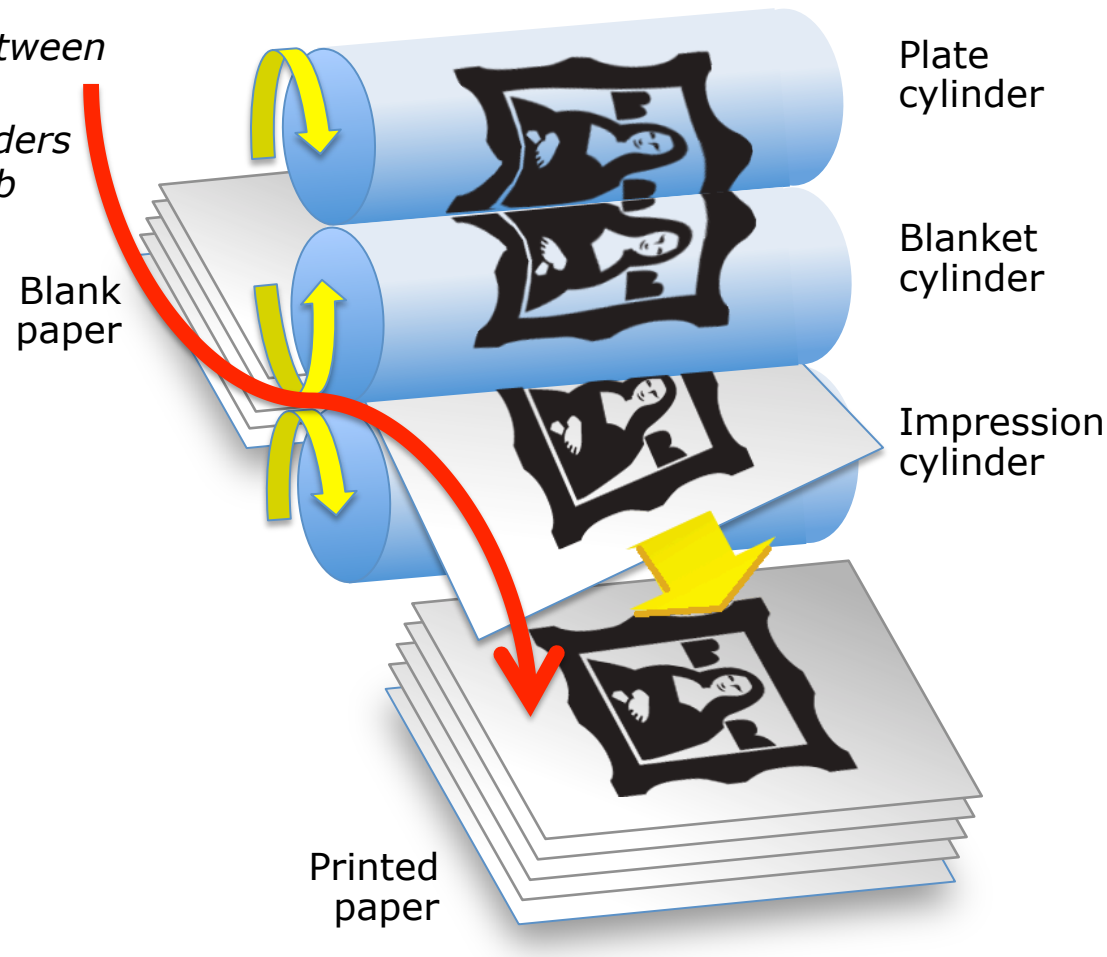
- Modern letterpress printing is faster than the original Gutenberg press.
- Letterpress is still in use.
- Rotary letterpress was a step to faster printing — now there are faster processes.
- It is a printing process with raised letters and image that push ink onto or into pape.r
- Modern, polymer relief plates can be used instead of metal type.

Offset lithography

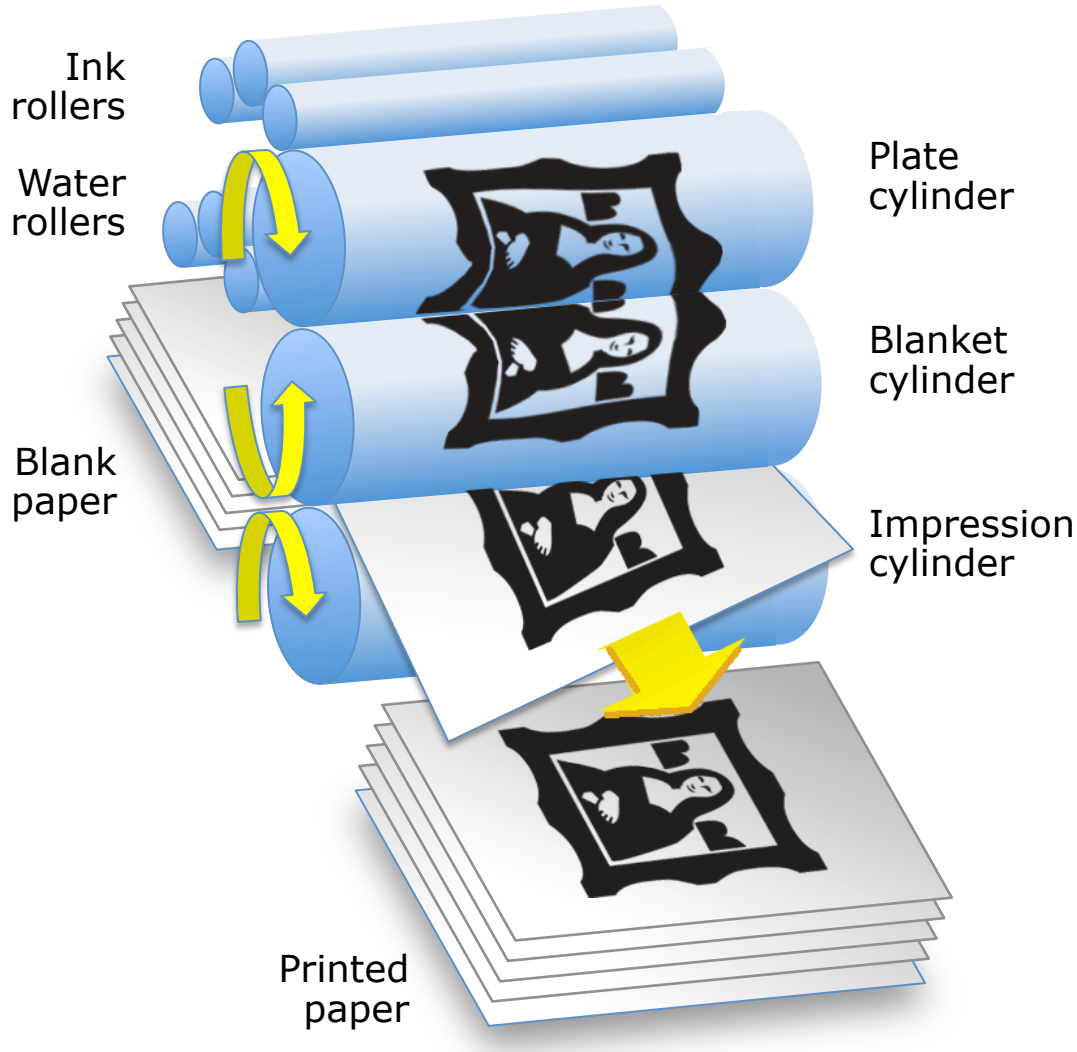
A six-color, sheet-fed offset litho press

