Beamer by Examples

Powerful Language for Typesetting and Presentation

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slides from W. Drago Chen's (Institute of Technology Taiwan) and Gonzalo Rivero's (New York University) presentations

University of Konstanz

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Outline

What is LaTeX?

- LaTeX (pronounced "lay-tek" or "lah-tek") is a typesetting language. LaTeX was created for the purpose of typesetting text and mathematical formulas.
- LaTeX is not a word processing program. Unlike programs like MS Word where your document is produced "on the fly" through a "What You See Is What You Get" (WYSIWYG) format, LaTeX files need to be processed or compiled first before the final product can be viewed.

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What is Beamer?

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- Beamer is a LaTeX class for creating presentations that are held using a projector, but it can also be used to create transparency slides.
- Preparing presentations with Beamer is different from preparing them with WYSIWYG programs like MS Powerpoint.
- A Beamer presentation is created like any other LaTeX document.

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- A Beamer presentation is created like any other LaTeX document.

Advantages of beamer

In comparison to WYSIWYG

- It is free
- It is easy - if you know LATEX
- It benefits from the professional typesetting of LATEX
- It is difficult to create bad design
- Sources from other LATEX-classes like article or book can be used
- Output is pdf

LaTeX Software and Tools

LaTeX Tools and Softwares

- Acrobat Reader (PDF Viewer)
- Ghostscript, Ghostview and GSview (PS Viewer)
- MiKTeX or fpTeX (Complete Setup)
- TeXnicCenter or WinShell (Typesetting English Only)

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Overall Structure of TeX File

Standard Control Sequences

```
\documentclass[12pt]{article}
\usepackage{amsmath,amssymb,amsthm,tabularx,graphics}
\begin{document}
      .....
\newpage
      .....
\end{document}
```

Other Classes

{report}, {book}, {letter}, {beamer}, ...

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Basic structure of a document

1. The easiest way to start is to use the default template.
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3. The basic structure is the standard in LaTeX. But:
   - Indicate that this document is of the `beamer` class.

Example of a document

```
\documentclass{beamer}
% your options here

\begin{document}

\end{document}
```

Basic structure of a document

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   - Indicate that this document is of the `beamer` class.
   - Declare each slide (*frame*) you want to create.

Example of a document

```
\documentclass{beamer}
% your options here

\begin{document}

\begin{frame}

% One slide
\end{frame}

\end{document}
```

Basic structure of a document

1. The easiest way to start is to use the default template.
2. Note that you may have to run the code twice.
3. The basic structure is the standard in LaTeX. But:
   - Indicate that this document is of the beamer class.
   - Declare each slide (*frame*) you want to create.

Example of a document

```
\documentclass{beamer}
% your options here



\begin{document}



\begin{frame}
  \frametitle{Title of your slide}
% One slide
\end{frame}

\end{document}
```

Title page

- Introduce information for
  - `title`
  - `subtitle`
  - `author`
  - `institute`
  - `date`

Example of a document

```
\documentclass{beamer}
% your options here
\title{Presentations in \LaTeX{}}
\subtitle{Introduction to beamer}
\author{Gonzalo Rivero}
\date{April, 14, 2009}

\begin{document}




\begin{frame}
  \frametitle{Title of your slide}
% One slide
\end{frame}

\end{document}
```

Title page

- Introduce information for
  - `title`
  - `subtitle`
  - `author`
  - `institute`
  - `date`
- Explicitly create one slide for the `titlepage`

Example of a document

```
\documentclass{beamer}
% your options here
\title{Presentations in \LaTeX{}}
\subtitle{Introduction to beamer}
\author{Gonzalo Rivero}
\date{April, 14, 2009}

\begin{document}

\begin{frame}
  \titlepage
\end{frame}

\begin{frame}
  \frametitle{Title of your slide}
% One slide
\end{frame}

\end{document}
```

Sections of the document

Just create a new slide with the command \tableofcontents and split the document using the commands \section{*name*} and \subsection{*name*}. The dynamic table of contents in the upper bar will be shown anyway.

Code

```
% ... The preamble here

\begin{document}
\begin{frame}
  \titlepage
\end{frame}

\section{Title of the section}


\begin{frame}
  \frametitle{Title of your slide}
% One slide
\end{frame}



\begin{frame}
  \frametitle{Title of your slide}
% Another slide
\end{frame}

\end{document}
```

Sections of the document

Just create a new slide with the command `\tableofcontents` and split the document using the commands `\section{`*name*`}` and `\subsection{`*name*`}`. The dynamic table of contents in the upper bar will be shown anyway.

