Presentations in LaTeX

Introduction to the beamer class

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June 6, 2017

Introduction

Not the only class for presentations but the current standard in LaTeX

Pros and cons of `beamer`: those of LaTeX.

- Easy to create nice-looking documents (adapted to technical presentations)
- Difficult to customize

`beamer` is a class and everything works the same way as in any other LaTeX document. This presentation will focus only on the distinctive features.

Basic structure of a document

1. The easiest way to start is to use the default template (we will see how to change it later).
2. Note that you may have to run the code twice.

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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.

Example of a document

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

\begin{document}

\end{document}
```

Basic structure of a document

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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}

% One slide
\end{frame}

\end{document}
```

Basic structure of a document

1. The easiest way to start is to use the default template (we will see how to change it later).
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{Farrah Sadre-Marandi}
\date{June 6, 2017}

\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{Farrah Sadre-Marandi}
\date{June 6, 2017}

\begin{document}

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

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

\end{document}
```

Sections of the document

Same for a table of contents. 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

Same for a table of contents. 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}
```

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}
```

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Code

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





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

Environments: Columns

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- *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}



      \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}
```

Environment: Theorem/Proof

The environments for mathematical statements are blocks:

Theorem (APS, 1989)

$\mathcal{E}^p \subset \mathbb{R}^n$ is compact.

Code

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

\begin{theorem}[APS, 1989]
  \mathcal{E}^p\subset \R^n  is compact.
\end{theorem}

\end{frame}
```

Environment: Theorem/Proof

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$\mathcal{E}^p \subset \mathbb{R}^n$ is compact.

Code

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

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\end{frame}
```

Environment: Theorem/Proof

The environments for mathematical statements are blocks:

Theorem (APS, 1989)

$\mathcal{E}^p \subset \mathbb{R}^n$ is compact.

Proof.

$\mathcal{E}^p \subset co(\pi(s)) \Rightarrow \mathcal{E}^p$ is bounded $\Rightarrow \mathcal{E}^p \subset cl(\mathcal{E}^p)$. Then $\mathcal{E}^p = B(\mathcal{E}^p) \subset B(cl(\mathcal{E}^p)) \Rightarrow cl(\mathcal{E}^p) \subset B(\mathcal{E}^p) \subset \mathcal{E}^p \Rightarrow \mathcal{E}^p$ is closed. □

Code

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

\begin{theorem}[APS, 1989]
  \mathcal{E}^p\subset \R^n  is compact.
\end{theorem}

\begin{proof}
  $\mathcal{E}^p \subset co(\pi(s))
\Rightarrow \mathcal{E}^p$ is
bounded $\Rightarrow \mathcal{E}^p
\subset cl(\mathcal{E}^p)$. Then
$\mathcal{E}^p = B(\mathcal{E}^p)
\subset B(cl(\mathcal{E}^p))
\Rightarrow cl(\mathcal{E}^p) \subset
B(\mathcal{E}^p) \subset \mathcal{E}^p
\Rightarrow \mathcal{E}^p$ is closed.
\end{proof}

\end{frame}
```

Navigating with hyperlinks

You can create links between pages: a button that can take you to a prespecified point in the presentation.

The text you want

Code

```
\begin{frame}
  \frametitle{The origin frame}
  \hyperlink{jumptable}{
  \beamergotobutton{The text you want}}
\end{frame}

\begin{frame}
  \frametitle{The target frame}
  \hypertarget{jumptable}{}
\end{frame}
```

Navigating with hyperlinks

You can create links between pages: a button that can take you to a prespecified point in the presentation.

▸ The text you want

Code

```
\begin{frame}
  \frametitle{The origin frame}
  \hyperlink{jumptable}{
  \beamergotobutton{The text you want}}
\end{frame}

\begin{frame}
  \frametitle{The target frame}
  \hypertarget{jumptable}{}
\end{frame}
```

Navigating with hyperlinks

You can create links between pages: a button that can take you to a prespecified point in the presentation.

The text you want

Other styles:

- `beamerbutton`: here
- `beamerskipbutton`: here
- `beamerreturnbutton`: here

Code

```
\begin{frame}
  \frametitle{The origin frame}
  \hyperlink{jumptable}{
  \beamergotobutton{The text you want}}
\end{frame}

\begin{frame}
  \frametitle{The target frame}
  \hypertarget{jumptable}{}
\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...}
\end{itemize}
```

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}
  \item<3-> \textsl<3>{This item third}
  \item<2-> \textbf<2>{This item second}
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\end{itemize}
```

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- This item first
- This item third
- This item second
- Finally...