Offset lithography

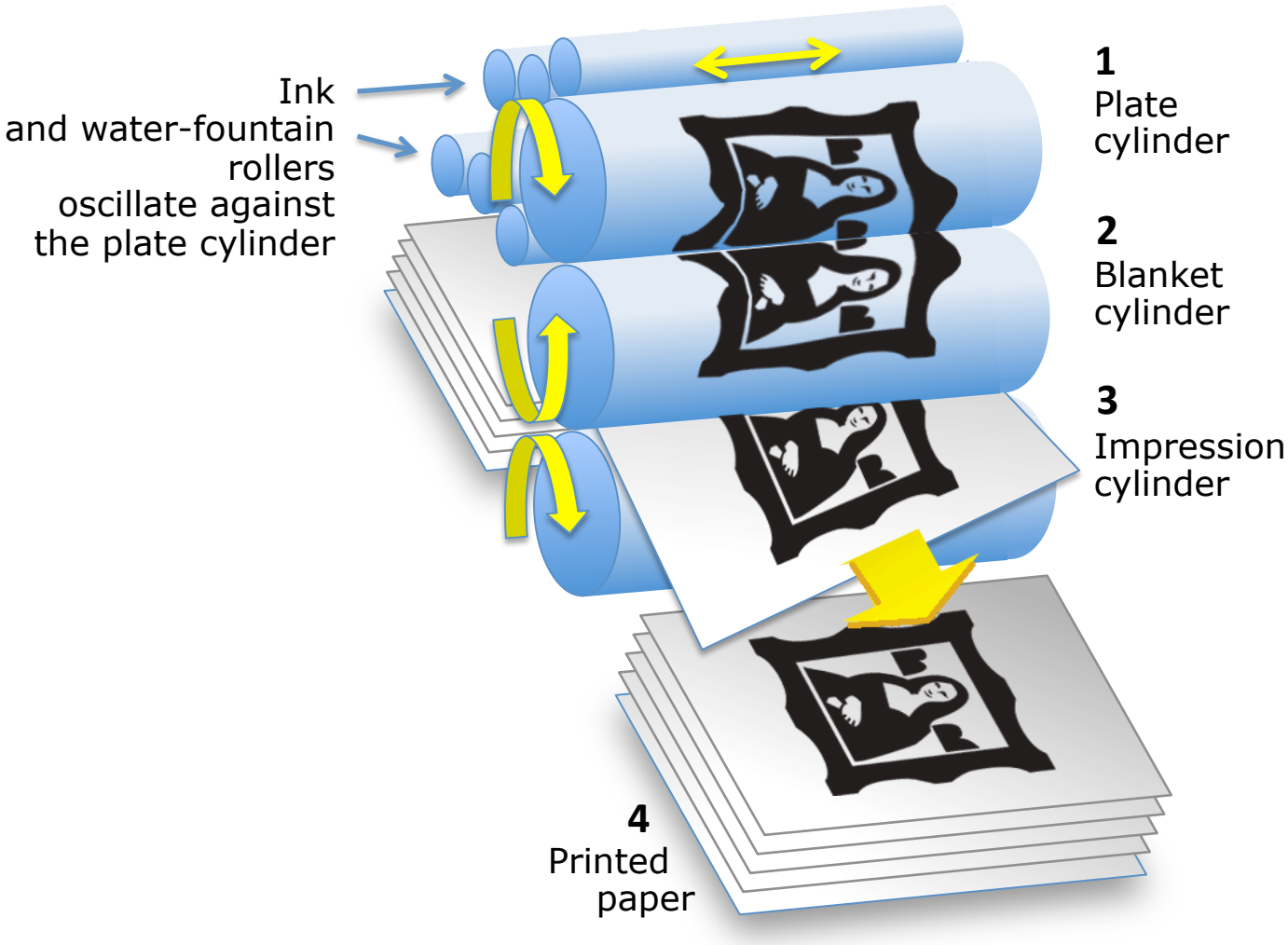
Paper path is between the blanket and impression cylinders for sheets or web rolls of paper



