An Introduction to LaTeX

Make Documents Like A PROgrammer

Wesley T. Honeycutt

University of Oklahoma

October 9, 2018

History

In 1978, Donald Knuth created the TEX programming language in a fit of frustration with how ugly photoprinting looked.

In 1983, Leslie Lamport released LATEX (Layman's TEX), a set of macros which made TEX usable by mortals.

There are many other variants such as :

BIBTEX ConTEXt LuaTEX LYX pdfLATEX XƎLATEX

LaTeX is. . .

. . . a sophisticated document preparation sytem.

LaTeX has. . .

- Stylistic uniformity
- Bibliography support
- Sophisticated structuring abilities
- Reference tracking
- Highly extendible capabilities

LaTeX is not...

...a word processor.

LaTeX does not...

- Spell-check your documents
- Give you complete control over formatting
- Provide a graphical interface for editing

"You take care of writing, and we'll take care of presentation."

You might be used to WYSIWYG

What
Y ou
S ee
I s
What
Y ou
G et

LaTeXis WYSIWYM

What
Y ou
S ee
I s
What
Y ou
Mean

Presentation matching what you wrote, not how it was written

This text is spaced specially.

```
1 This    text is
2 spaced     specially.
```

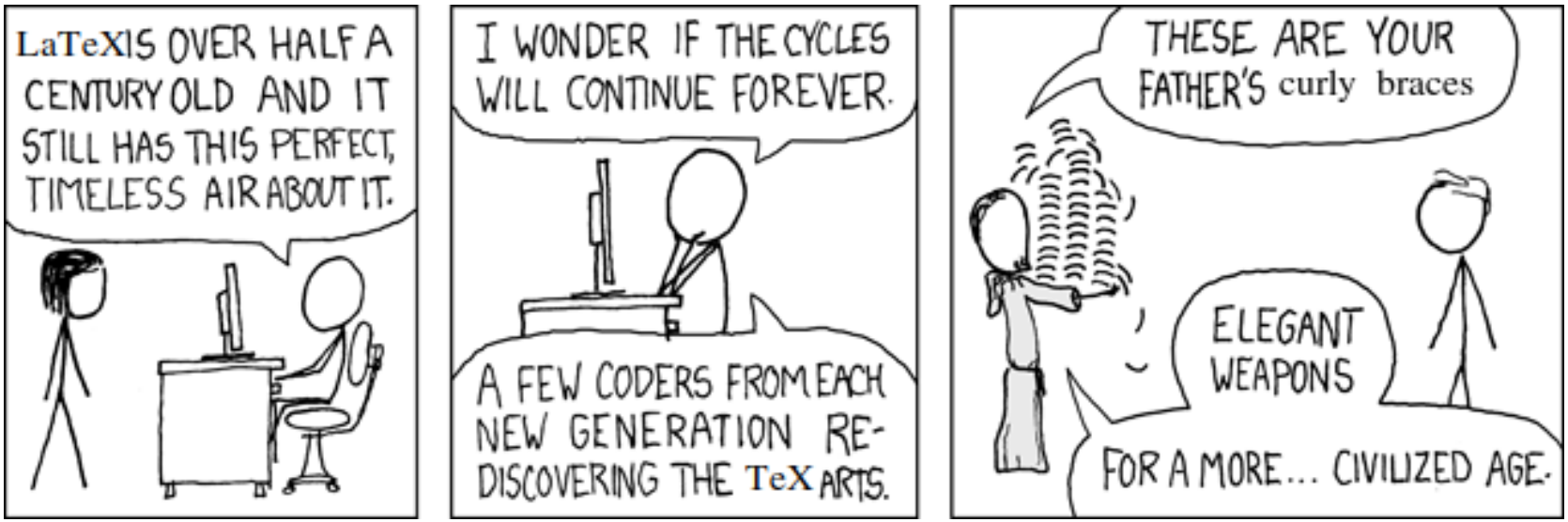
Paragraphs are easy.
Use double line breaks.

```
1 Paragraphs are easy.
2
3 Use double line breaks.
```

Never break the unbreakable unless you want to.
You can force connections of words in a line or force spaces and
linebreaks.

```
1 Never break the unbreakable
      unless you want to.
2
3 You~can~force~connections~of~
      words~in~a~line~or\ force
      \ spaces and\\linebreaks.
```

Learn to love braces



[0]With apologies to Randall Munroe

Commands and Environments

Uncentered

```
1 Uncentered
```

Centered Environment

```
1 \begin{center}
2   Centered Environment
3 \end{center}
```

Command Centered

```
1 \centering
2 Command Centered
```

The Logical Structure of a LaTeX Document

Preamble

- Declare the document type you will be making:
  \documentclass[options]{class}

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- Declare what packages you will need:
  \usepackage[options]{package}

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- Define any custom functions or environments

The Logical Structure of a LaTeX Document

Preamble

- Declare the document type you will be making: \documentclass[options]{class}
- Declare what packages you will need: \usepackage[options]{package}
- Define any custom functions or environments
- Declare important variables

The Logical Structure of a LaTeX Document cont'd

Body

- Initialize the document in an environment

```
\begin{document}
    ...
\end{document}
```

The Logical Structure of a LaTeX Document cont'd

Body

- Initialize the document in an environment
  \begin{document}
  ...
  \end{document}
- Within this environment you will:

The Logical Structure of a LaTeX Document cont'd

Body

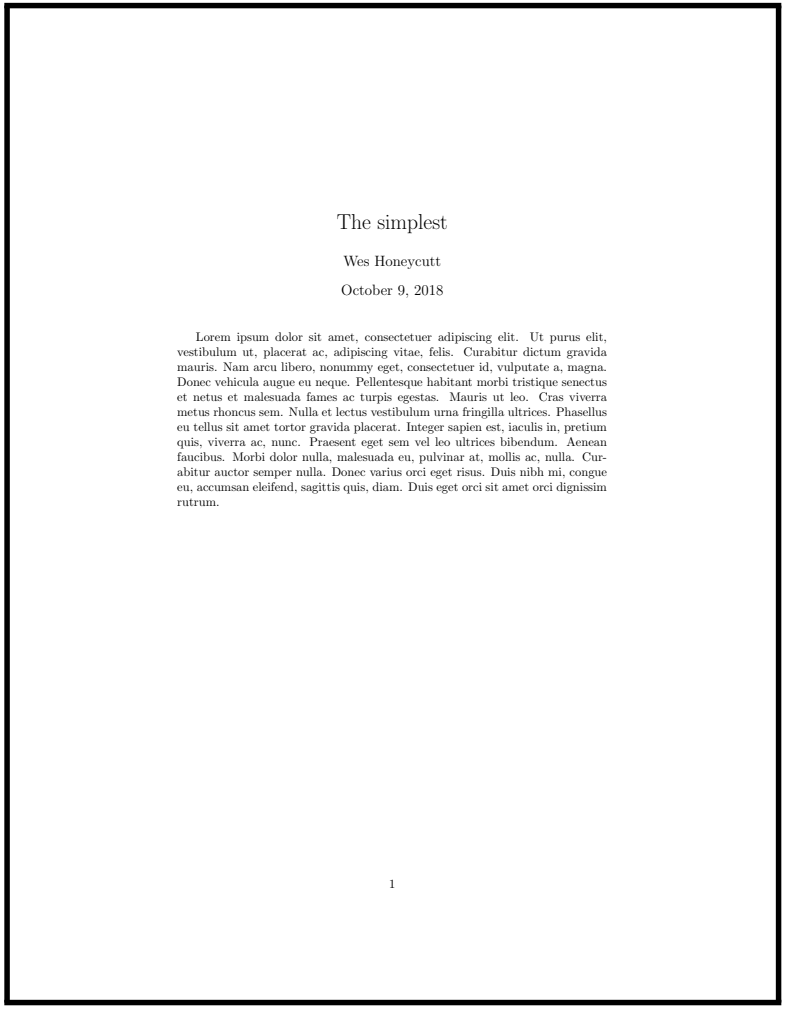
- Initialize the document in an environment
  \begin{document}
  ...
  \end{document}
- Within this environment you will:
  - Create the title page or section:
    \maketitle

The Logical Structure of a LaTeX Document cont'd

Body

- Initialize the document in an environment
  \begin{document}
  ...
  \end{document}
- Within this environment you will:
  - Create the title page or section:
    \maketitle
  - Write your document

The simplest document



The simplest

Wes Honeycutt

October 9, 2018

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

1

```
\documentclass{article}
\usepackage{lipsum}
\title{The simplest}
\author{Wes Honeycutt}
\begin{document}
  \maketitle
  \lipsum[1]
\end{document}
```

Making the \maketitle

The title can include several elements, which are declared by the user.

Making the \maketitle

The title can include several elements, which are declared by the user.

- \title{The Title}

Making the \maketitle

The title can include several elements, which are declared by the user.

- \title{The Title}
- \author{The Author's Name}

Making the \maketitle

The title can include several elements, which are declared by the user.

- \title{The Title}
- \author{The Author's Name}
  - This can include \thanks{Some Institution}

Making the \maketitle

The title can include several elements, which are declared by the user.

- \title{The Title}
- \author{The Author's Name}
  - This can include \thanks{Some Institution}
- \subtitle{A Clever Subtitle}

Making the \maketitle

The title can include several elements, which are declared by the user.

- \title{The Title}
- \author{The Author's Name}
  - This can include \thanks{Some Institution}
- \subtitle{A Clever Subtitle}
- \subject{A Subject Heading}

Our Sample Title Page

```
\title{The Pitfalls of LaTeX}

\author{
  Wesley T. Honeycutt
  \thanks{University of Oklahoma Department of Biology}
  \and Leon the Cat}

\subtitle{Stackexchange was down and other horror stories}

\subject{A Joke Paper}
```

\documentclass{article}

The Pitfalls of LaTeX

Wesley T. Honeycutt [*] Leon the Cat

October 9, 2018

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

[*]University of Oklahoma Department of Biology

\documentclass{scrbook}

A Joke Paper

The Pitfalls of LaTeX

Stack Exchange was down and other horror stories

Wesley T. Honeycutt * Leon the Cat

October 9, 2018

*University of Oklahoma Department of Biology

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

\documentclass{report}

The Pitfalls of LaTeX

Wesley T. Honeycutt [1] Leon the Cat

October 9, 2018

[1]University of Oklahoma Department of Biology

\documentclass{elsarticle}

The Pitfalls of LaTeX

Wesley T. Honeycutt [1]

Leon the Cat Lorem ipsum dolor

sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Publisher Distributed Classes

The previous example shows how different classes rearrange the same elements.