Code

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

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

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]
μ_2	2.676	0.409	[1.863,	3.498]

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]
ρ	0.313	0.264	[-0.295,	0.749]

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]
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  \\
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\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}
```

Size of the slide

Remember that the size of a `beamer` slide is 128mm $\times$ 96mm ($\sim$ 5.03in $\times$ 3.77in). These dimensions are fixed and *should not be changed*.

To squeeze extra material into a Beamer slide, you may specify a shrink factor:

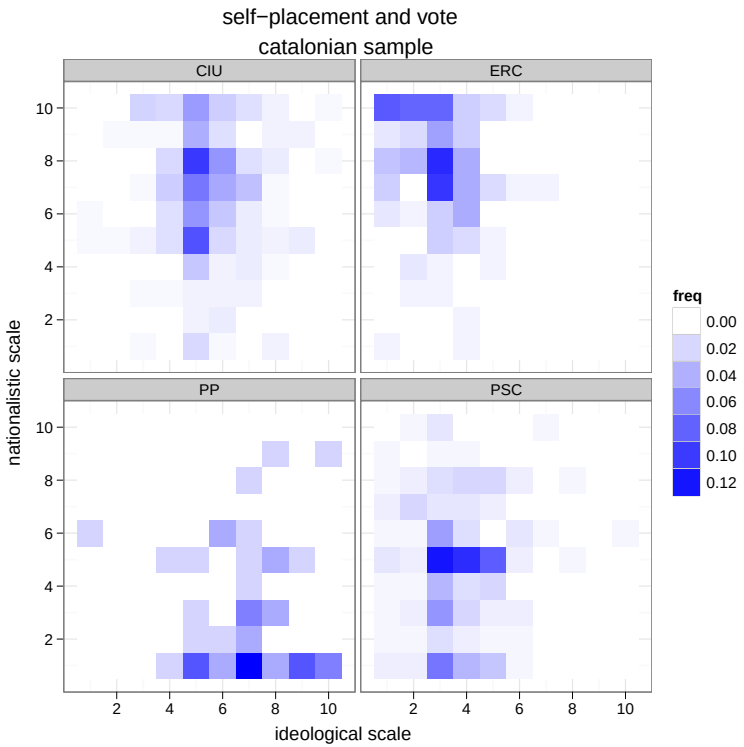
Code

```
\begin{frame}[shrink = 5]
  % Text of the slide
\end{frame}
```

but it is usually better to rewrite the slide.

Figures

beamer supports .png, .jpeg, .jpg, and .pdf files using the package graphicx that is launched by default with beamer. For .pdf files (strongly recommended) use the option pdftex.



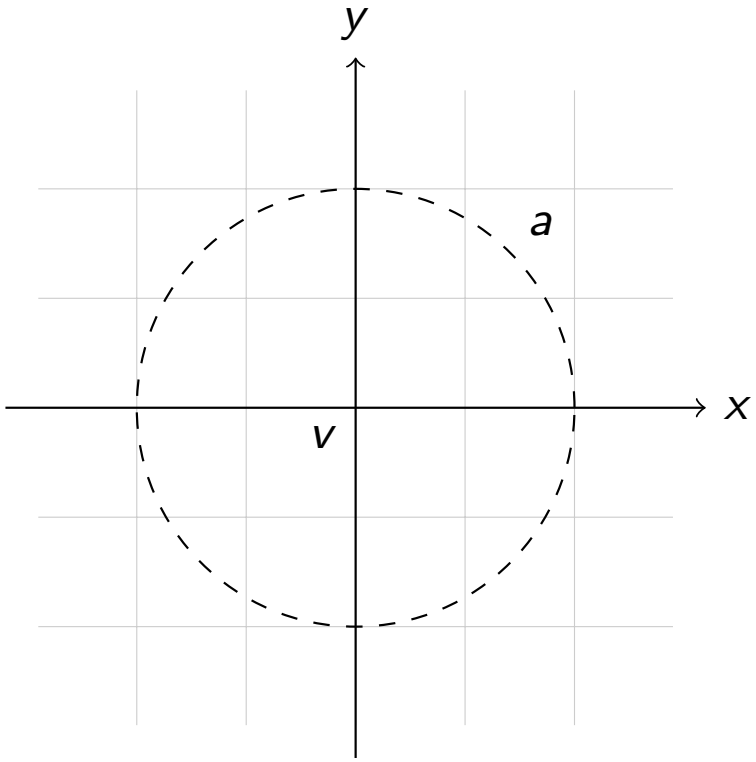
Code

