HEC MONTRÉAL

Writing with \title{LaTeX}

The Basics

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Writing with \title{LaTeX}

Part One : The Basics
HEC Montréal Edition, revised and extended (english version)

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Training Session Summary

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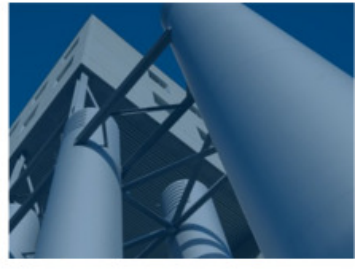
TEX and LATEX presentation



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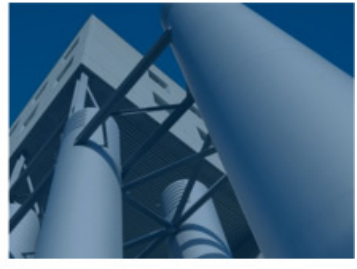


What is TEX and LATEX?

At the beginning (1978), there was TEX. . .

What is TEX?

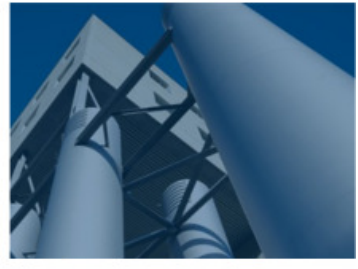
- A typesetting and document preparation system;
- "The most powerful formatting program for producing book-quality text of scientific and technical works"[1];
- A mature, stable, complete and bug-free system;
- A set of very primitive commands perfect for typography and programming functions;
- «*typesetter-level program*».

[1] Kopka & Daly, p. 6

On the sixth day (1983), there was LaTeX...

What is LaTeX?

- A set of macro-commands used to facilitate TeX's usage;
- No preliminary knowledge of typography in general or TeX in particular is required;
- Typographical and logical markup language used for text layout (like HTML);
- Cross-platform language, identical from one operating system to the other, and extensible with packages;
- «*author-level program*».



A LaTeX document creation process

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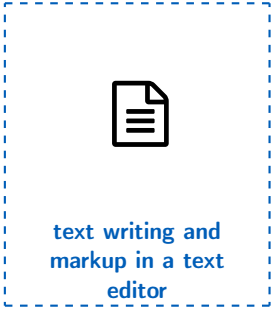
Writing with a new perspective

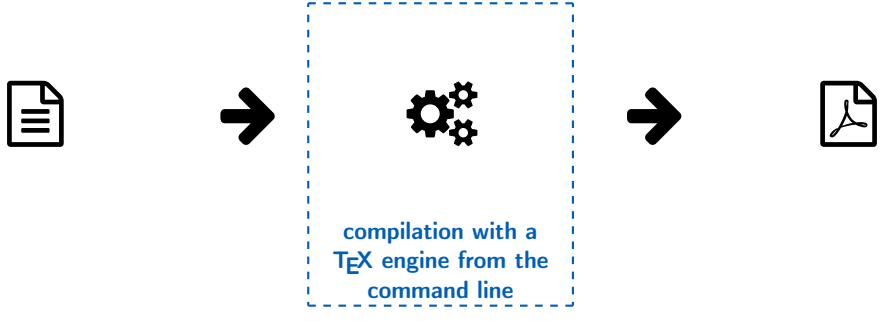
- You write your document in plain text and use commands to describe **what your text is** and **not what it's supposed to look like**.
- You concentrate on your **content**.
- You let LaTeX do its work, that is taking care of the **container**.

LaTeX document creation process

LaTeX document creation process



LaTeX document creation process



LaTeX document creation process





visualization with an external viewer

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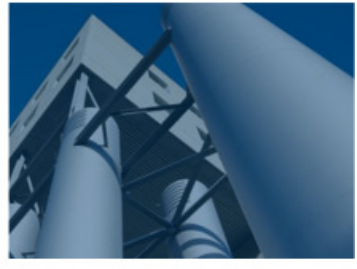
LaTeX document creation



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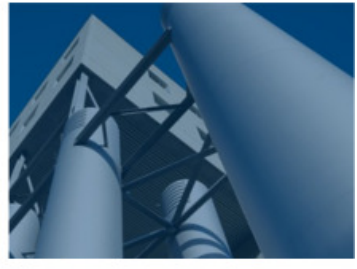

Document structure

The most basic LaTeX document

In a text editor, open a new file and write the following code:

```
\documentclass{article}

\begin{document}
  This is my first LaTeX document and I am proud of it.
\end{document}
```

Save your file with the `.tex` extension and compile it. Look at the results.