Publisher Distributed Classes

The previous example shows how different classes rearrange the same elements.

Academic Publishers

Elsevier - *elsarticle*
Springer - *llncs*
IEEE - *IEEEtran*
AMS - *amscls*

Some More Academic Publishers With Classes

- aaai www.aaai.org
- AAAS/science www.sciencemag.org
- American Chemical Society Publications
- Addison-Wesley
- algebra universalis
- American Institute of Physics www.aip.org
- American Meteorological Society www.ametsoc.org
- American Physical Society authors.aps.org
- Beech Stave Press
- Birkhuser
- Cambridge University Press
- CRC
- Documenta Mathematica www.math.uiuc.edu
- Docscape
- Engine House Books

Some More Academic Publishers With Classes

- Fondo de Cultura Econmica
- Informs joc.pubs.informs.org
- Institut Mittag-Leffler (Royal Swedish Academy of Sciences)
- www.arkivformatematik.org
- IOP (institute of physics) authors.iop.org
- John Benjamins Publishing Company
- London Mathematical Society books www.lms.ac.uk
- Louisiana State University Press
- Mathematical Association of America www.maa.org
- National Research Council of Canada
- Oxford University Press www.oup.co.uk
- Princeton University Press press.princeton.edu
- Publications de l'Institut Mathmatique (Beograd) www.emis.de

Some More Academic Publishers With Classes

- SAS Institute
- SIAM books www.siam.org
- Springer math www.springer.com
- Springer physics www.springer.com
- Thomson Delmar Learning
- UIT Cambridge
- Unipress (Institute of High Pressure Physics, Polish Academy of Sciences)
- www.unipress.waw.pl
- University of California Press
- Wiley www.wiley.com
- William Andrew Publishing
- World Scientific
- WordTech

Section Hierarchy

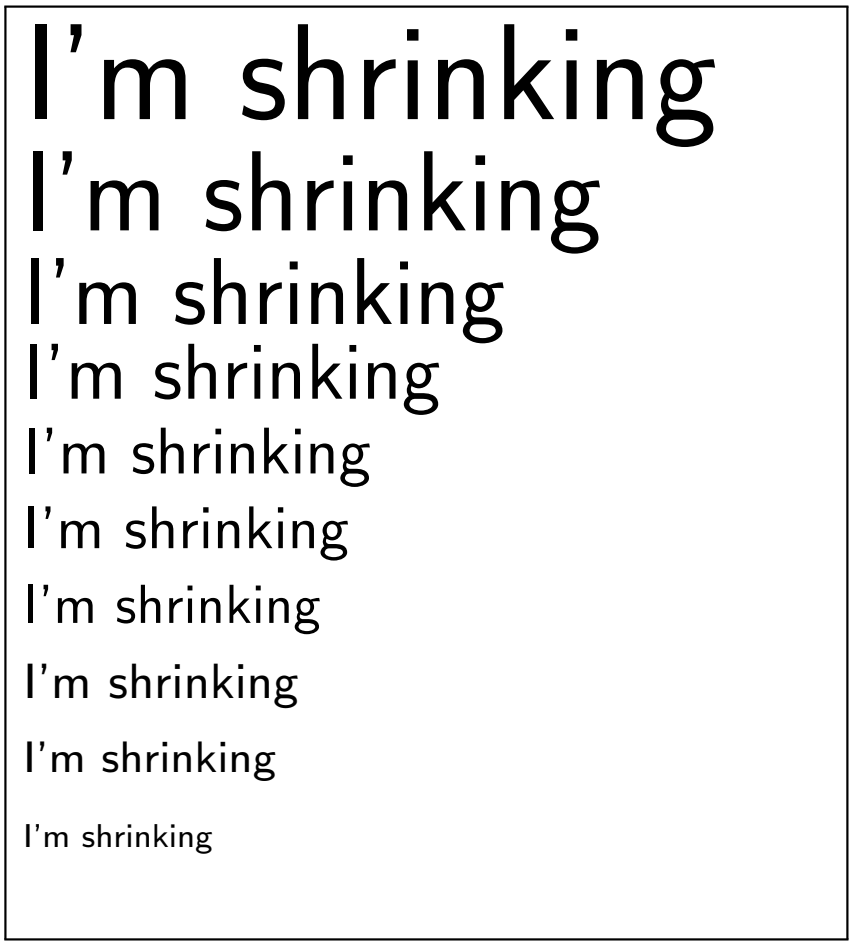
```
\section{The Topmost}
    \subsection{A Little Deeper}
        \subsubsection{Deeper Still}
                                                    ...
```

Text Formats

Be **Bold**!
Italicize!
Underline to accentuate!
Write with *emphasis*!

```
1  Be \textbf{Bold}!\\
2  \textit{Italicize}!\\
3  \underline{Underline} to
       accentuate!\\
4  Write with \emph{emphasis}!\\
```

Font Size




```
1  {\Huge I'm shrinking}\\
2  {\huge I'm shrinking}\\
3  {\LARGE I'm shrinking}\\
4  {\Large I'm shrinking}\\
5  {\large I'm shrinking}\\
6  {\normalsize I'm shrinking}\\
7  {\small I'm shrinking}\\
8  {\footnotesize I'm shrinking
       }\\
9  {\scriptsize I'm shrinking}\\
10 {\tiny I'm shrinking}\\
```

Lists

- Boomer
- Sooner
- Oklahoma

```
\begin{itemize}
  \item Boomer
  \item Sooner
  \item Oklahoma
\end{itemize}
```