Code

```
% ... The preamble here

\begin{document}
\begin{frame}
  \titlepage
\end{frame}

\section{Title of the section}
\subsection{Title of the subsection}

\begin{frame}
  \frametitle{Title of your slide}
% One slide
\end{frame}

\subsection{Title of the subsection}

\begin{frame}
  \frametitle{Title of your slide}
% Another slide
\end{frame}

\end{document}
```

Paragraphs and Outline

Section and Subsection

```
\section{...}
\subsection{...}
        \begin{frame}
            ......
        \end{frame}
        ......
\section{...}
        \begin{frame}
```

Outline

```
\begin{frame}
    \frametitle{Outline}
\tableofcontents
\end{frame}
```

Paragraphs and Outline

Section and Subsection

```
\section{...}
\subsection{...}
        \begin{frame}
            ......
        \end{frame}
        ......
\section{...}
        \begin{frame}
```

Outline

```
\begin{frame}
    \frametitle{Outline}
\tableofcontents
\end{frame}
```

Text and Fonts Commands

Result

Do not *worry about* your **difficulties** in MATHEMATIC, I assure you that mine are greater.

Einstein, Albert (1879-1955)

Typesetting

```
Do not \textit{worry about} your \textbf{difficulties} in \textsc{mathematic},
I assure you that mine are \LARGE greater \normalsize.
\begin{flushright}
\underline{Einstein}, \underline{Albert} (1879-1955)
\end{flushright}
```

Text and Fonts Commands

Result

Do not *worry about* your **difficulties** in MATHEMATIC, I assure you that mine are greater.

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```
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\begin{flushright}
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\end{flushright}
```

Environments: Columns

We can type our slides using the typical LaTeX structure. To organize the information we have two specific environments that are specific to `beamer`.

- *Columns*. Breaks the frame horizontally. Declare the environment and specify the width of the column.
- *Blocks*. Encloses the text in a colored framework with a title. A title is required (may be blank)

Code

```
\begin{frame}
  \frametitle{Frame title}

\end{frame}
```

Environments: Columns

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Code

```
\begin{frame}
  \frametitle{Frame title}
    \begin{columns}




    \end{columns}
\end{frame}
```

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Code

```
\begin{frame}
  \frametitle{Frame title}
    \begin{columns}
      \column{.5\textwidth}



      \column{.5\textwidth}



    \end{columns}
\end{frame}
```

Environments: Columns

We can type our slides using the typical LaTeX structure. To organize the information we have two specific environments that are specific to `beamer`.

- *Columns*. Breaks the frame horizontally. Declare the environment and specify the width of the column.
- *Blocks*. Encloses the text in a colored framework with a title. A title is required (may be blank)

Code

```
\begin{frame}
  \frametitle{Frame title}
    \begin{columns}
      \column{.5\textwidth}

Text for your first column

      \column{.5\textwidth}

Text for your second column

    \end{columns}
\end{frame}
```

Environment: Blocks

Block title

This is a block in blue

Code

```
\begin{frame}
  \frametitle{Frame title}

\begin{block}{Block title}
  This is a block in blue
\end{block}

\end{frame}
```

Environment: Blocks

Block title

This is a block in blue

Code

```
\begin{frame}
  \frametitle{Frame title}

\begin{block}{Block title}
  This is a block in blue
\end{block}









\end{frame}
```

Environment: Blocks

Block title

This is a block in blue

Alert-block title

This is a block in red

Code

```
\begin{frame}
  \frametitle{Frame title}

\begin{block}{Block title}
  This is a block in blue
\end{block}

\begin{alertblock}{Alert-block title}

  This is a block in red
\end{alertblock}









\end{frame}
```

Environment: Blocks

Block title

This is a block in blue

Alert-block title

This is a block in red

Example-block title

This is a block in green

Code

```
\begin{frame}
  \frametitle{Frame title}

\begin{block}{Block title}
  This is a block in blue
\end{block}

\begin{alertblock}{Alert-block title}

  This is a block in red
\end{alertblock}

\begin{exampleblock}{Example-block
title}
  This is a block in green
\end{exampleblock}

\end{frame}
```

Itemize/Enumerate

`itemize` and `enumerate` work as expected:

- First element
- Second element
- Third element

Code

```
\begin{itemize}
  \item First element
  \item Second element
  \item Third element
\end{itemize}
```

Nevertheless, it might be useful to uncover lines in a given order: *overlays* in `beamer` jargon. For instance, ...

Items and overlays

- This item first

Code