The parts of a document

Document class declaration

- A document always starts with the `\documentclass` **command**.

```
\documentclass[options]{class}
```

- The document class determines a document's type.
- Many options can be used to change a document's layout.

The parts of a document

Document body

A document's content is written inside the `document` **environment**, between the `\begin{document}` and `\end{document}` commands.

```
\documentclass[options]{class}

\begin{document}
  The document's content is written here...
\end{document}
```

The parts of a document

The preamble

Everything that is written before the `\begin{document}` command is called the document **preamble**.

```
\documentclass[options]{class}

%% Here lies the document preamble...

\begin{document}
  The document's content is written here...
\end{document}
```

In the preamble, you will find:

- packages;
- configuration commands;
- custom commands and environments;
- metadata.

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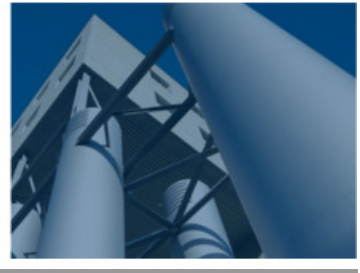
Creating a more complex document

- Open the first `.tex` file you created.
- Go to the HEC Montréal news web page .
- Copy and paste a whole article in your document.
- Save and compile your document, then look at the results.



LaTeX customization

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Preamble

Packages

Packages are used to **modify commands** or **add functionalities** to the system.

They are loaded in the preamble with the `\usepackage[options]{package}` command.

```
\documentclass[options]{class}

\usepackage{package}
\usepackage[options]{package}
\usepackage{package1,package2,package3,...}
```

Each package's documentation can be found on the Comprehensive TEX Archive Network website.

Commands

- Always start with a \
- General syntax:

```
\nomcommande[optional_args]{mandatory_args}
\nomcommande*[optional_args]{optional_args}
\nomcommande
```

- Mandatory arguments are placed between { and }
- Optional arguments are placed between [et]
- Commands without arguments : their name ends with any character that isn't a letter, including a white space
- The scope of a command is limited in the zone between { and }.

Environments

- Delimited by

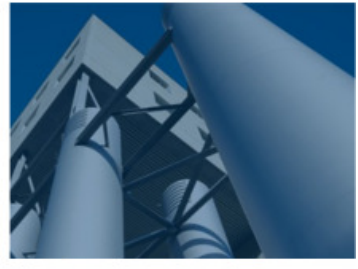
```
\begin{environment}
  ...
\end{environment}
```

- An environment's content is treated differently from the remainder of the text
- Changes only apply inside the environment

Custom commands and environments

- You can **create** new commands with `\newcommand` .
- You can **modify** existing commands with `\renewcommand` .
- You can **create** new environments with `\newenvironment` .
- You can **modify** existing environments with `\renewenvironment` .

Writing



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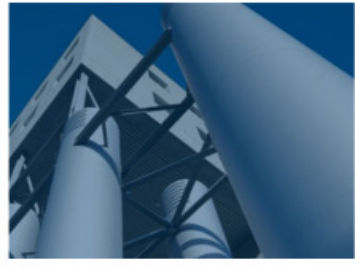

Basic formatting

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Title, author and date

- Automatic formatting

```
\documentclass{article}

\title{Document title}
\author{Author name}
\date{A date}

\begin{document}
  \maketitle

  % Document content...
\end{document}
```

- Manual formatting

```
\documentclass{article}

\begin{document}
  \begin{titlepage}
    % Title page built manually...
  \end{titlepage}
\end{document}
```

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Paragraphs, line breaks and white space

- LaTeX automatically deletes all extra white spaces.
- Line breaks are created with \\.
- There needs to be at least one blank line between paragraphs in the code in order to distinguish them in the text.

Reserved characters

TEX reserved characters

- `#` Argument identifier in commands
- `$` Math mode delimiter
- `&` Column delimiter in tables
- `%` Start of a comment
- `_` Indice (math)
- `^` Exponent (math)
- `~` No-break space
- `{` Opens a command or environment definition
- `}` Closes a command or environment definition

Reserved characters

TEX reserved characters

		TO USE THEM:
#	Argument identifier in commands	\#
$	Math mode delimiter	\$
&	Column delimiter in tables	\&
%	Start of a comment	\%
_	Indice (math)	_
^	Exponent (math)	\textasciicircum
~	No-break space	\textasciitilde
{	Opens a command or environment definition	\{
}	Closes a command or environment definition	\}

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Reserved characters

Part deux...