1. Boomer
2. Sooner
3. Oklahoma

```
\begin{enumerate}
  \item Boomer
  \item Sooner
  \item Oklahoma
\end{enumerate}
```

Nested Lists

- Boomer
  - Sooner
- Oklahoma

```
\begin{itemize}
  \item Boomer
  \begin{itemize}
    \item Sooner
  \end{itemize}
  \item Oklahoma
\end{itemize}
```

1. Boomer
   1.1 Sooner
2. Oklahoma

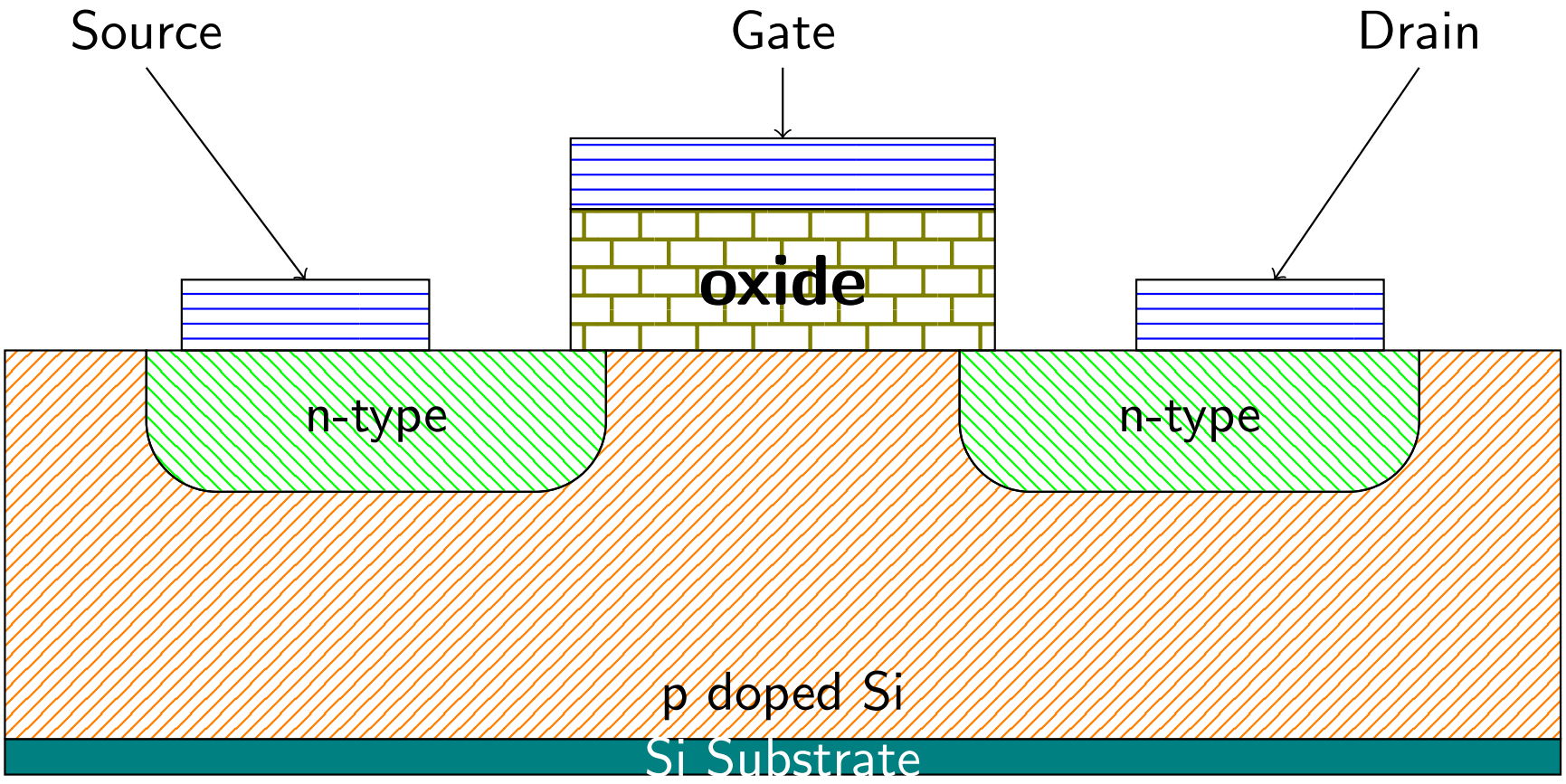
```
\begin{enumerate}
  \item Boomer
  \begin{enumerate}
    \item Sooner
  \end{enumerate}
  \item Oklahoma
\end{enumerate}
```

Graphics Generation with TikZ

High quality vector images can be produced from within LaTeX using a package called TikZ.
Additionally, Inkscape can export TikZ directly.