Offset lithography



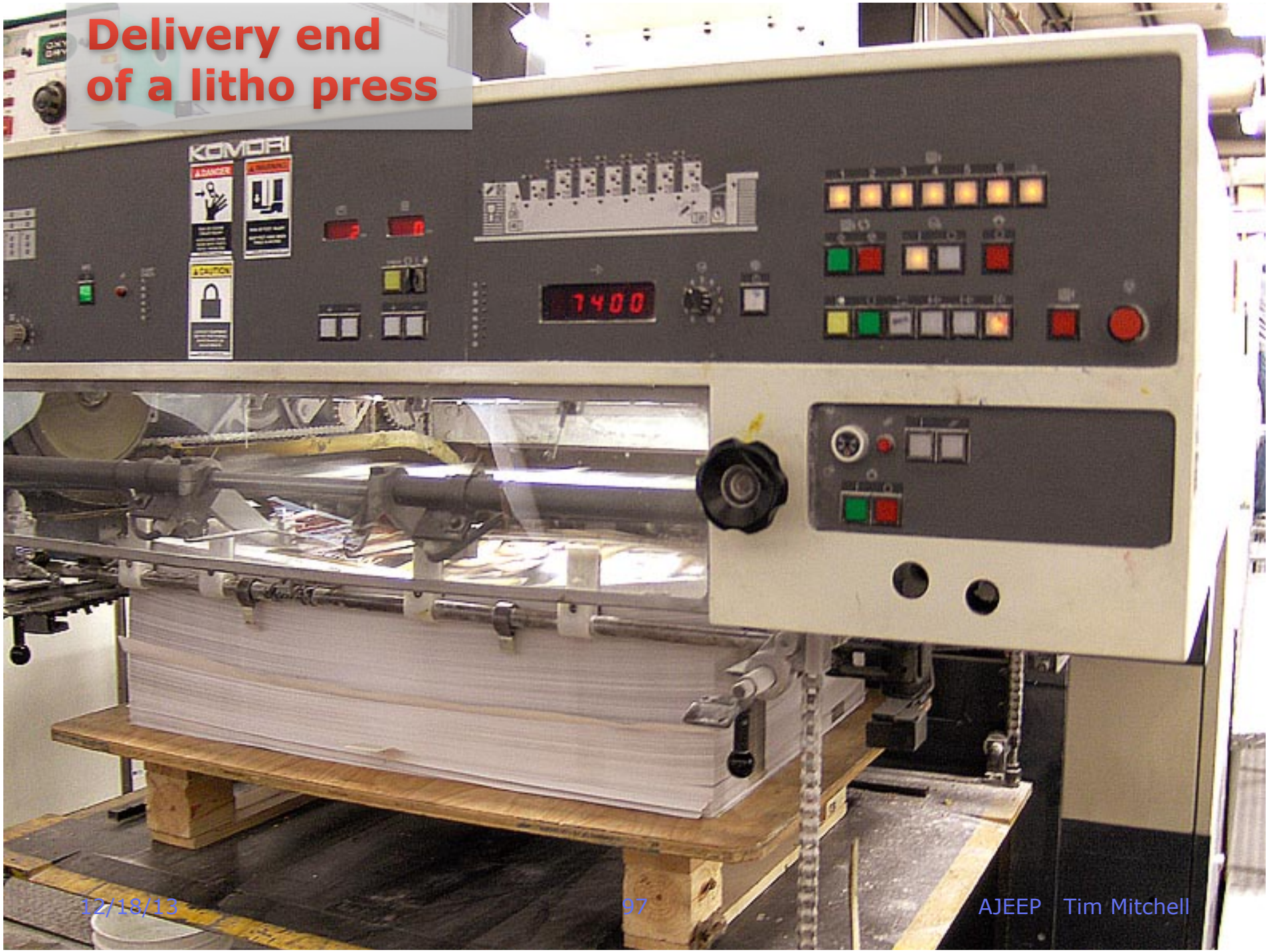
Offset lithography



Printer controls for ink densities

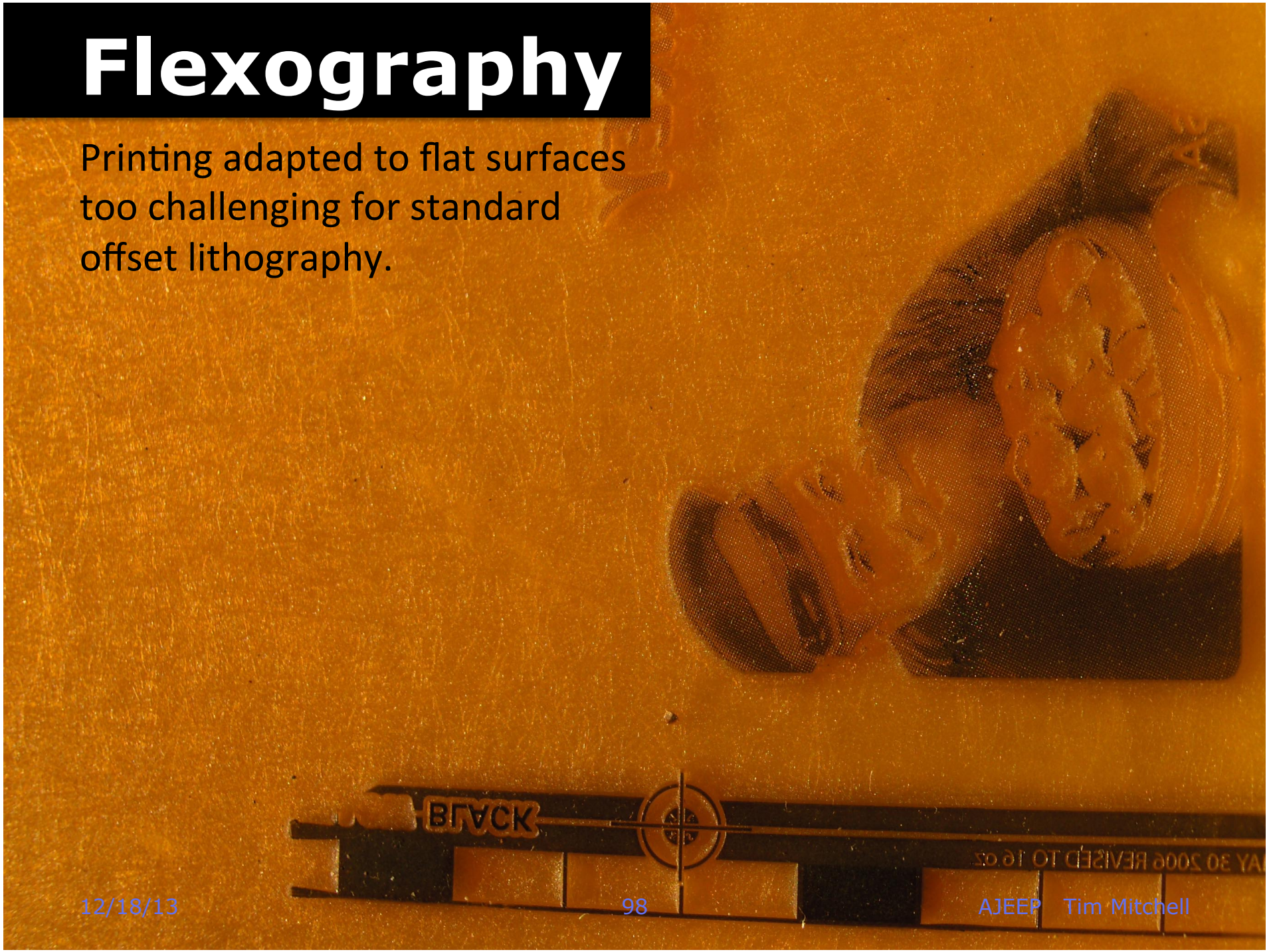
Individual color print heads allow control of ink delivery across the cylinders as a way to control densities and balance colors.

Delivery end of a litho press



Flexography

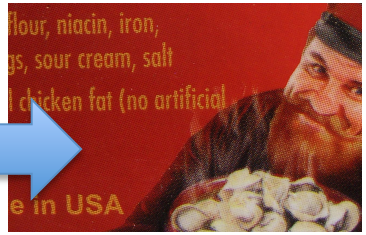
Printing adapted to flat surfaces too challenging for standard offset lithography.