- Quote marks
  - We open english single quotes with (`) and double quotes with (``). We close them with one (') or two ('') apostrophes, depending on the case.
  - We use chevrons (« and ») to open and close french quotation marks. To do this, you must enter the following command in the preamble:

```
\frenchbsetup{og=“,fg=”}
```

- You write hyphens with a single (−) sign, n-dashes with two (−−) signs and m-dashes with three (−−−) signs.

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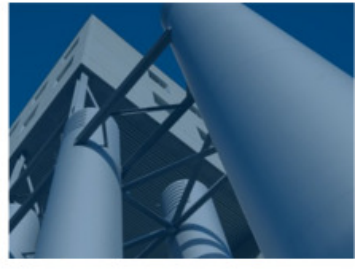
Comment

- To clarify your code (or long documents), it is advised that you insert comments in your document.
- They always begin with the % symbol.
- Comments are visible in your code but not in the final document.



Text appearance

Fonts

- By default, all LaTeX documents use the Computer Modern font.
- Preferably use high-quality and complete fonts (diacritics, great choice of symbols).
- Very few fonts are adapted to maths : Palatino, Times, Lucida ($) are safe choices.
- In the **hecthese** document class, the mathptmx and mathpazo packages are preloaded, so you can choose between the Times and Palatino fonts.

Font attributes

families		
roman	`\rmfamily`	`\textrm{<text>}`
`fixed width`	`\ttfamily`	`\texttt{<text>}`
sans serif	`\sffamily`	`\textsf{<text>}`
shapes		
upright	`\upshape`	`\textup{<text>}`
italic	`\itshape`	`\textit{<text>}`
slanted	`\slshape`	`\textsl{<text>}`
SMALL CAPS	`\scshape`	`\textsc{<text>}`
series		
medium	`\mdseries`	`\textmd{<text>}`
bold	`\bfseries`	`\textbf{<text>}`

Font attributes

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SMALL CAPS	`\scshape`	`\textsc{<text>}`
series		
medium	`\mdseries`	`\textmd{<text>}`
bold	`\bfseries`	`\textbf{<text>}`

applies to all following text

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Font attributes

families		
roman	`\rmfamily`	`\textrm{<text>}`
`fixed width`	`\ttfamily`	`\texttt{<text>}`
sans serif	`\sffamily`	`\textsf{<text>}`
shapes		
upright	`\upshape`	`\textup{<text>}`
italic	`\itshape`	`\textit{<text>}`
slanted	`\slshape`	`\textsl{<text>}`
SMALL CAPS	`\scshape`	`\textsc{<text>}`
series		
medium	`\mdseries`	`\textmd{<text>}`
bold	`\bfseries`	`\textbf{<text>}`

applies to the text in braces

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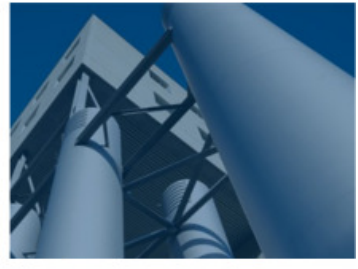
Font size

Commands	Rendering
`\tiny`	smallest
`\scriptsize`	even more smaller
`\footnotesize`	smaller
`\small`	small
`\normalsize`	normal
`\large`	large
`\Large`	larger
`\LARGE`	largest
`\huge`	huge
`\Huge`	humongus

Bold, italics and underline

- **Bold** characters: `\textbf{}`
- Characters in *italics* :
  - `\textit{}`
  - `\emph{}` – command of choice
- Underlined characters : `\underline{}`

Text layout



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Text alignment

- By default, text is fully justified.
- To align text to the left, you use the `flushleft` environment.

```
\begin{flushleft}
  Text will be aligned to the left.
\end{flushleft}
```

- You use the `center` environment to center text.

```
\begin{center}
  Text will be centered.
\end{center}
```

- To align text to the right, you use the `flushright` environment.

```
\begin{flushright}
  Text will be aligned to the right.
\end{flushright}
```

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Lists

Unnumbered and numbered lists

- Unnumbered lists are built using the `itemize` environment.

```
\begin{itemize}
  \item First item
  \item Second item
  \item etc.
\end{itemize}
```

- Numbered lists are built using the `enumerate` environment.

```
\begin{enumerate}
  \item First item
  \item Second item
  \item etc.
\end{enumerate}
```

- The `\item` command is used to list items.
- You can embed lists up to four levels.

Lists

Definition lists

You create definition lists with the `description` environment.

```
\begin{description}
  \item[First expression] First expression's definition
  \item[Second expression] Second expression's definition
\end{description}
```

First expression First expression's definition. Auctor est gravida habitasse leo lobortis mollis nec platea posuere sollicitudin tempus.