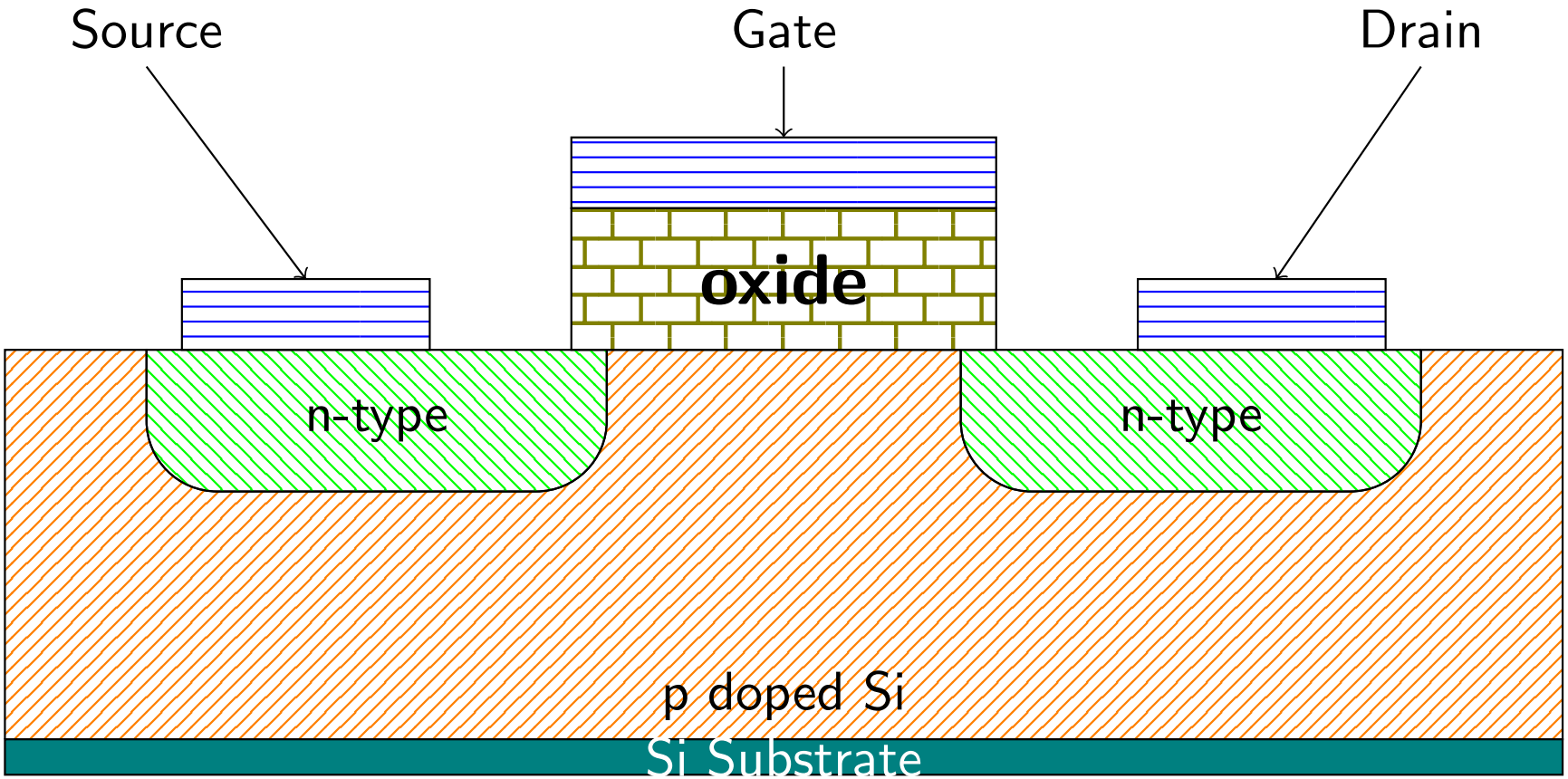
```
\begin{tikzpicture}
\draw \pdiff (0,.25) -- (0,3) -- (1,3) -- (1,2.5) to [out
    =270,in=180] (1.5,2) -- (3.75,2) to [out=0,in=270]
    (4.25,2.5) -- (4.25,3) -- (6.75,3) -- (6.75,2.5) to [
    out=270,in=180] (7.25,2) -- (9.5,2) to [out=0,in=270]
    (10,2.5) -- (10,3) -- (11,3) -- (11,.25) -- (0,.25)
    node [midway,above] {p doped Si};
\draw \metalthree (0,0) rectangle (11,.25) node [midway,
    color=white]
{Si Substrate};
\draw \oxide (4,3) rectangle (7,4) node [pos=.5,font=\bf\
    Large] {oxide};
\draw \metalone (4,4) rectangle (7,4.5);
\draw \ndiff (4.25,3) -- (1,3) -- (1,2.5) to [out=270,in
    =180] (1.5,2) -- (3.75,2) to [out=0,in=270] (4.25,2.5)
     -- (4.25,3) node at (2.625,2.5) [align=center] {n-
    type};
\draw \ndiff (10,3) -- (6.75,3) -- (6.75,2.5) to [out=270,
    in=180] (7.25,2) -- (9.5,2) to [out=0,in=270] (10,2.5)
     -- (10,3) node at (8.375,2.5) [align=center] {n-type
    };
\draw \metalone (1.25,3) rectangle (3,3.5);
\draw \metalone (8,3) rectangle (9.75,3.5);
\draw [->] (1,5) node [above] {Source} -- (2.125,3.5);
\draw [->] (10,5) node [above] {Drain} -- (8.975,3.5);
\draw [->] (5.5,5) node [above] {Gate} -- (5.5,4.5);
\node at (5.5,-.5) [align=center] {$V_{GS} < V_{threshold}
    $};
```