Flexography

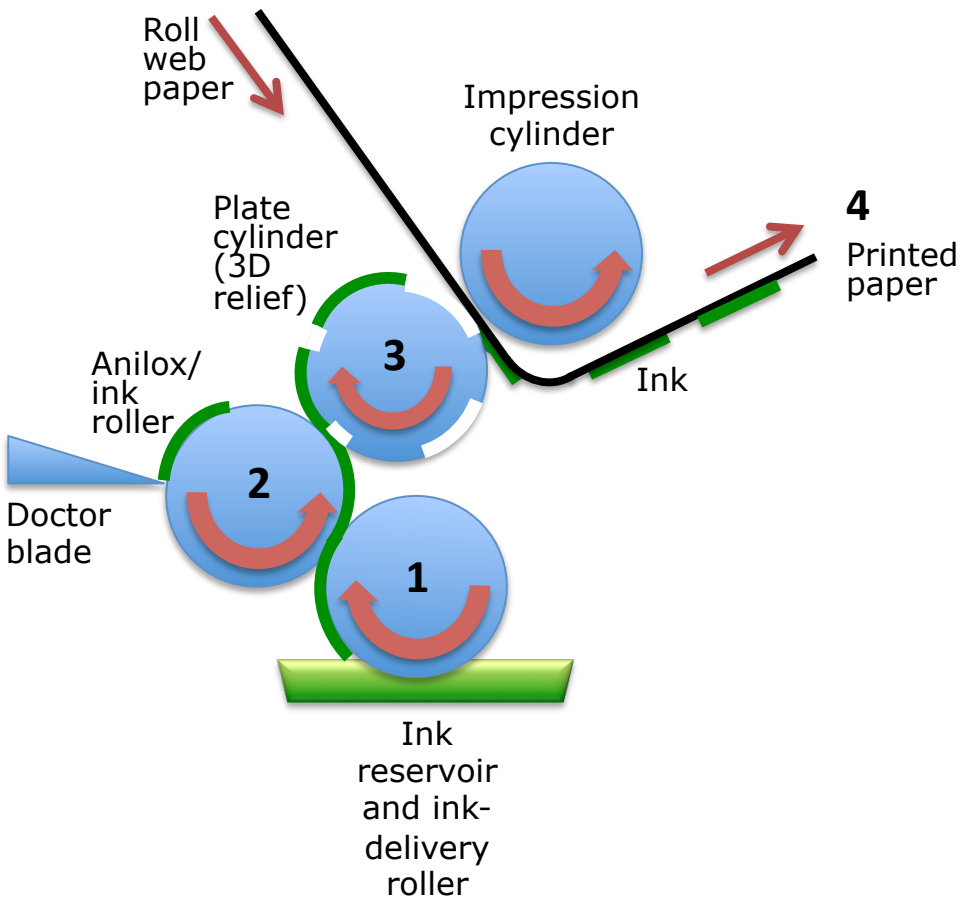
Black-ink printing plate without ink on it

The portion of the plate on the left was responsible for carrying black ink to the full-color label.



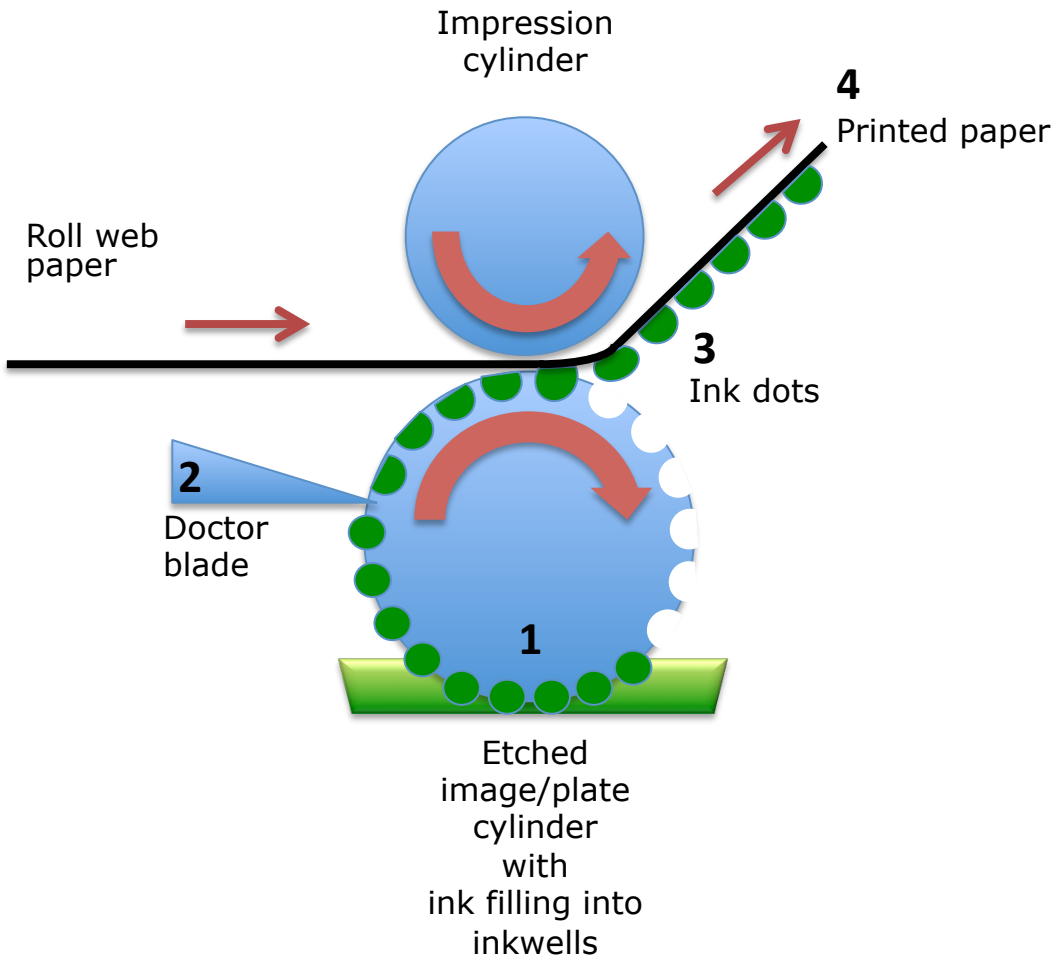
Partial view of label printed with CMYK inks

Flexography



1. The ink delivery roller pulls a limited amount of ink from the reservoir
2. The doctor blade scrapes away remaining ink from the used ink roller
3. The plate cylinder transfers ink from its raised surfaces to the printing surface
4. The finished product