Second expression Second expression's definition. Aenean consequat dictumst dignissim duis facilisis himenaeos id pharetra placerat porta posuere primis senectus tortor.

Quotations

Short quotations

You use the quote environment to insert short quotations (one paragraph) in the text.

```
\begin{quote}
  Life is what happens to you while
  you're busy making other plans.
  -- John Lennon
\end{quote}
```

> *Life is what happens to you while you're busy making other plans.* – *John Lennon*

Quotations

Long quotations

You use the `quotation` environment to insert long quotations (more than one paragraph) in the text.

```
\begin{quotation}
  I've missed more than 9000 shots in my
  career. I've lost almost 300 games. 26
  times I've been trusted to take the game
  winning shot and missed.

  I've failed over and over and over again
  in my life. And that is why I succeed.
  -- Michael Jordan
\end{quotation}
```

> *I've missed more than 9000 shots in my career. I've lost almost 300 games. 26 times I've been trusted to take the game winning shot and missed.*
>
> *I've failed over and over and over again in my life. And that is why I succeed. – Michael Jordan*

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Footnotes

- You insert footnotes with the following command:

```
\footnote{footnote text}
```

- The command must follow the text that has to be annotated.
- Recommended method :

```
... fera remarquer que Pierre Lasou\footnote{%
  Spécialiste en ressources documentaires} %
fut une grande aide dans la préparation de ...
```

- Footnote numbering and layout are automatic.

Source code

- To write source code in blocks, you use the `verbatim` environment.

```
\begin{verbatim}
  Text laid out as is with a
  fixed-width font.
\end{verbatim}
```

- To write source code inside text, you use the `\verb` command. Its syntax is `\verbcsourcec` where *c* is a character not used in *source*.

```
Text with \verb|some code|.
```

- For a more intensive use, please read the **listings** package's documentation.

[2] taken from the r4stats.com website.

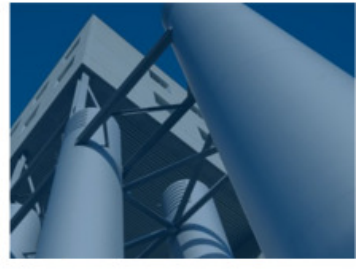
Source code

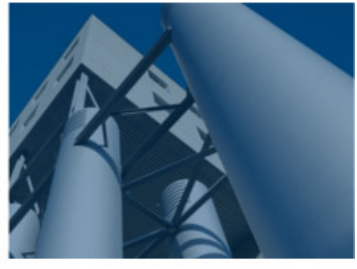
Example[2] :

```
# ---Writing Your Own Functions (Macros)---

# A good function that just prints.
mystats <- function(x) {
  print( mean(x, na.rm = TRUE) )
  print(   sd(x, na.rm = TRUE) )
}
mystats(myvar)

# A function with vector output.
mystats  <- function(x) {
  mymean <- mean(x, na.rm = TRUE)
  mysd   <-   sd(x, na.rm = TRUE)
  c(mean = mymean, sd = mysd )
}
mystats(myvar)
myVector <- mystats(myvar)
myVector
```

[2] taken from the r4stats.com website.

Document organization





Parts of a document

Document class choice

The first thing to do before we start writing a LaTeX document is to choose a document class.

Class	Divisions	Layout	Headers	Footers
`article`	parts, sections, ...	one-sided	empty	centered page numb
`report`	parts, chapters, sections, ...	one-sided	empty	centered page numb
`book`	parts, chapters, sections, ...	two-sided	page numbers, titles	empty
`hecthese`	chapters, sections, subsections	two-sided	empty	centered page numb

Abstract

- **article**, **report** or **memoir** classes: the abstract is created with the abstract environment.

```
\begin{abstract}
  ...
\end{abstract}
```

- **hecthese** class: french and english abstracts considered as normal unnumbered chapters

Sections

- A document is divided in sections with the following commands:

```
\part[short title]{long title}
\chapter[short title]{long title}
\section[short title]{long title}
\subsection[short title]{long title}

\subsubsection[short title]{long title}   % à éviter dans un livre

\paragraph[short title]{long title}     % ne jamais utiliser
\subparagraph[short title]{long title}  % ne jamais JAMAIS utiliser
```

- Automatic numbering
- Commands followed by an * = unnumbered section
- Short title is optional

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Appendices

- Appendices are sections using an alphanumeric numbering (A, A.1, . . .).
- Sections following the `\appendix` command are considered appendices.
- In the section title, "'Chapter" is changed to "Appendix".