```
\begin{itemize}
  \item<1-> This item first
  \item<3-> This item third
  \item<2-> This item second
\end{itemize}
```

Items and overlays

- This item first
- This item second

Code

```
\begin{itemize}
  \item<1-> This item first
  \item<3-> This item third
  \item<2-> This item second
\end{itemize}
```

Items and overlays

- This item first
- This item third
- This item second

Code

```
\begin{itemize}
  \item<1-> This item first
  \item<3-> This item third
  \item<2-> This item second
\end{itemize}
```

Items and overlays

- This item first
- This item third
- This item second

Code

```
\begin{itemize}
  \item<1-> This item first
  \item<3-> This item third
  \item<2-> This item second
\end{itemize}
```

Note that the order is given by

- <1> Show *only* on slide 1
- <1-> Show on slide 1 *onwards*
- <1-4,6-8> Show on every slide except 5
- \pause Creates stopping points (useful for tables)

Emphasis in overlays

We can emphasize portions of our slide using alerts. Alerts can use overlays.

- This item first

Code

```
\begin{itemize}
  \item<1-> \alert<1>{This item first}
  \item<3-> \textsl<3>{This item third}
  \item<2-> \textbf<2>{This item second}
  \item<4-> \color<4>{blue}{Finally...}
\end{itemize}
```

Emphasis in overlays

We can emphasize portions of our slide using alerts. Alerts can use overlays.

- This item first
- **This item second**

Code

```
\begin{itemize}
  \item<1-> \alert<1>{This item first}
  \item<3-> \textsl<3>{This item third}
  \item<2-> \textbf<2>{This item second}
  \item<4-> \color<4>{blue}{Finally...}
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```

Emphasis in overlays

We can emphasize portions of our slide using alerts. Alerts can use overlays.

- This item first
- *This item third*
- This item second

Code

```
\begin{itemize}
  \item<1-> \alert<1>{This item first}
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- This item first
- This item third
- This item second
- Finally...

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\begin{itemize}
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  \item<4-> \color<4>{blue}{Finally...}
\end{itemize}
```

More on overlays

1. First argument

Code

```
\begin{enumerate}[<+-| alert@+>]
  \item First argument
  \item Second argument
  \item Third argument
  \item Fourth argument
\end{enumerate}
```

More on overlays

1. First argument
2. Second argument

Code

```
\begin{enumerate}[<+-| alert@+>]
  \item First argument
  \item Second argument
  \item Third argument
  \item Fourth argument
\end{enumerate}
```

More on overlays

1. First argument
2. Second argument
3. Third argument

Code

```
\begin{enumerate}[<+-| alert@+>]
  \item First argument
  \item Second argument
  \item Third argument
  \item Fourth argument
\end{enumerate}
```

More on overlays

1. First argument
2. Second argument
3. Third argument
4. Fourth argument

Code

```
\begin{enumerate}[<+-| alert@+>]
  \item First argument
  \item Second argument
  \item Third argument
  \item Fourth argument
\end{enumerate}
```

Dynamic displays of tables: rowwise

We can use overlays with tables to show them row- or columnwise

	Mean	Sd. Dev.	95% HPD
μ_1	1.220	0.303	[0.567, 1.821]

Dynamic displays of tables: rowwise

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	Mean	Sd. Dev.	95% HPD	
μ_1	1.220	0.303	[0.567,	1.821]
μ_2	2.676	0.409	[1.863,	3.498]

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μ_1	1.220	0.303	[0.567,	1.821]
μ_2	2.676	0.409	[1.863,	3.498]
ρ	0.313	0.264	[-0.295,	0.749]

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ρ	0.313	0.264	[-0.295,	0.749]

Code (Approximate)

```
\begin{table}[!h]
  \centering
    \begin{tabular}{l|cccc}
                & Mean     & Sd. Dev. & 95\% HPD       \\ \hline
      $\mu_1$   & 1.220    & 0.303    & [0.567, 1.821]  \pause\\
      $\mu_2$   & 2.676    & 0.409    & [1.863, 3.498]  \pause\\
      $\rho$    & 0.313    & 0.264    & [-0.295, 0.749]
    \end{tabular}
\end{table}
```

Dynamic displays of tables: columnwise

	M1
β	1.11
σ	4.44
θ	7.77

Code

```
\begin{table}[!h]
  \centering
    \begin{tabular}
      {lc<{\onslide<2->}c<{\onslide<3->}c<{\onslide}}
                    & M1    & M2    & M3    \\ \hline
          $\beta$   & 1.11  & 2.22  & 3.33  \\
          $\sigma$  & 4.44  & 5.55  & 6.66  \\
          $\theta$  & 7.77  & 8.88  & 9.99
\end{tabular}
\end{table}
```