```
\usepackage[pdftex]{graphicx}

% ... Document ...

\begin{frame}
  \frametitle{Figures}

  \begin{figure}[!t]
    \includegraphics[height = 5cm]{p.pdf}
  \end{figure}

\end{frame}
```

Remember the size of the slide: this figure is just 5cm×5cm

Diagrams

It is "easy" to draw diagrams using PGF/TikZ (similar to PSTricks).

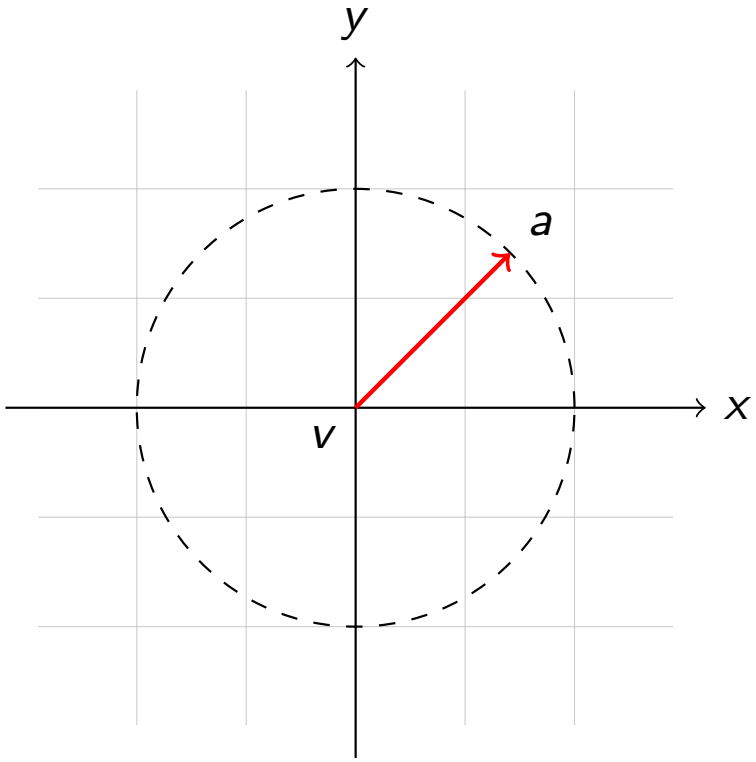


Code

```
\usepackage{tikz}

% ... Document ...

\begin{figure}
\begin{tikzpicture}[domain=-4:4,scale=.6]
\draw[very thin,color=black!20]
    (-2.9,-2.9) grid (2.9,2.9);
\draw[->] (-3.2,0) -- (3.2,0) node[right]
    {$x$};
\draw[->] (0,-3.2) -- (0,3.2) node[above]
    {$y$};

\draw (0,0) node[below left] {$v$};
\draw (1.41,1.41) node[above right]{$a$};

\draw[dashed] (0,0) circle (2cm);
\uncover<2->{\draw [red, ->, thick]
    (0,0) -- (1.41,1.41);}
\end{tikzpicture}
\end{figure}
```

Diagrams

It is "easy" to draw diagrams using PGF/TikZ (similar to PSTricks).
You can use overlays.



Code

