An introduction to what is ink

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Key communication developments in human history

Language Development:

- Writing Systems
- Printing Press
- Telephone
- Radio and Television
- Internet

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One Human Component

Imagination

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Why is this important?

- Printing created the first “network” where knowledge could be shared beyond the immediate community
- This in turn lead to the key changes of “Renaissance” “Reformation” and the “Scientific Revolution”
- Depending on your point of view, printing ink is the most important of all components
- Why? – Without it there is NO visible image which after all, is the key point of printing

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A QUICK HISTORY

The History

- First inks were made in China (300-500 BC)
- Used for Writing/calligraphy using a brush
- Water based inks were made from soot mixed into animal glue
- Ink sticks and ink stone

The History

- Inks were first used for writing in europe (with quills) for religious and legal books and documents
- Closely related to the church
- Hand reproduction of religious texts by monks

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The History

- The first practical printing press was invented by Gutenberg around 1450 based on a wine press
- He invented metallic moveable type

- **What is not well known is that he also invented the first “modern” printing ink**

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The History

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The History

- Key components of LETTERPRESS printing
  - Moveable type
  - Printing Press
  - Substrate
  - Ink

The History

- Gutenberg came up with a working ink formula based on lampblack (soot), vegetable oil and beef tallow
- Although moveable type was claimed as the key invention, if the ink hadn't worked correctly - the process would have failed
- For many years until automation crept into the process during the industrial revolution, changes to inks were minor and, since the ink was made by the printer himself, they were highly varied and kept as "secrets"

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The History

- The industrial revolution changed this
- In the early 1800's the first true printing ink companies were established:

  - charles lorrileux – paris
  - george morrill – usa (ma)
  - coates brothers – uk

- The descendants of these companies can be traced to the present day where they exist as part of the largest multi-national ink conglomerate

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The History

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The History

- The increase in speed of innovation required separate ink companies with the necessary resources to keep up with – or even lead, the printing industry into the future.
- Despite the innovations taking place, even into the 1950's there was something of a "black art" stigma attached to inks.
- Printers still added their "secret sauce" to basic inks because it made the product work "better" on their specific press!
- It was around this time that ink making truly changed and became a science.
- Much of that change can be traced to the origination of the summer course at Lehigh university and the City&Guilds ink technology program in the United Kingdom.

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The History

These courses, along with the formation of NPIRI were started and supported by several great technical members of our industry and their names remain well known even today:

Carlick
Zettlemoyer
Schaeffer
Eriksen
Fetsko
Bassemir
Leach
Idle
Bates
Larsen
Gerlach

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The History

- It is important to note that printing ink remains one of the great bargains of modern technology.
- Even today - with few exceptions, ink represents only 3-5% of the total cost of a printed job.
- What it enables an art director and printer to achieve in “value added” is highly cost effective