Dynamic displays of tables: columnwise

	M1	M2
β	1.11	2.22
σ	4.44	5.55
θ	7.77	8.88

Code

```
\begin{table}[!h]
  \centering
    \begin{tabular}
      {lc<{\onslide<2->}c<{\onslide<3->}c<{\onslide}}
                    & M1    & M2    & M3    \\ \hline
          $\beta$   & 1.11  & 2.22  & 3.33  \\
          $\sigma$  & 4.44  & 5.55  & 6.66  \\
          $\theta$  & 7.77  & 8.88  & 9.99
\end{tabular}
\end{table}
```

Dynamic displays of tables: columnwise

	M1	M2	M3
β	1.11	2.22	3.33
σ	4.44	5.55	6.66
θ	7.77	8.88	9.99

Code

```
\begin{table}[!h]
  \centering
    \begin{tabular}
      {lc<{\onslide<2->}c<{\onslide<3->}c<{\onslide}}
                    & M1    & M2    & M3    \\ \hline
          $\beta$   & 1.11  & 2.22  & 3.33  \\
          $\sigma$  & 4.44  & 5.55  & 6.66  \\
          $\theta$  & 7.77  & 8.88  & 9.99
\end{tabular}
\end{table}
```

Assign a Theme

Typesetting

```
\documentclass{beamer}
\usetheme{Warsaw}
      ......
\begin{document}
        \maketitle
        \begin{frame}
              ......
```

Other Themes

{Rochester}, {Berkeley}, {Berlin}, {Singapore}, ...

Assign a Theme

Typesetting

```
\documentclass{beamer}
\usetheme{Warsaw}
      ......
\begin{document}
        \maketitle
        \begin{frame}
              ......
```

Other Themes

{Rochester}, {Berkeley}, {Berlin}, {Singapore}, ...