```
\usepackage{tikz}

% ... Document ...

\begin{figure}
\begin{tikzpicture}[domain=-4:4,scale=.6]
\draw[very thin,color=black!20]
    (-2.9,-2.9) grid (2.9,2.9);
\draw[->] (-3.2,0) -- (3.2,0) node[right]
    {$x$};
\draw[->] (0,-3.2) -- (0,3.2) node[above]
    {$y$};

\draw (0,0) node[below left] {$v$};
\draw (1.41,1.41) node[above right]{$a$};

\draw[dashed] (0,0) circle (2cm);
\uncover<2->{\draw [red, ->, thick]
    (0,0) -- (1.41,1.41);}
\end{tikzpicture}
\end{figure}
```

Themes: Frankfurt

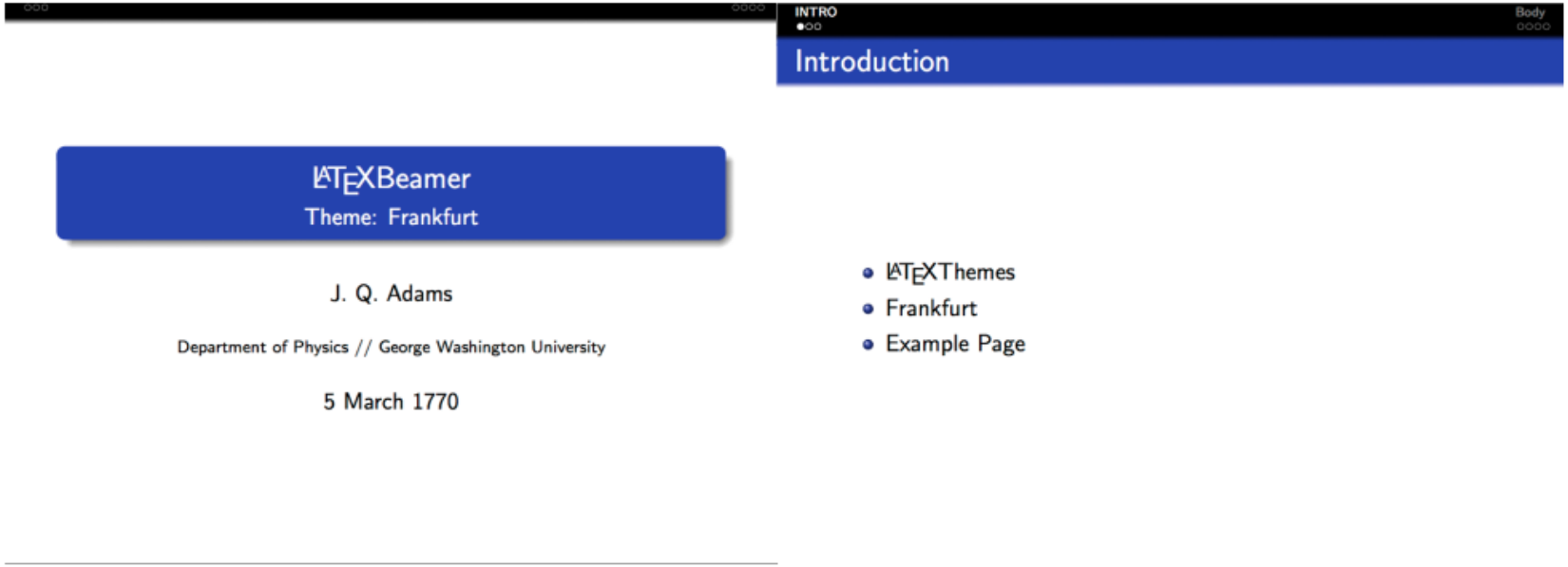


Figure: Frankfurt Theme

Themes: Boadilla

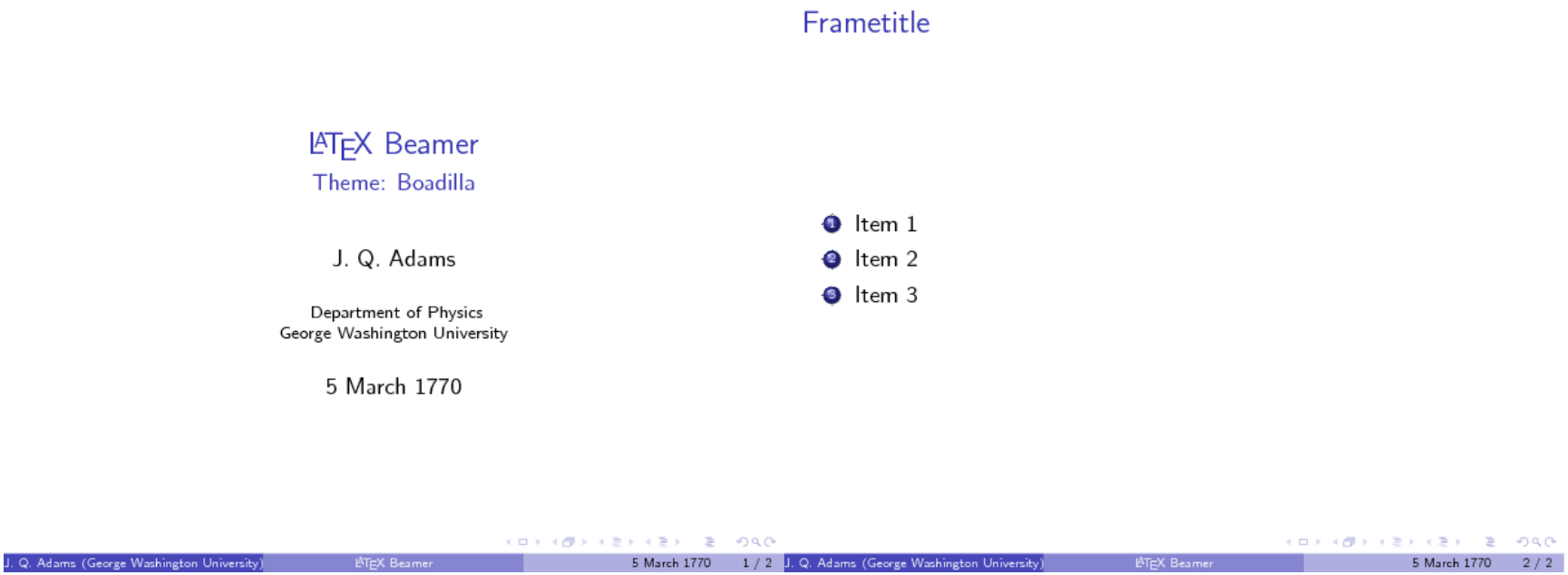


Figure: Boadilla Theme

Themes: Montpellier