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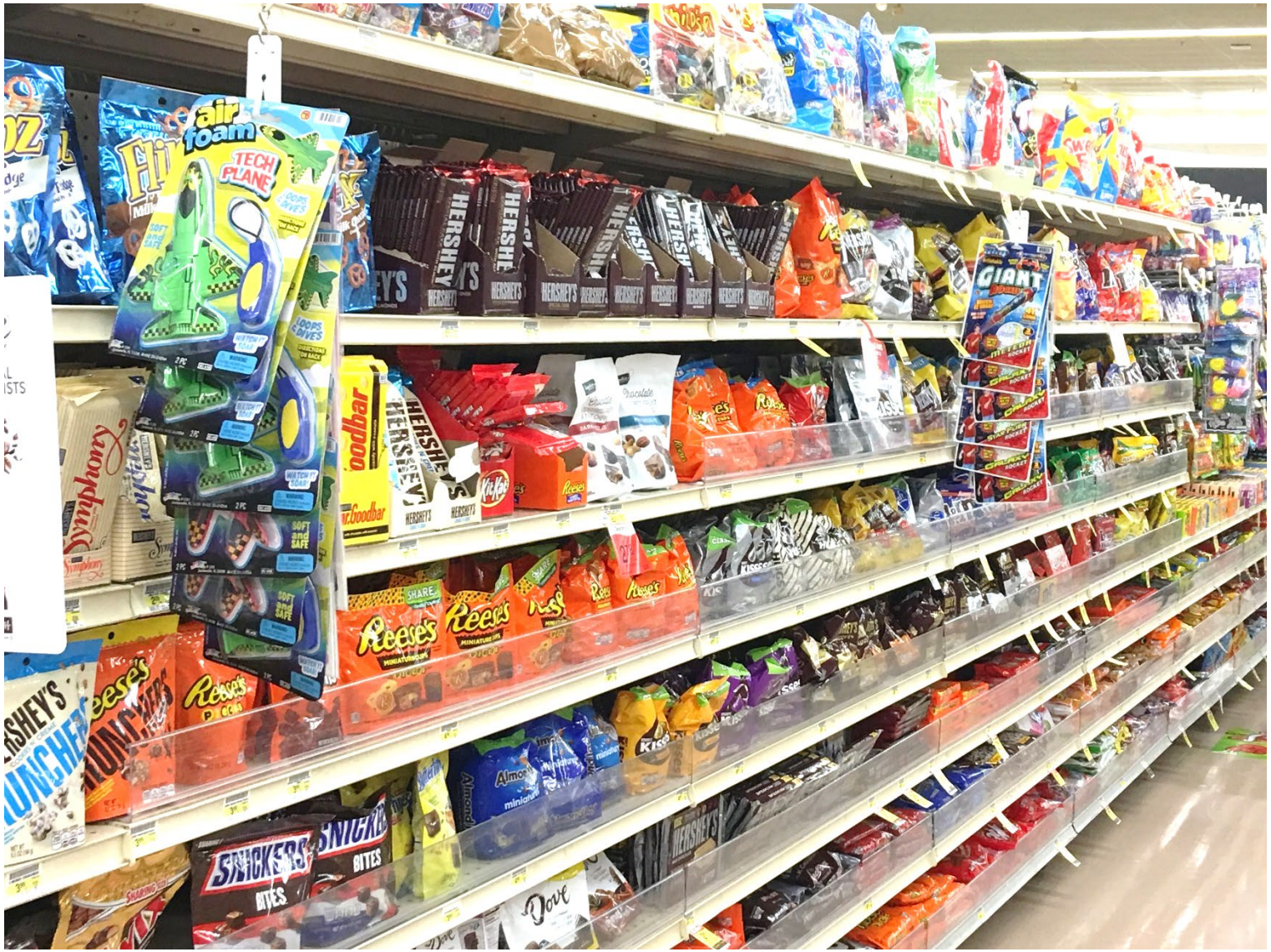
The Impact



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The Impact

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The Impact


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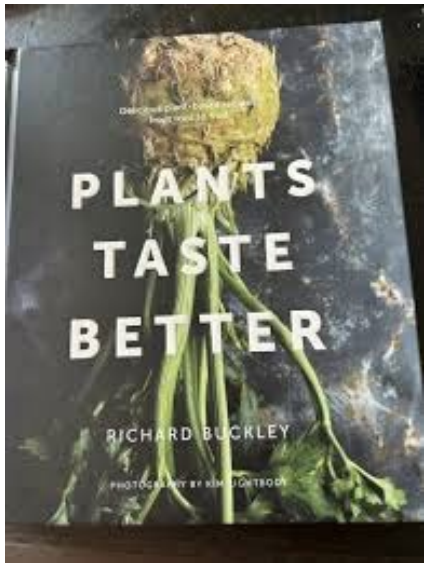
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So… what exactly is a printing ink?

Primarily, ink serves as a filter

It achieves this by selectively removing some wavelength components from a light source (be it the sun, a lightbulb or a candle) that would normally be reflected back to the eye from the substrate surface.