Themes: Frankfurt

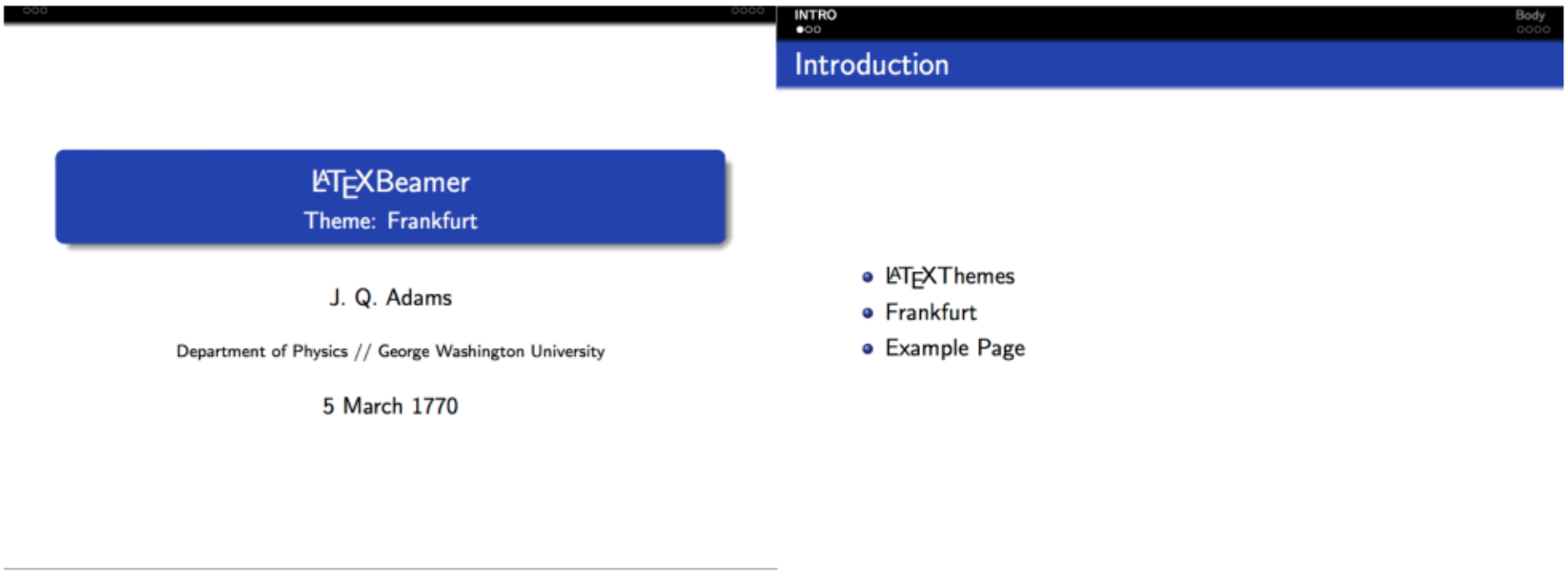

Figure: Frankfurt Theme

Themes: Boadilla

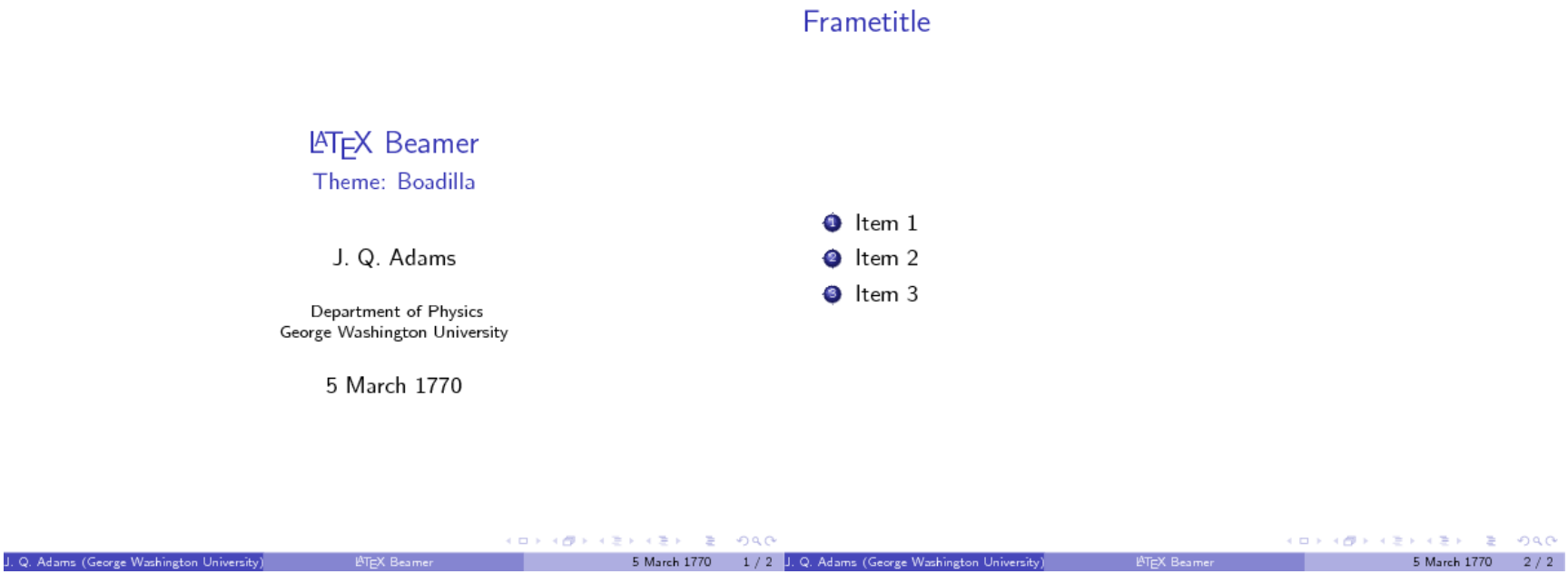

Figure: Boadilla Theme