MOSFET



$$V_{GS} < V_{threshold}$$

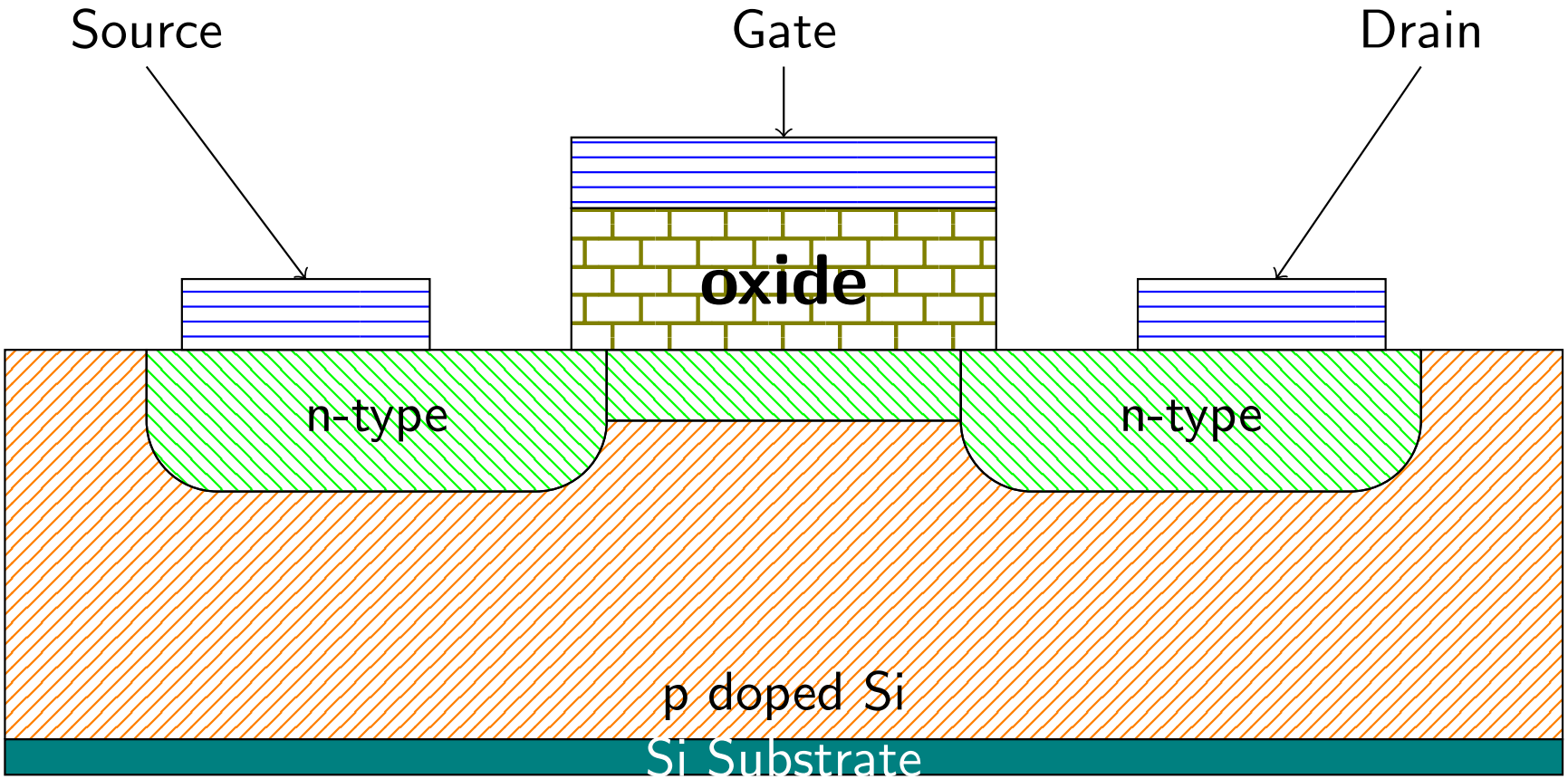
MOSFET



$$V_{GS} \geq V_{threshold}$$

$$V_{DS} < V_{GS} - V_{threshold}$$