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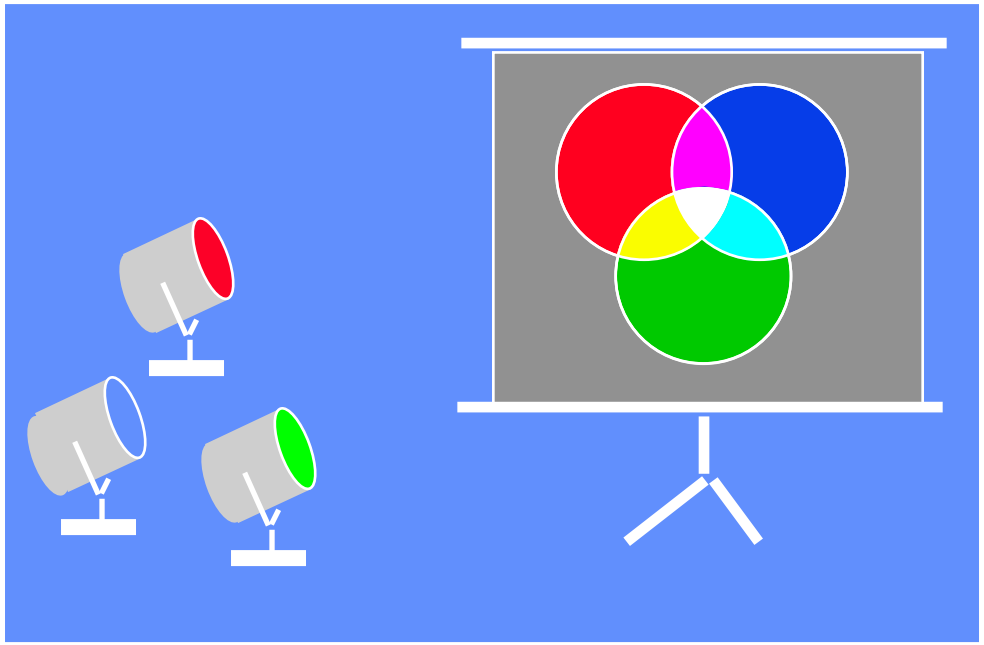
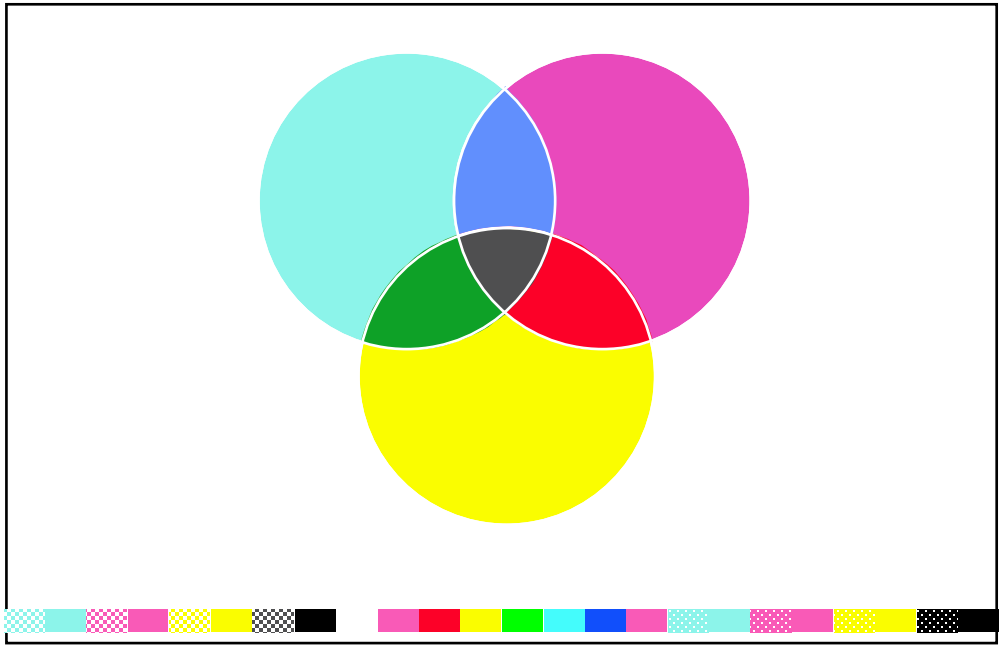
Color is explained by 2 theories:

- Additive Color Theory
- Subtractive Color Theory





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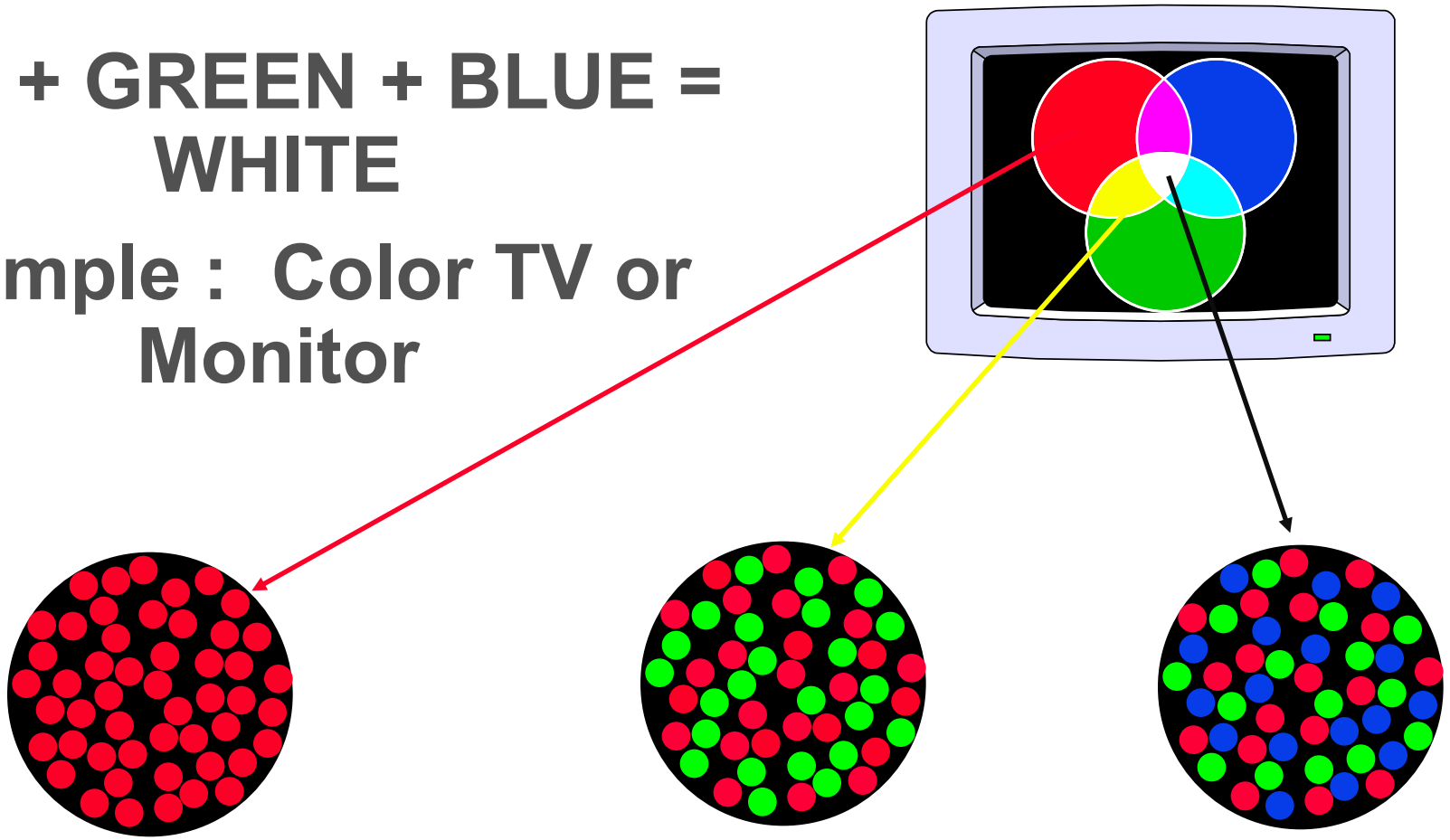
Additive Color Theory