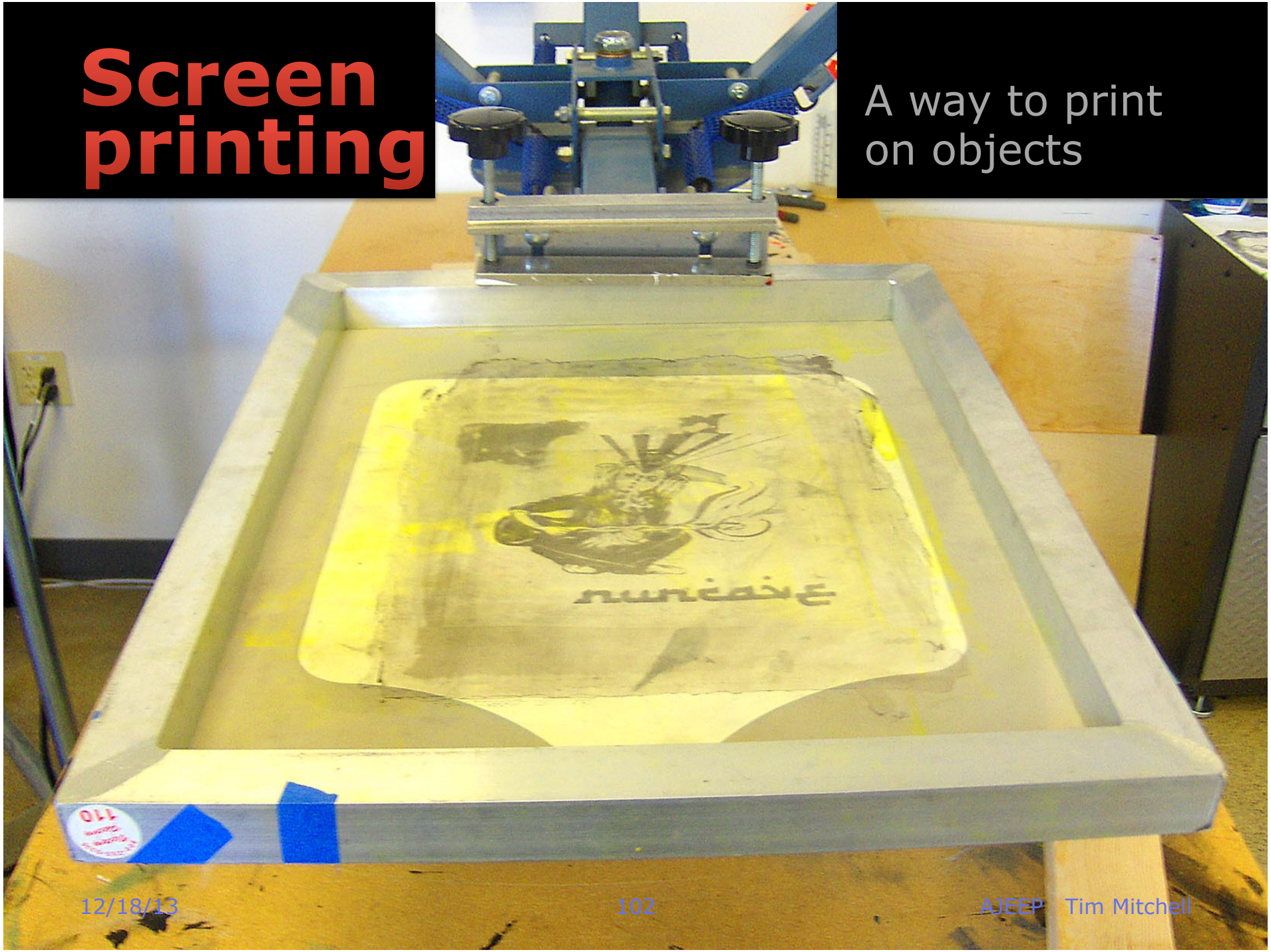
Gravure printing



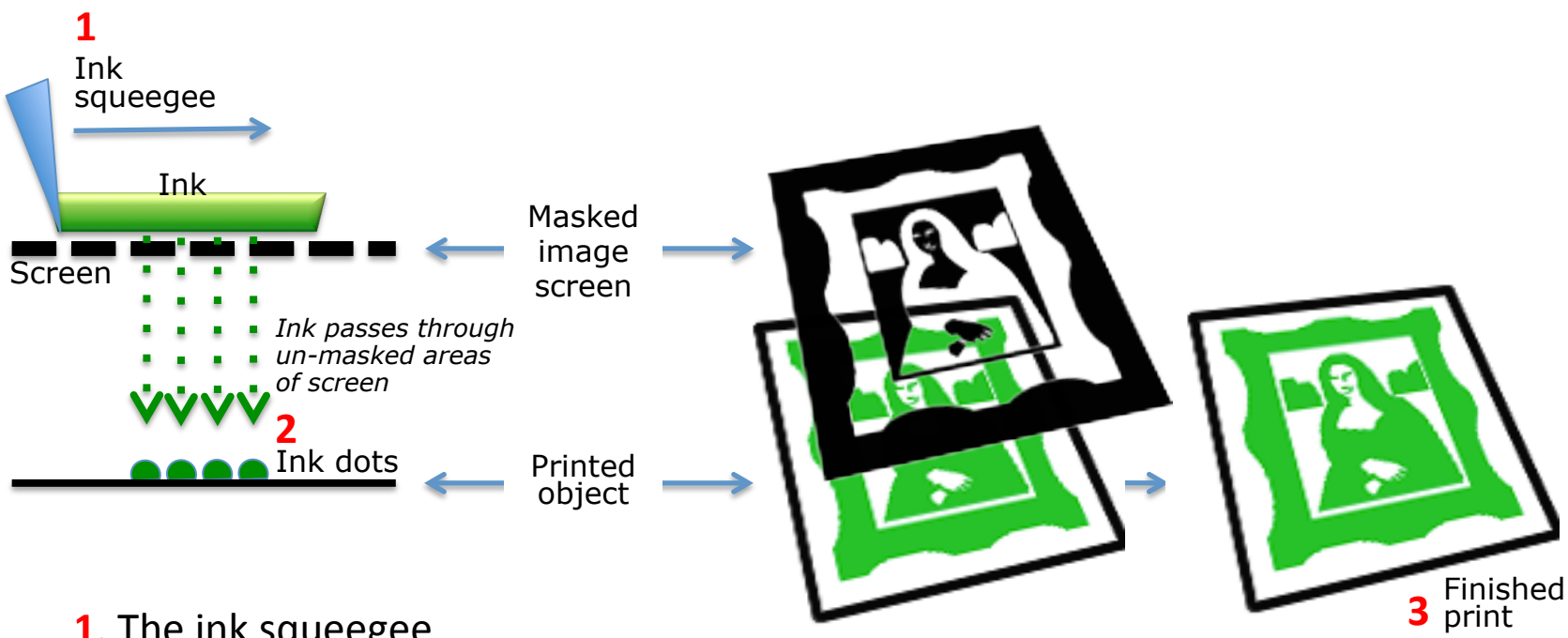
1. The ink wells in the plate pick up ink drops
2. The doctor blade scrapes away excess ink
3. The ink dots are thicker than offset litho dots and stick to the paper
4. The finished product

Screen printing

A way to print on objects



Screen printing



1. The ink squeegee pushes ink through the screen

2. The ink prints on the object

3. The finished product

Specialty

Uses letterpress and other modified techniques to create effects like:

- Foil stamping
- Embossing
- Die cuts
- Lenticular (3D)
- Holographic (3D)

Digital printing

- Technological improvement over standard, commercial offset printing
- Short-run, high-quality offset lithography
- Uses special inks
- Can print a new/different image on each page passing through the printer (variable-data printing)

Digital Printing

Improved, short-run offset lithography

- Technical improvements
- With digital technology, every turn of the impression cylinder can yield a new image.
- More control using databases
- Digital printing files can be sent instantaneously

Quiz

Printing Module 5

1. What printing process is best to print on clothing?
2. For very large printing quantities and very high quality, which printing process does the job best?
3. Very thin materials are usually printed using what process?
4. What is the most recent printing technology that
5. Why is offset lithogrqphy given that name?
6. What is the oldest printing process still in use today?