Themes: Montpellier

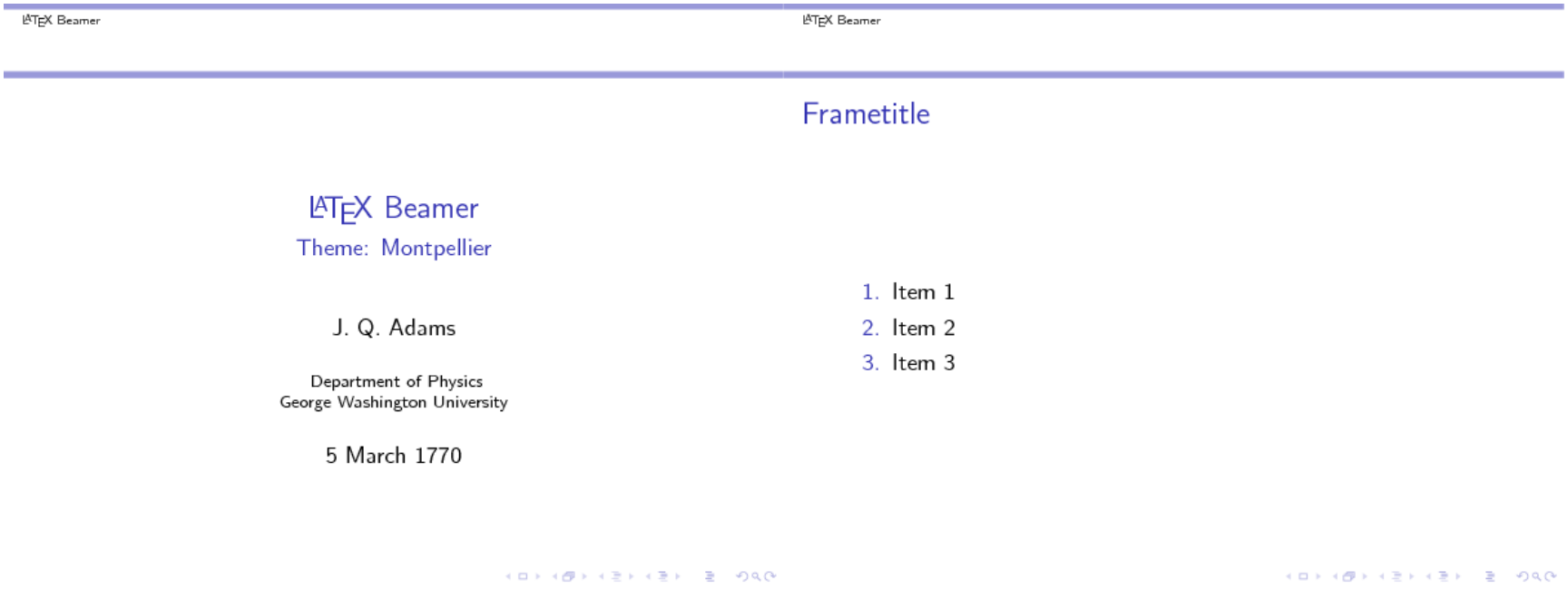

Figure: Montpellier Theme

Themes: Goettingen

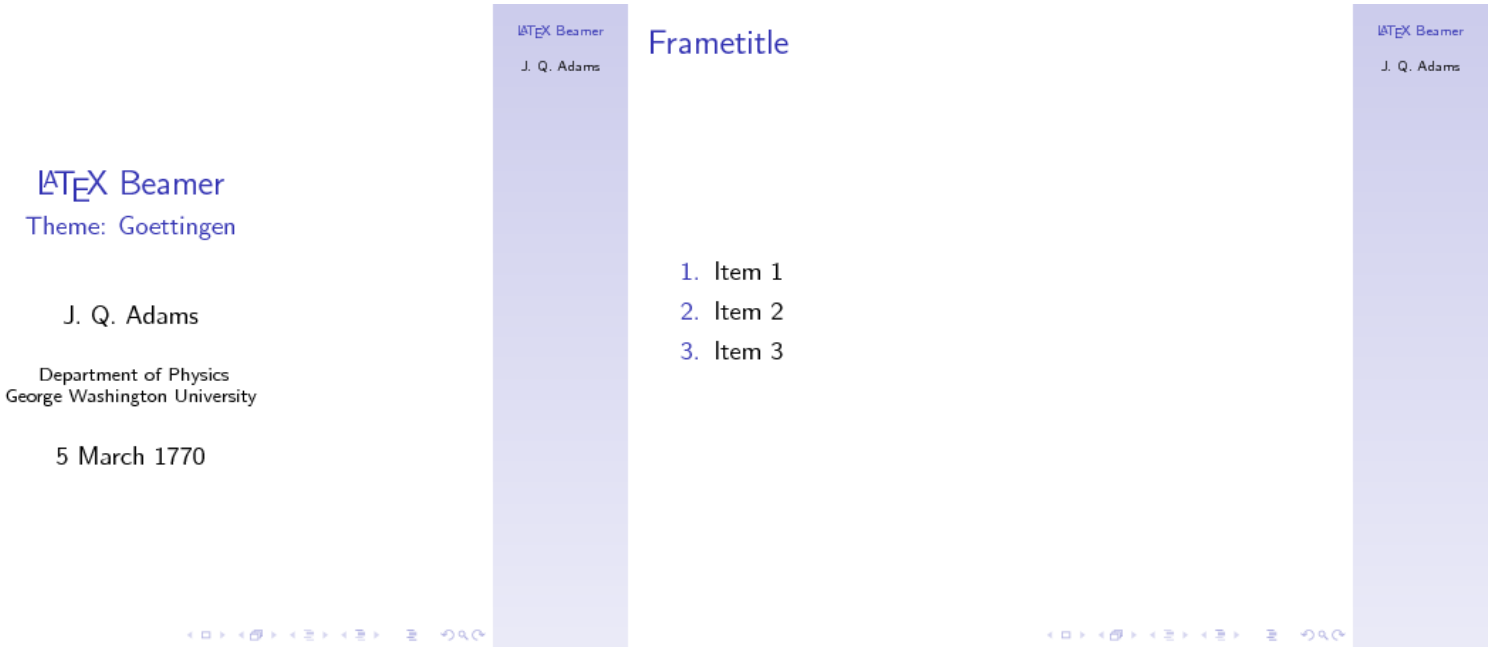