RED + GREEN + BLUE = WHITE

Example : Color TV or Monitor



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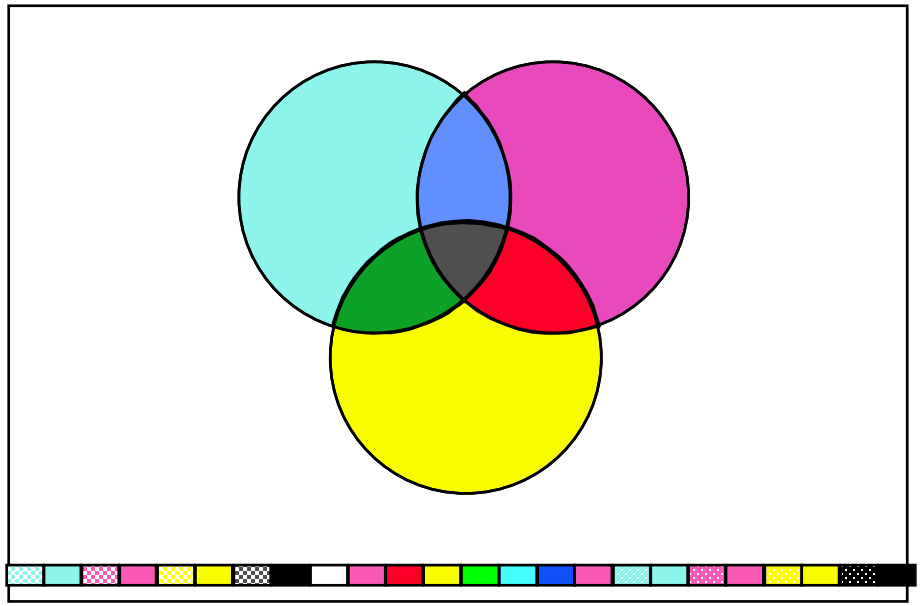
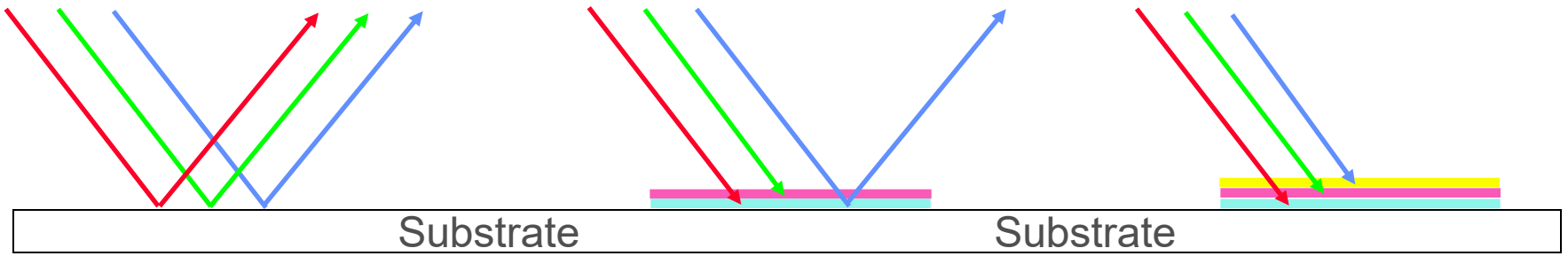
Subtractive Color Theory

CYAN + MAGENTA + YELLOW = BLACK

Example : Color Printing





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Key ink properties

- As we noted previously, the first inks were **BLACK** so that almost all the light was filtered out by them.
- This provided good contrast on parchment or vellum even when viewed under candlelight

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Key ink properties

The second key component of an ink is that it must “accurately conform to a predetermined image or design” in order to be able to communicate something visually to the viewing subject.

Without these two key properties… **it ain’t an ink!!!!**

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Provides contrast, but does not function properly

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Provides contrast , delivers message

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Key ink properties

- Over time we have added many more requirements that a modern printing ink has to meet:
  - Withstand the printing process
  - Drying method
  - Printing speed
  - Chemical and other resistance
  - Non-toxic
  - Non migration
  - Adhesion to different substrates
  - Electroconductivity
  - Remain “invisible” as ink

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Key ink properties

In the next few days you will learn a lot of the nuances, chemistry, physics and techniques that go into modern ink making.

But remember…

Ink is above all a light filter and must faithfully follow an image.