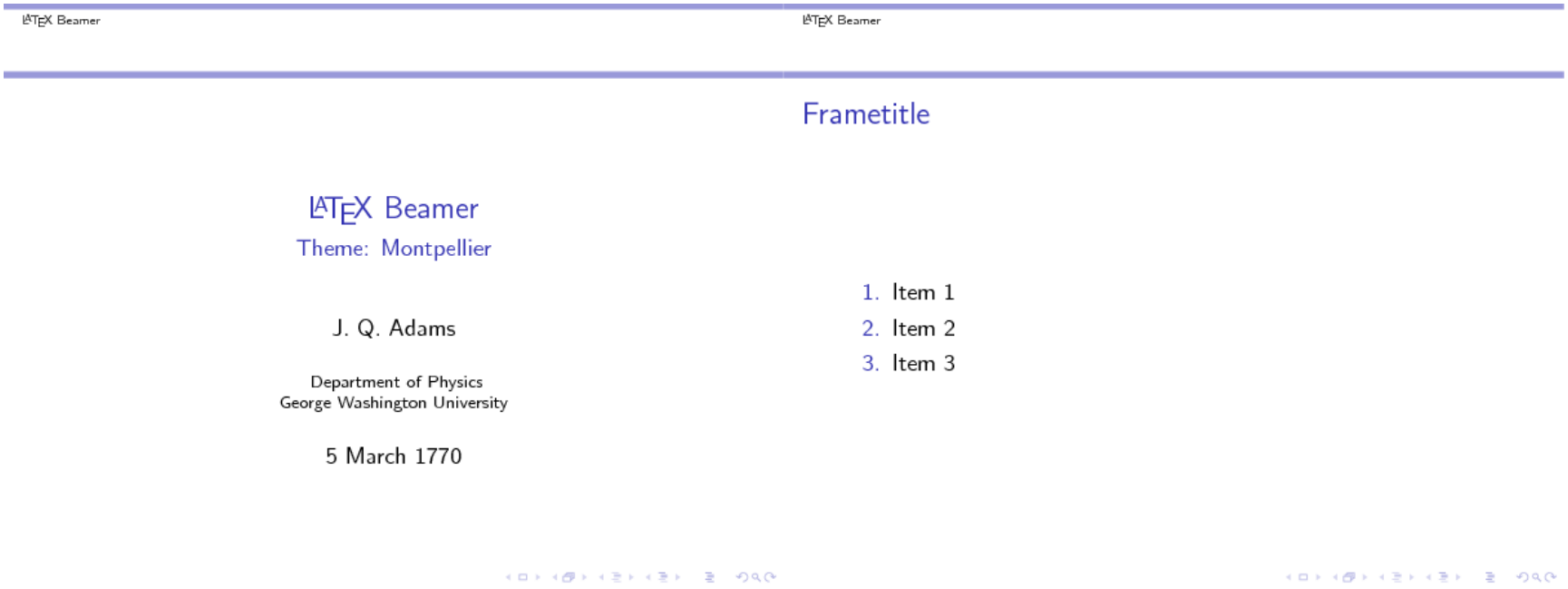


Figure: Montpellier Theme

Themes: Goettingen

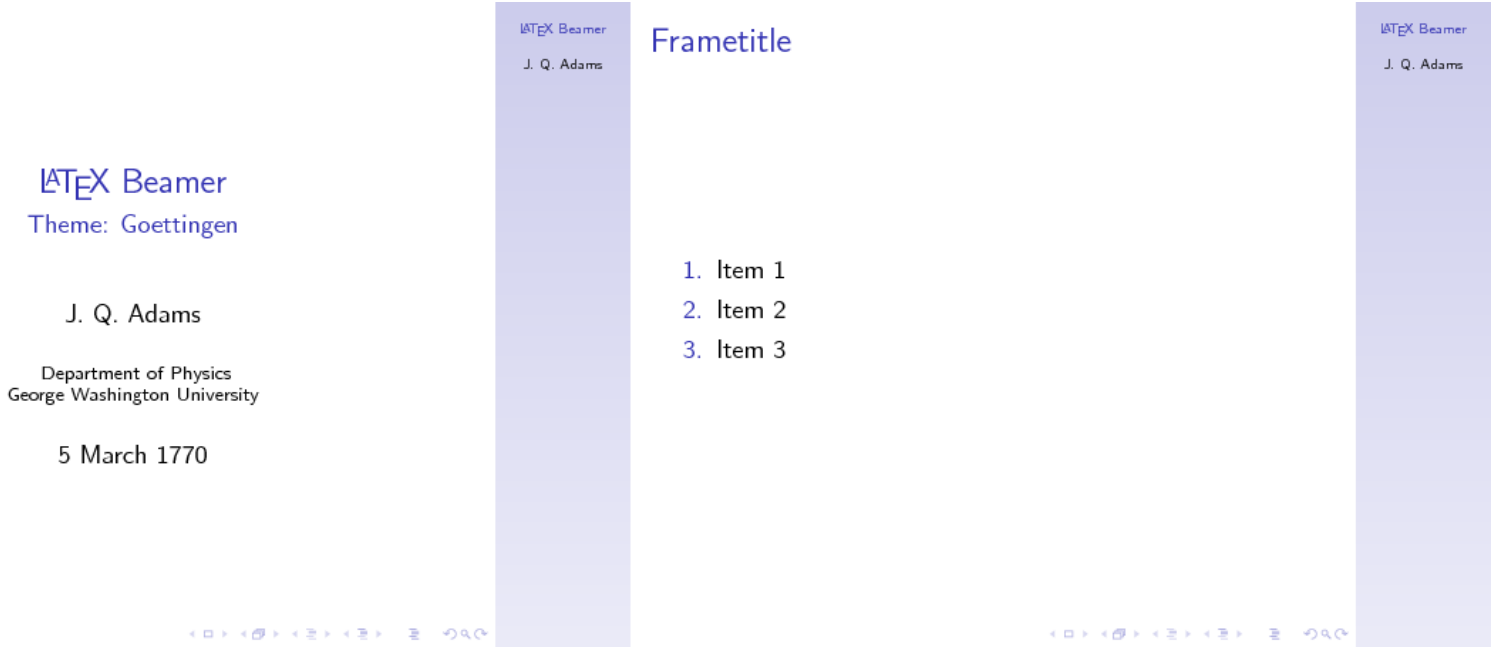


Figure: Goettingen Theme

Themes: PaloAlto

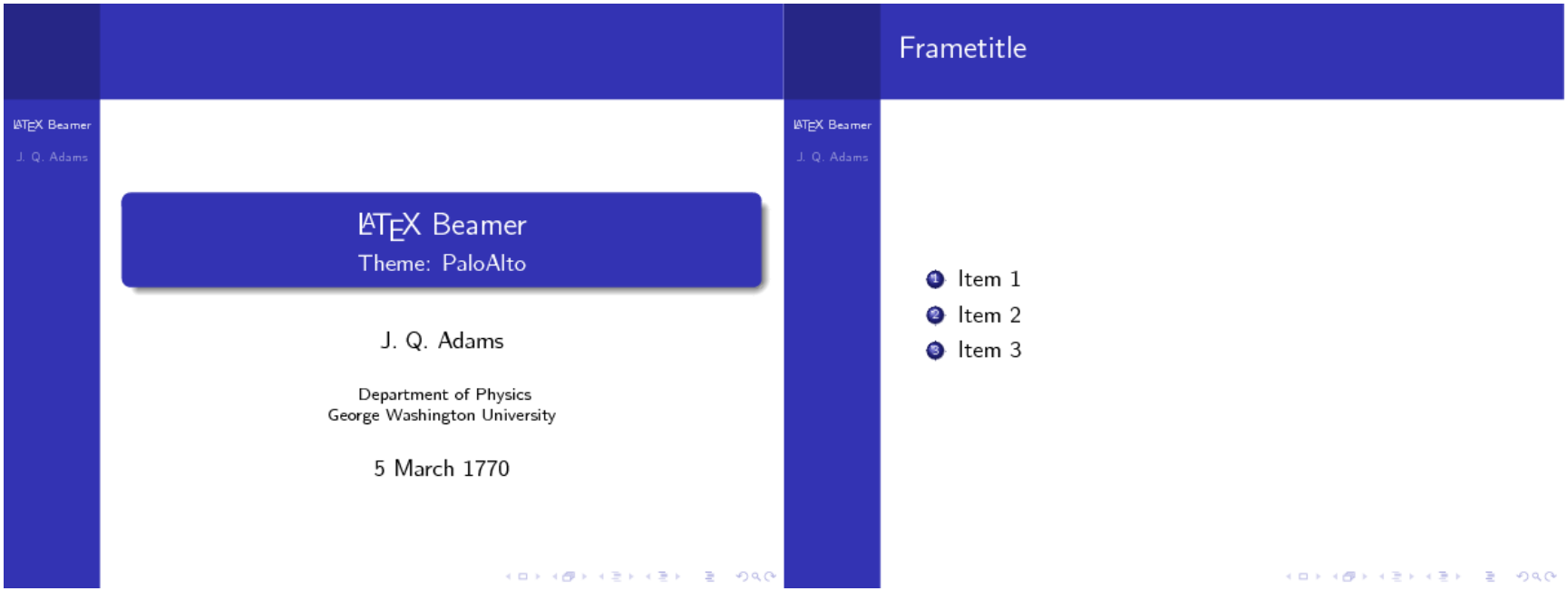


Figure: Palo Alto Theme