Figure: Goettingen Theme

Themes: PaloAlto

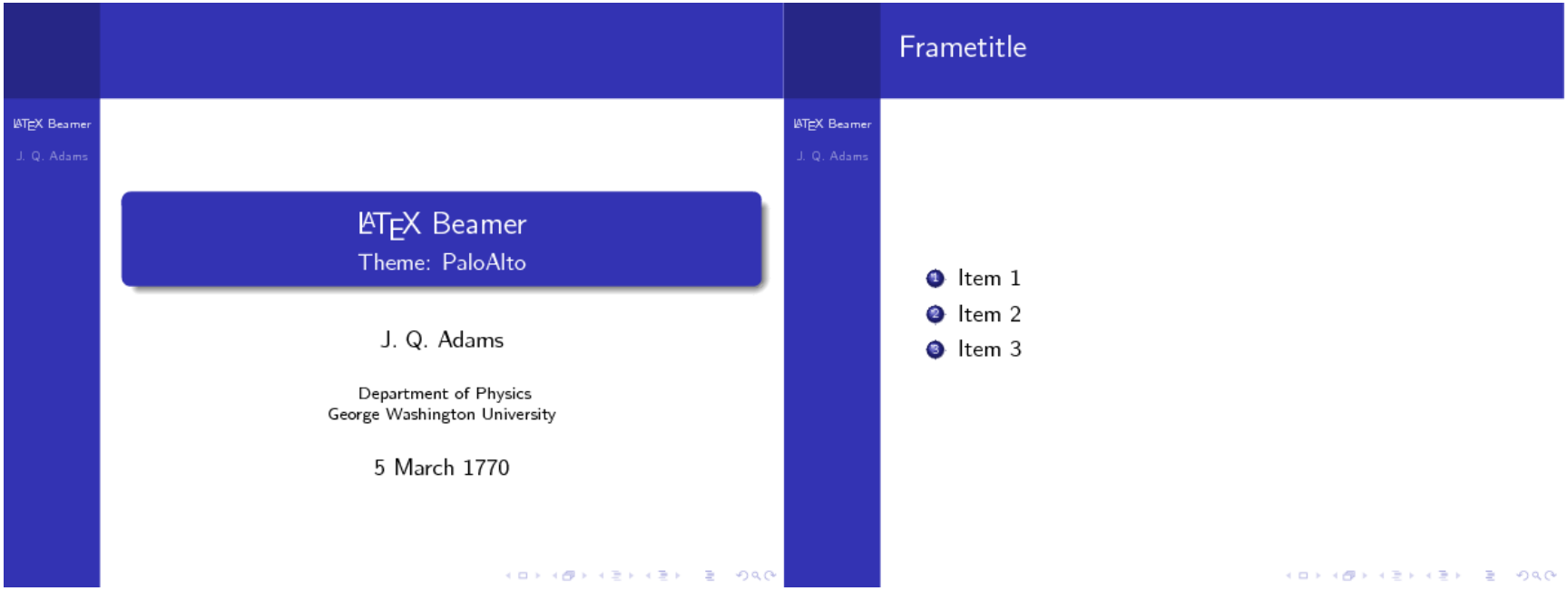

Figure: Palo Alto Theme

Changing templates and colors

\usetheme{Warsaw} or...