These are the two great requirements

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Printing Processes

PRINTING PROCESS	INK	PLATE TYPE	DRYING METHOD[1]	SUBSTRATES[2]
Lithographic offset	Paste: Oil based, energy curable	Planographic (Image & non-image areas neither raised nor recessed)	Absorption, evaporation, oxidation, UV, EB	Paper, paperboard, nonporous substrates
Gravure	Liquid: Solvent based, water based	Recessed (Engraved)	Evaporation	Paper, paperboard, nonporous substrates
Flexographic	Liquid: Solvent based, water based, energy curable	Raised image (Relief) Pliable material	Evaporation, precipitation, UV, EB	Paper, paperboard, nonporous substrates
Letterpress	Paste: Oil based, solvent based, energy curable	Raised image (Relief) Rigid material	Absorption, evaporation, oxidation, UV, EB	Paper, paperboard, nonporous substrates
Screen	Paste: Oil based. solvent based, energy curable, waterbased	Stencil	Oxidation, evaporation, UV, EB	All above substrates plus textiles, glass & other misc. materials
Non-impact	Liquid, powder, or solid: Water based, solvent based, energy curable	Plate-less	Absorption, evaporation, high heat (fusion), UV, EB	Paper, paperboard, nonporous substrates

Table 2-1
Overview of Printing Processes

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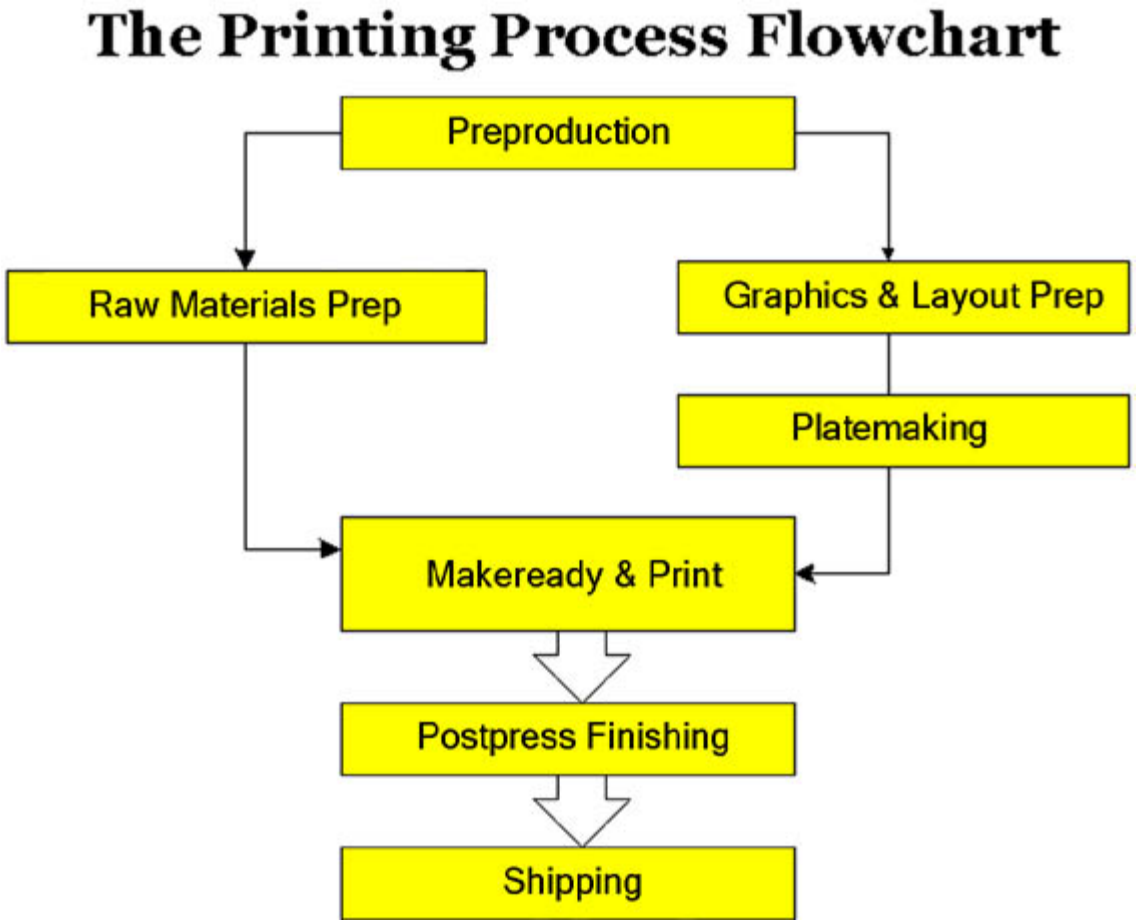
Printing Processes and Workflow



Printing Production Workflow

1. PREPRESS	2. PRESS	3. POSTPRESS
File Submission	Press Make-Ready	Precision Trimming
Preflight Checking	Registration Check	Folding & Collating
Imposition Layout	Ink/Toner Alignment	Binding Assembly
Client Proofing	Main Production Run	Surface Finishing
Plate Generation	Ink Drying / Curing	Quality Inspection

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Enjoy the course!