Introduction
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Lesson 6

Working with a printing company

"Beware: your computer screen doesn't always show what printing will really do to your file."

Tim Mitchell, Designer

Design for printing: a process approach

1. **Define printing needs** (based on final product)
2. **Write printing-deliverables specifications**
3. **Select printing companies** (early in project)
4. **Get printing quotes** (print brokers can also help)
5. **Understand printing company file needs**
6. **Send a test file and view the printer's proof**
7. **Send final printing files**
8. **Approve proofs**
9. **Press check**
10. **Approve final manufacturing** (bindery check)
11. **Confirm receipt of printed job**
12. **Pay the bill**

Design for printing

1. **Define the printing needs based on the final product**

Consider the desired result to understand the best way to make it

Design for printing

2. Write printing-deliverables specifications

Define the job for the printer's quote/estimate

- Give the project a title,
- Format and general description,
- State the finished, trimmed size,
- How many pages will there be,
- What kind of files or artwork will be sent to the printer,
- Give the paper specifications including name and weight,
- What and how many inks will be used,
- What kind of bindery operations are involved,
- Packaging and shipping needs,
- When will final files be ready and when you the job delivered.

Design for printing

3. **Begin printing company selection**

Searching for a printing solution should begin early in the process.

Print brokers can help source appropriate suppliers.

Design for printing

4. Get printing quotes

Criteria for printer selection

- Fair price and ask about cost for changes (ACs),
- Ability to meet the delivery date,
- Equipment and experienced personnel to produce required quality results,
- Reputation for consistently good printed products over time (good reviews),
- Logistical support to deliver the product (in good condition),
- Dedicated printing representative and/or print broker

Keep the quotation process ethical

- Information shared with one supplier should be shared with all,
- Don’t tell bidders about other quotes so it stays competitive.

Design for printing

5. Understand printing company file needs

Plan ahead

- Work with the printing rep to understand file expectations.
- Do they want PDF files?
- Do they want source files?

Design for printing

5b. Understand printing company file needs

Importing presets and PDF export settings

How to import and install a Document Preset for InDesign (.dcst)
From InDesign go to File > Document Presets > Define
Click “Load” and navigate to the file you just downloaded with the .dcst extension
Click “Open” then “OK,” Choose File > Document Presets > Define
Click New in the dialog box that appears
Name the preset and select basic layout options in the New Document Preset dialog box.
Click OK twice.

How to import and install a PDF Preset for InDesign (.joboptions)
Choose File > AdobePDF Presets > Define
Click New in the dialog box that appears
Name the preset and select basic layout options in the New Document Preset dialog box.
Click OK twice.

Design for printing

5c. Understand printing company file needs

Saving presets and PDF export settings

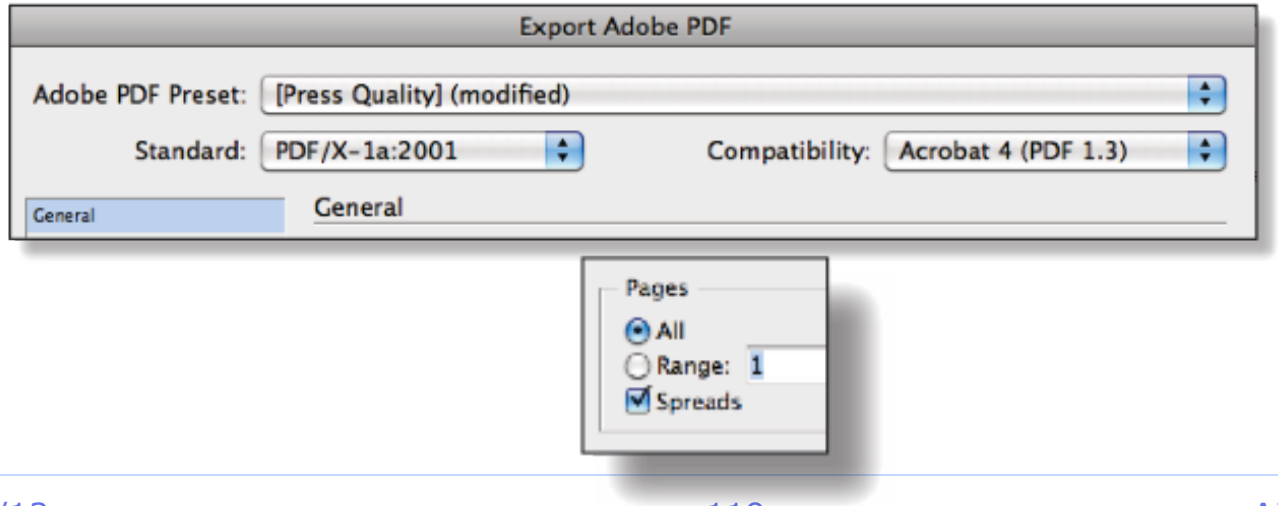
How to create and save a Document Preset for InDesign(.dcst)
Choose File > Document Presets > Define
Click New in the dialog box that appears
Specify a name for the preset and select basic layout options in the New Document Preset dialog box.
Click OK twice.

How to create and save a PDF Preset for InDesign (.joboptions)
Choose File > AdobePDF Presets > Define
Click New in the dialog box that appears
Specify a name for the preset and select basic layout options in the New Document Preset dialog box.
Click OK twice.