Antibes Bergen Berkeley Berlin Boadilla Copenhagen Darmstadt Dresden Frankfurt Goettingen Hannover Ilmenau Juanlespins Madrid Malmoe Marburg Montpellier PaloAlto Pittsburgh Rochester Singapore Szeged Warsaw boxes default

\usecolortheme{default} or...

albatross crane beetle dove fly seagull wolverine beaver

Theme tuning

Inner elements, like blocks:

\usecolortheme{lily} or...

lily orchid rose

\useinnertheme{rectangles} or...

rectangles circles inmargin rounded

Outter elements, like headline and footline:

\usecolortheme{whale} or...

whale seahorse dolphin

\useoutertheme{infoline} or...

infoline miniframes shadow sidebar smoothbars smoothtree split tree

A few common options

Font themes

```
\usepackage{helvet}  % Font families
\usefonttheme{serif}  % For the structural elements
```

Remove navigation bar

```
\setbeamertemplate{navigation symbols}{}
```

Slide numbers

```
\setbeamertemplate{footline}[slide number]  % Typically
\insertframenumber/\inserttotalframenumber  % To insert them in specific places
```

Style of each element (check the documentation for the full list)

```
\setbeamertemplate{itemize items}[triangle]
\setbeamertemplate{blocks}[shadow=false]
```

Color and font of each element (check the documentation for the full list)

```
\setbeamercolor{background canvas}{bg=white}
\setbeamerfont{title}{family=\rm}
```

Title

Result

Beamer by Examples

Juan Quintana
Uni. Konstanz

May 6, 2014

Typesetting

```
\title{Beamer by Examples}
\institute{Uni. Konstanz}
\author{Juan Quintana}
\date{\today} \begin{document}
    \maketitle
    \begin{frame}
        \frametitle{...}
            .....
    \end{frame}
    .....
\end{document}
```

Title

Result

Beamer by Examples

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Typesetting

```
\title{Beamer by Examples}
\institute{Uni. Konstanz}
\author{Juan Quintana}
\date{\today} \begin{document}
        \maketitle
        \begin{frame}
                \frametitle{...}
                        ......
        \end{frame}
        ......
\end{document}
```

Numbered List of Items or Steps

Result

Sampling Schemes

1. Systematic Sampling
2. Stratified Sampling
3. Cluster Sampling

Typesetting

```
Sampling Schemes
\begin{enumerate}
    \item Systematic Sampling
    \item Stratified Sampling
    \item Cluster Sampling
\end{enumerate}
```

Numbered List of Items or Steps

Result

Sampling Schemes

1. Systematic Sampling
2. Stratified Sampling
3. Cluster Sampling

Typesetting

```
Sampling Schemes
\begin{enumerate}
        \item Systematic Sampling
        \item Stratified Sampling
        \item Cluster Sampling
\end{enumerate}
```

Itemized List

Result

Sampling Schemes

- Systematic Sampling
- Stratified Sampling
- Cluster Sampling

Typesetting

```
Sampling Schemes
\begin{itemize}
    \item Systematic Sampling
    \item Stratified Sampling
    \item Cluster Sampling
\end{itemize}
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Itemized List

Result

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- Systematic Sampling
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Mathematical Expressions

Result

If the sample regression model is $y_i = \beta_0 + \beta_1 x_i + \epsilon_i, i = 1, 2, ..., n$, then the least squares criterion is

$$S(\beta_0, \beta_1) = \sum_{i=1}^{n} (y_i - \beta_0 - \beta_1 x_i)^2.$$

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$$\int \sqrt{a^2-u^2}du=\frac{1}{2}\left(a^2\arcsin\frac{u}{a}+u\sqrt{a^2-u^2}\right)+C$$

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$$\begin{aligned} \int 2x \cos x dx &= 2x \sin x - \int 2 \sin x dx \quad (1) \\ &= 2x \sin x + 2 \cos x + C. \quad (2) \end{aligned}$$

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Result

$$\begin{aligned} & 1^2+2^2+3^2+\ldots+n^2 \\ = \quad & \frac{n(n+1)(2n+1)}{6}. \end{aligned}$$

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Mathematical Expressions

Theorem

There is no greatest prime number.

Proof.

Trivial. □

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Table

Result

p	q	and
T	T	T
T	F	F

Typesetting

```
\begin{center}
    \begin{tabular}{|cc|c|} \hline
        $p$ & $q$ & and\\
        \hline \hline
        T & T & T\\
        T & F & F\\
        \hline
    \end{tabular}
\end{center}
```

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        \hline
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\end{center}
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Figure

Figure: Are you fit?

Typesetting

```
\begin{center}
\begin{figure}
\includegraphics[height=0.8in]{simulator.png}
\caption{Are you fit?}
\end{figure}
\end{center}
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Figure

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Question and Discussion

Questions?