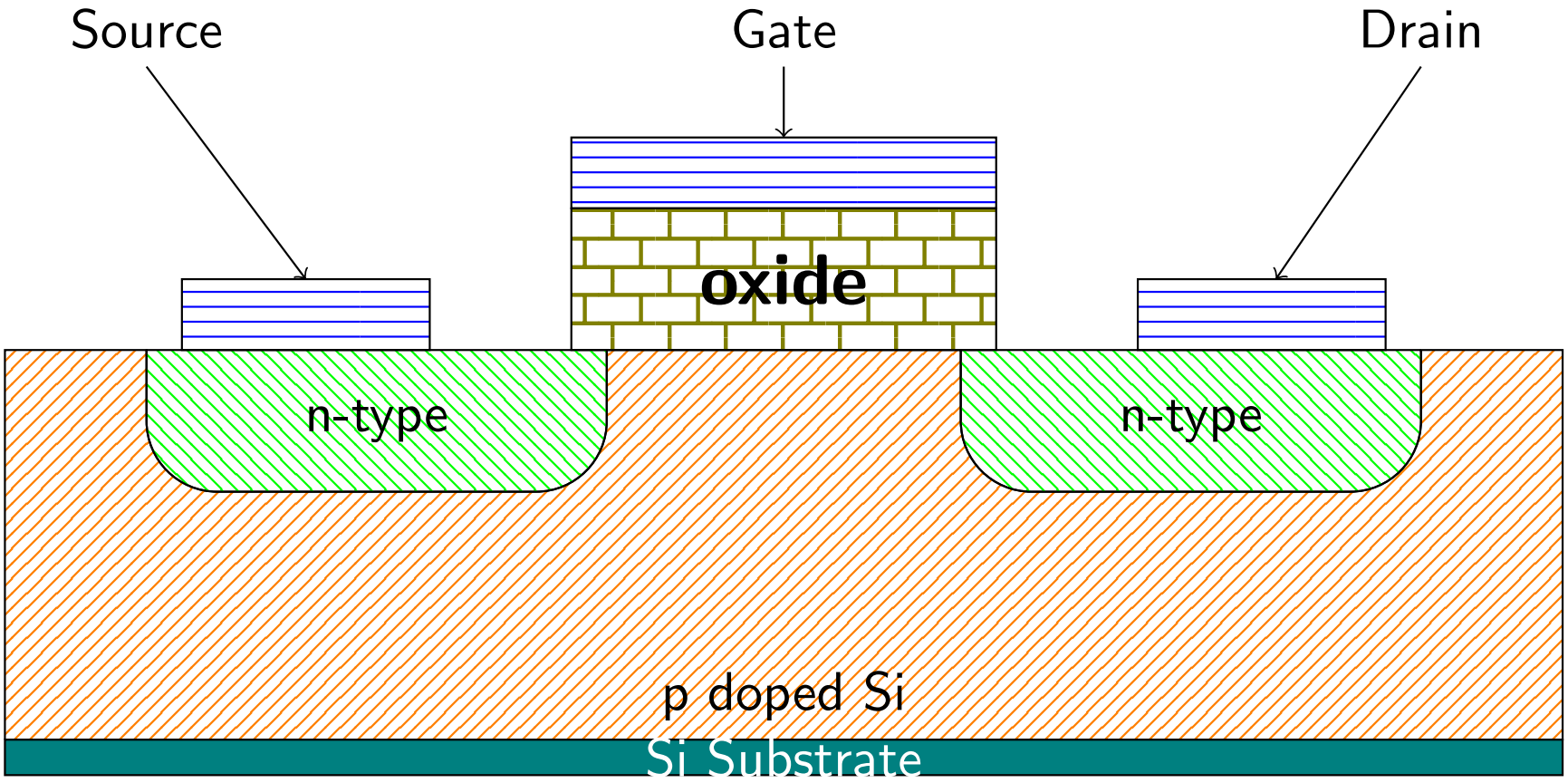
MOSFET



$$V_{GS} \geq V_{threshold}$$

$$V_{DS} < V_{GS} - V_{threshold}$$

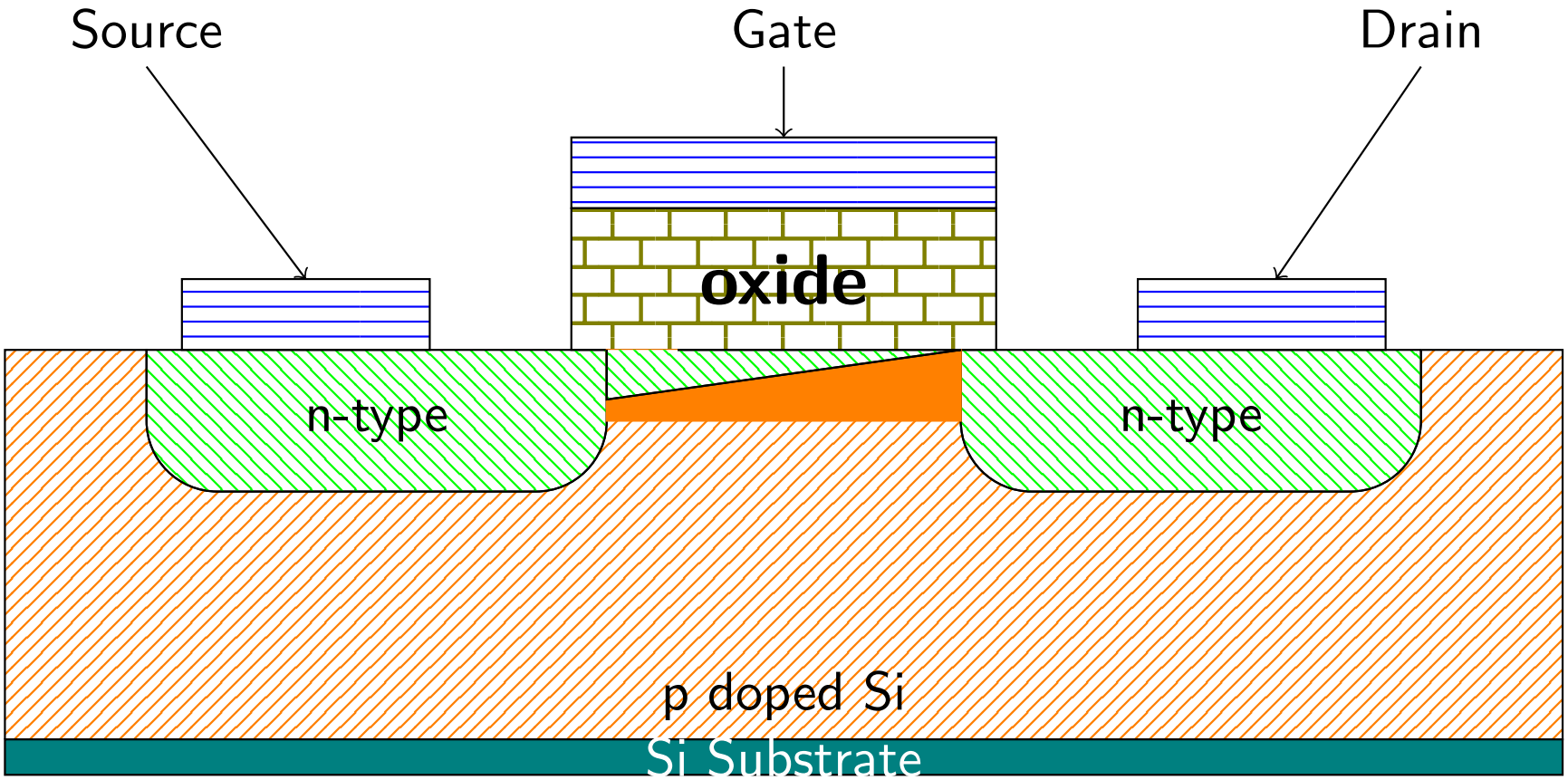
MOSFET



$$V_{GS} \geq V_{threshold}$$