Design for printing

5d. Understand printing company file needs

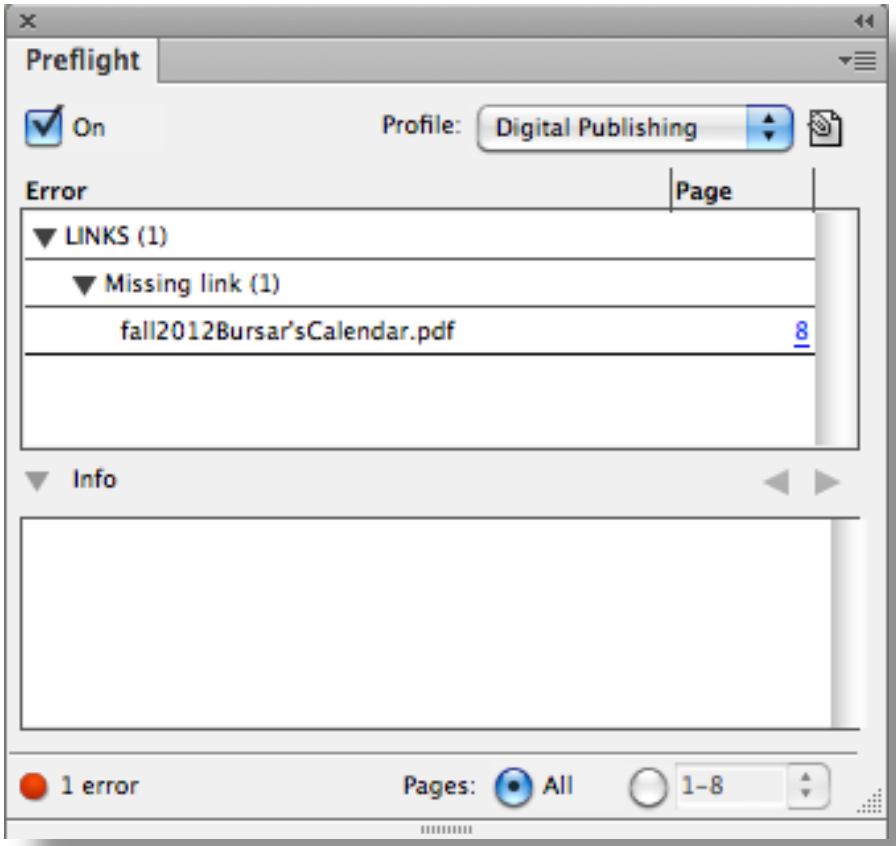
Two desktop publishing dialogue boxes showing some PDF export settings



Design for printing

5e. Understand printing company file needs

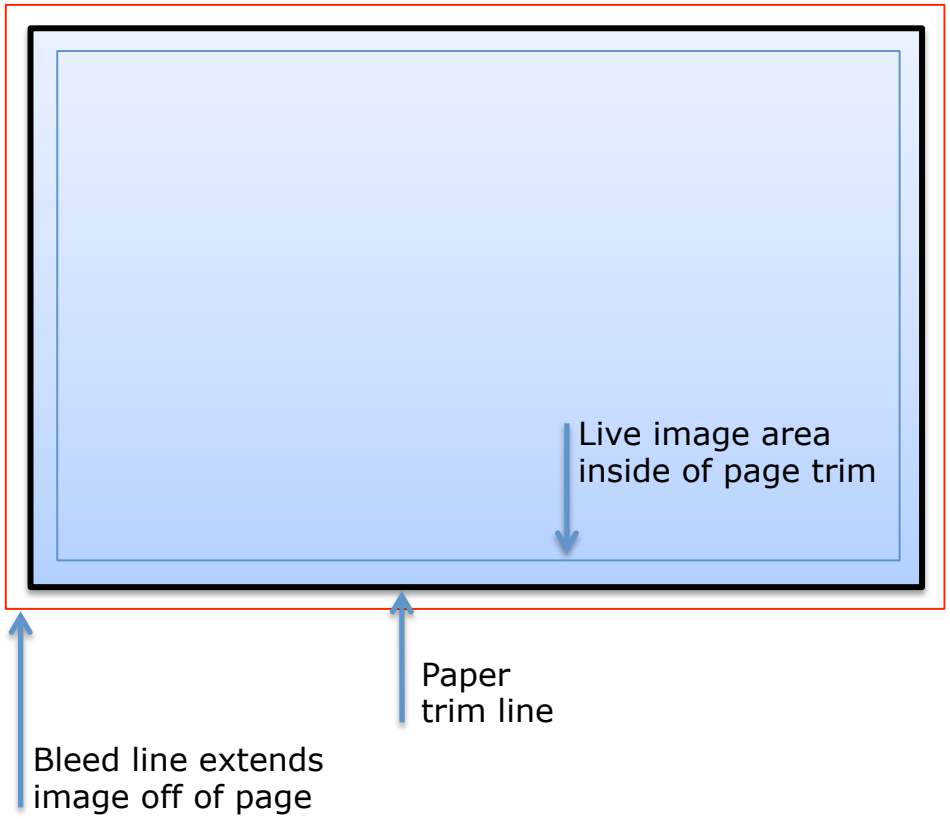
"Preflight" every document to find and fix errors before they go to the printing company.



Design for printing

5f. Understand printing company file needs

Design pages to allow for live area, trim and bleeds



Design for printing

6. Send a test file and view the printer's proof

Test the system

- Submit a test file before the deadline.
- Review the printer's proof and compare it to the test file.
- Create your files based on the printer's test results.

Design for printing

6a. Computer images versus printing inks

Original file sent

Printed with full-color, process inks: CMYK

Color image

A color image is separated by the printer into the four process ink colors: CMYK

Grayscale image

A grayscale image can be made to look the same when printed with just the black ink (K) or with all four inks (CMYK) for a richer, more densely-inked image

Line-art image

A black and white line-art image can print with just the black ink (K) or with all four inks (CMYK) to still look like a line-art image

Design for printing

6b. Images versus inks used on press

Original file sent

Cyan ink only on press

Color image

A full-color image would need to be separated into a grayscale before it could be printed with only cyan (blue) ink. You would not be able to print a full-color looking image if only cyan ink is used.

Grayscale image

Line art image

Design for printing

7. Send final printing files

Make correct files the first time

- Transfer files to the printer
- Confirm file receipt
- Back up the files

Design for printing

8. Approve proofs

Printer proofs simulate printing

- Carefully review the printer's proof,
- Mark any changes that need to be made,
- Sign and return the proof

Design for printing

9. Press check

The process of approving
the initial printed press sheet

- Go to the printer and approve the beginning of the print run.
- Only small adjustments can be made for on-press color balance.

Design for printing

10. Approve final manufacturing

The last production step
is usually bindery operations

- Approve the final assembled/trimmed item.
- Expect quality control but tolerate small imperfections.

Design for printing

11. Confirm receipt of printed job

Inspect your delivery

- Check for receipt of the correct items, amount and that everything is in good condition,
- "Overs or unders" allowance,
- Sign paperwork to confirm correct delivery.

Design for printing

12. Pay the bill

Make the payment within the prescribed timeframe

- Compare the invoice to the estimate,
- Pay according to the agreed-upon payment schedule.

Quiz

Printing Module 6

1. What is the easiest way to ensure files with the correct settings will be created for the printer?
2. Getting just one printing estimate is enough to know the best price for a printing project. True or false?
3. Inks on a printing press must correspond to the printing plates used. True or false?
4. A press check is when the printing company mechanic makes sure the printing press will run correctly for the printing jobs. True or false?