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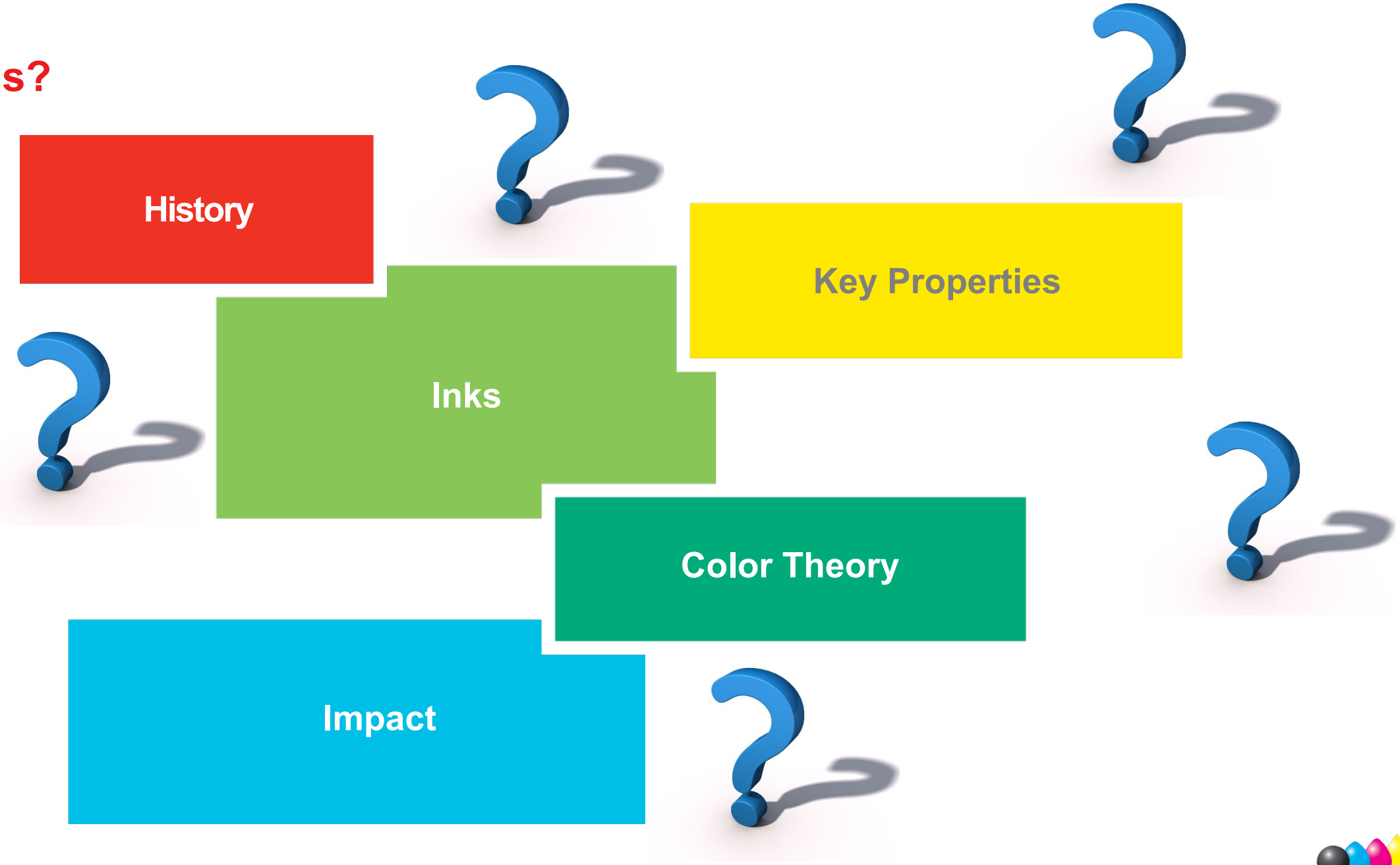
Questions?



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