A book's logical structure

book, memoir and hecthese classes

`\frontmatter`

- preface, table of contents, etc.
- roman page numbering (i, ii, ...)
- unnumbered chapters

`\mainmatter`

- the document's main content
- arabic page numbering starting at 1
- numbered chapter

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A book's logical structure

book, memoir and hecthese classes

```
\backmatter
```

- everything else (bibliography, index, etc.)
- page numbering continues
- unnumbered chapters

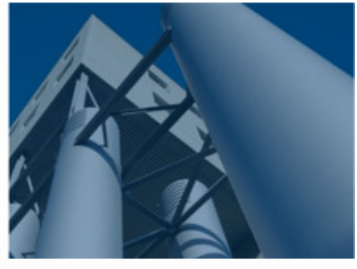

Table of contents and in-text references

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Table of contents

- The table of contents is automatically generated with `\tableofcontents` .
- It requires **many** compilations.
- Unnumbered sections are not included.
- With the **hyperref** package, `\tableofcontents` also generates the .pdf file's table of contents.

Table of contents

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- The memoir document class also provides the `\tableofcontents*` command which excludes the table of contents from the table of contents.

Table of contents

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- It requires **many** compilations.
- Unnumbered sections are not included.
- With the **hyperref** package, `\tableofcontents` also generates the .pdf file's table of contents.
- The memoir document class also provides the `\tableofcontents*` command which excludes the table of contents from the table of contents.
- `\listoffigures` generates the list of figures.
- `\listoftables` generates of the list of tables.

Labels and cross-references

Because your computer will do it better than you...

- **NEVER** refer to a section, an equation, a table, etc., manually.
- "Name" an element with `\label`
- Refer to that element using its name with `\ref`
- Requires 2 or 3 compilations

```
\section{Definitions}
  \label{sec:definitions}

  Lorem ipsum dolor sit amet, consectetur adipiscing elit,
  sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
  Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris
  nisi ut aliquip ex ea commodo consequat.

\section{Historique}
  As seen in section \ref{sec:definitions}...
```

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Labels and cross-references

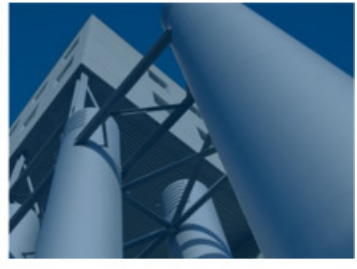
Because your computer will do it better than you...

- The **hyperref** package inserts hyperlinks with the in-text references in the .pdf files.
- The `\autoref{}` command allows us to:
  1. automatically name the reference type (section, equation, table, etc.);
  2. convert to a hyperlink the reference's text **and** number.

```
As seen in \autoref{sec:definitions}...
```

- The `\pageref{}` command refers to a specific page.
- The **amsmath** provides the `\eqref{}` command for equation referring.

hecthese document class



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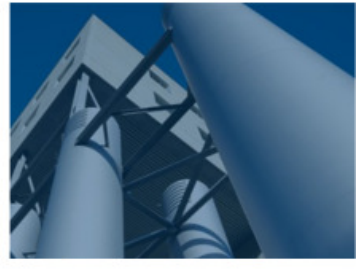
hecthese document class

- Document class created specifically for the M.Sc. and Ph.D. students from HEC Montréal;
- Available at https://ctan.org/pkg/hecthese ;
- Layout fully complies with the presentation standards of the Guidelines for Writing an Academic Work at a Graduate Level ;
- Based on the **memoir** document class;
- Provides new commands for title page creation and more...
- New adapted environments;
- You start from a base template (available after installing the package in a working directory);
- You use separate files for each chapter of your dissertation or thesis.

Bibliography



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For those who still prefer the scent of ink

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- ShareLaTeX Documentation
- TeX - LaTeX Stack Exchange
- LaTeX Community
- Comprehensive TeX Archive Network
- UK List of TEX Frequently Asked Questions
- Google...

Questions and comments

Training Session Documentation

http://bit.ly/enltxhec1

Training Session Evaluation

http://bit.ly/enltxsurvey1

TeXnical Support

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Crédits

- "At the beginning, there was TEX" montage, page 4
  - «La création du Soleil, de la Lune et des plantes», Michel-Ange
  - TEX logo
  - Portrait de Donald Knuth
- «On the sixth day, there was LATEX» montage, page 6
  - «La création d'Adam», Michel-Ange
  - TEX logo
  - LATEX logo
  - Portrait de Donald Knuth
  - Portrait de Leslie Lamport