Introduction
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Appendix

Instructor materials

Quiz answers

Printing Module 1

1. The Gutenberg printing era started an information explosion some say is like the start of the Internet. True or False? **Answer: True. It is seen as a cultural change and explosion of information like the modern Internet.**

2. Gutenberg was the first printer to use moveable type. T or F? **Answer: False. Asian cultures were first but their solutions were not practical for timely setup or large-scale printing. Wood blocks and some of the first metal letters for movable type were not strong enough to make large numbers of impressions on paper. The letters would wear down.**

3. What print/design era gave the designer full control of creating and providing artwork for images and words to be printed? **Answer: Digital era put all of the tools, and responsibility, in the hands of the designer.**

4. What print/design era allows publications to be printed closer to destinations? **Answer: Digital era. Files can be sent electronically.**

5. Why is it an advantage to "distribute and print" instead of "print and distribute?" **Answer: Less shipping of physical material and fast transfer of the printing content. Distribute can even mean going all the way to readers to print in their home on or their monitor electronically.**

Quiz answers

Printing Module 2

1. What are anti-aliased images? **Images displaying smooth transitions**
2. Is bindery done before or after printing a project? **Afterwards**
3. Color bitmapped files are composed of pixels that carry color information. True or false?**True**
4. What are the names of the four process-color printing inks? **Cyan, magenta, yellow, and black (CMYK)**
5. A gripper margin is the non-printing area of a press sheet. True or false? **True**
6. What is a halftone screen used for? **Printing images color/gray shades**
7. How is a line art image different from a halftoned image? **No tonal shades since line art is either a solid color of ink or no color (paper)**

Quiz answers

Printing Module 3

1. A mezzotint can simulate shades of a color using just one solid ink color, like line art. True or false? **True**

2. Describe what a moiré pattern is. **An undesirable interference pattern caused by overlapping trid patterns.**

3. Is offset printing a widely-used commercial printing process? **Yes. Nearly 80% of commercial printing uses this process.**

4. What's the advantage of using PDF files? **A file that is multi-computer platform compatible and shows fonts and images that don't need to be installed on the viewing computer.**

5. If an image is going to be enlarged, which image file will look best: bitmapped or vector? **Vector is resolution independent so it is always sharp.**

6. A JPEG image can be color, grayscale, and line art. True or false? **False.**

Quiz answers

Printing Module 4

1. CMYK printing inks can simulate any color. True or false? **False.**

2. Spot colors are named for printing in specific places on the page. True or false? **False. They are solid colors not depending on CMYK mixes.**

3. Web-roll presses are designed to print images directly from the Internet. True or false? **False. A web roll of paper is designed for a high-speed, non-sheetfed press that cuts the printed paper into sheets.**

4. Recycled printing papers are made up of 100% recycled fibers. True or false? **False. In the United States, paper can be called recycled if it has less than 100% recycled fibers. Uncoated paper needs to be at least 30% recycled fiber and coated paper needs to be at least 10% recycled content.**

Quiz answers

Printing Module 5

1. What printing process is best to print on clothing? **Screen printing**
2. For very large printing quantities and very high quality, which printing process does the job best? **Gravure printing**
3. Very thin materials are usually printed using what process? **Flexographic printing**
4. What is the most recent printing technology that produces high-qualty results with cost-effective short printing quantities? **Digital printing**
5. Why is offset lithogrqphy given that name? **The printing ink is offset, or printed indirectly, from the metal plate cylinder to a rubber impression cylinder that then transfers the ink to the paper.**
6. What is the oldest printing process still in use today? **Letterpress**

Quiz answers

Printing Module 6

1. What is the easiest way to ensure files with the correct settings will be created for the printer? **Answer: If the printing company can provide presets they can be loaded into the desktop publishing program and used to create final files for the printer.**
2. Getting just one printing estimate is enough to know the best price for a printing project. True or false? **Answer: False. It is best to get comparative estimates based on the same specifications to see who can offer the best price. The best quality printing and customer experience is based on other feedback and by looking at the printed samples.**
3. Inks on a printing press must correspond to the printing plates used. True or false? **Answer: True. If color separations are made for a four-color press then the individual CMYK inks need to be on the press in the same order as their corresponding printing plates.**
4. A press check is when the printing company mechanic makes sure the printing press will run correctly for the printing jobs. True or false? **Answer: false. A press check is the approval of the first printed sheets to set the standards for the remaining print run.**

Discussion & Practice

Printing Module 1

1. Bring in printed examples of publications for class discussion

2. Discuss how the ratio of words to pictures influences the look and tone of a communication.

3. Since most current printing uses digitial-era publishing, find image examples on the Internet that can show earlier works and classify them by era. Share the images in class.

4. Digital-era printing includes electronic imaging so look at how an online publication is experienced compared to one that is ink on paper. What are the favorable aspects and the unfavorable ones to the reader.

5. Take a poll of how many people want to read printed communications versus electronic-only communications. Why is one preferred over the other or are there certain kinds of information that need to be presented certain ways?

Discussion & Practice

Printing Module 2

1. Bring in printed samples to discuss how they are produced. Use a magnifier to be able to look closely at the printed products.

2. Identify bitmapped images by looking for printing dots.

3. Identify line art images and text that print with solid ink and no dots. (The exception is gravure printing where all printed components are broken into dots. A popular example is *National Geographic* magazine.)

4. Use a magnifier to identify different sized printing/halftone dots. Do smaller halftone dots mean finer reproduction?

Discussion & Practice

Printing Module 3

1. Bring in printed samples to discuss how they are produced. Use a magnifier to be able to look closely at the printed products.

2. Identify any out-of-registration printing by looking closely at printed color images.

3. Do any of the publications under review use saddle stitching? If so, how do the pages open up and lay flat comparted to other types of bindery?

4. Using the magnifier, what printed colors are made up of CMYK ink dots or solid colors without dots?

Discussion & Practice

Printing Module 4

1. Bring in printed samples to discuss how they are produced. Use a magnifier to be able to look closely at the printed products.

2. What differences in papers are seen in the printed samples?

3. Obtain paper sample books to try and identify papers used in the publications under review. Paper sample books can be obtained from paper suppliers, design agencies, and printing companies.

4. Are any of the publications claiming to be printed on recycled paper? Check in the masthead section or table of contents areas.

Discussion & Practice

Printing Module 5

1. Bring in printed samples of as many different printing technologies as you can identify.

2. Discuss how they are produced and the choices of paper or substrate used for each.

3. Using a magnifier (also called a loupe) to be able to look closely at the printed products and see how the printing varies with each process.

4. Which samples are of the highest quality and which are of the poorest reproduction quality?

Discussion & Practice

Printing Module 6

1. Ask a printing company representative to visit the class and discuss best practices to work together or visit a printing company.

2. Plan a schedule for a printing project with each of the steps accounted for. Start with the delivery date and work backwards to the start of the project. Plan each step on a calendar.

3. Get sample paper swatch books from a paper company or printing company to help identify some kinds of papers that might be best suited for particular printing jobs. Select one paper to specify for item 4 (below).

4. Prepare a printing job specification sheet, as described in step 2, so it can be quoted by a printing company. It might be possible to ask the printing company to quote the project to see how much it would cost. Arrange this with the printing company representative if you can get one to visit (see 1 above).

5. Bring in printed samples to compare and discuss highest-quality to low-quality reproductions.