$$V_{DS} = V_{GS} - V_{threshold}$$

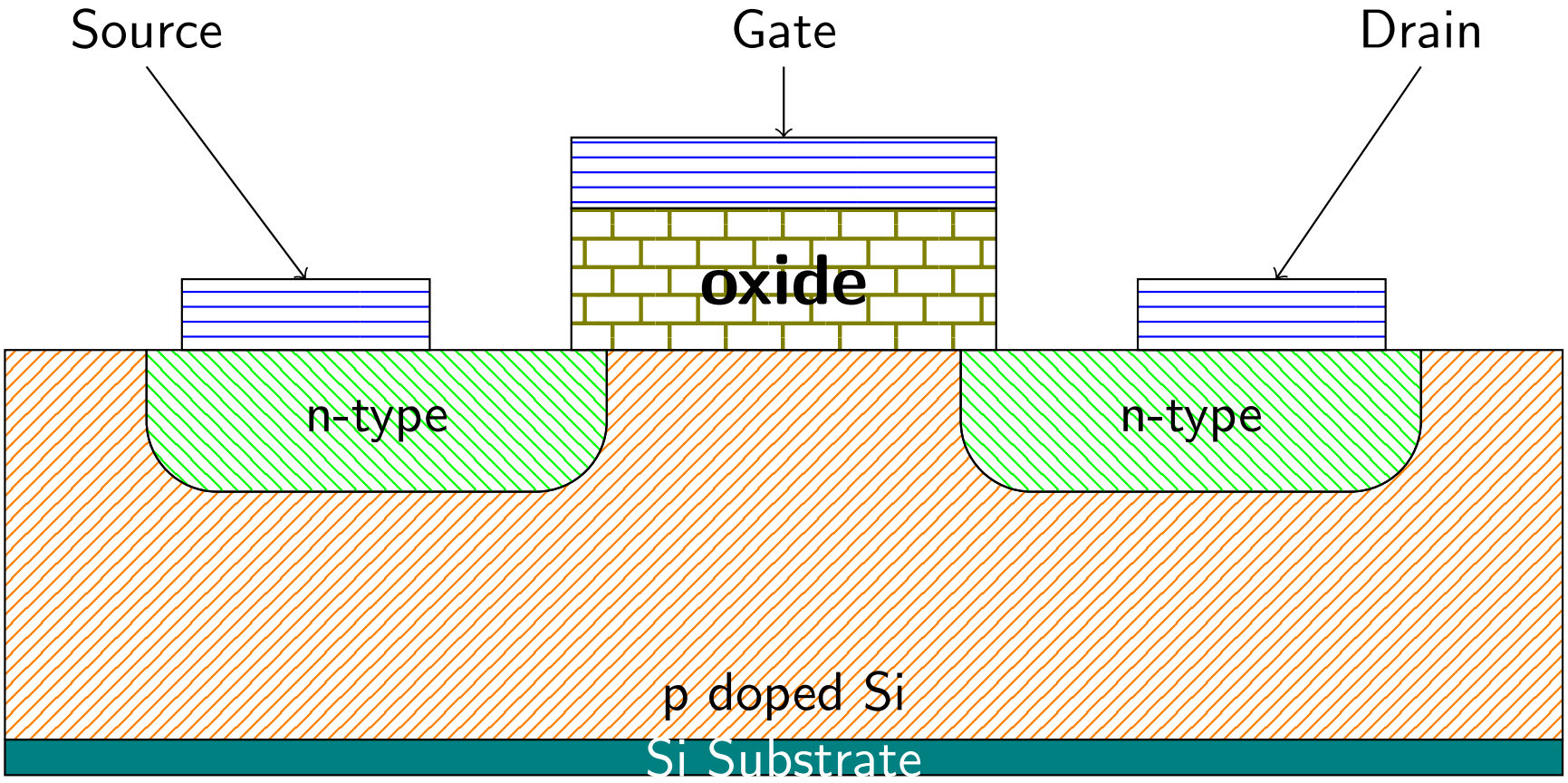
MOSFET



$$V_{GS} \geq V_{threshold}$$

$$V_{DS} = V_{GS} - V_{threshold}$$

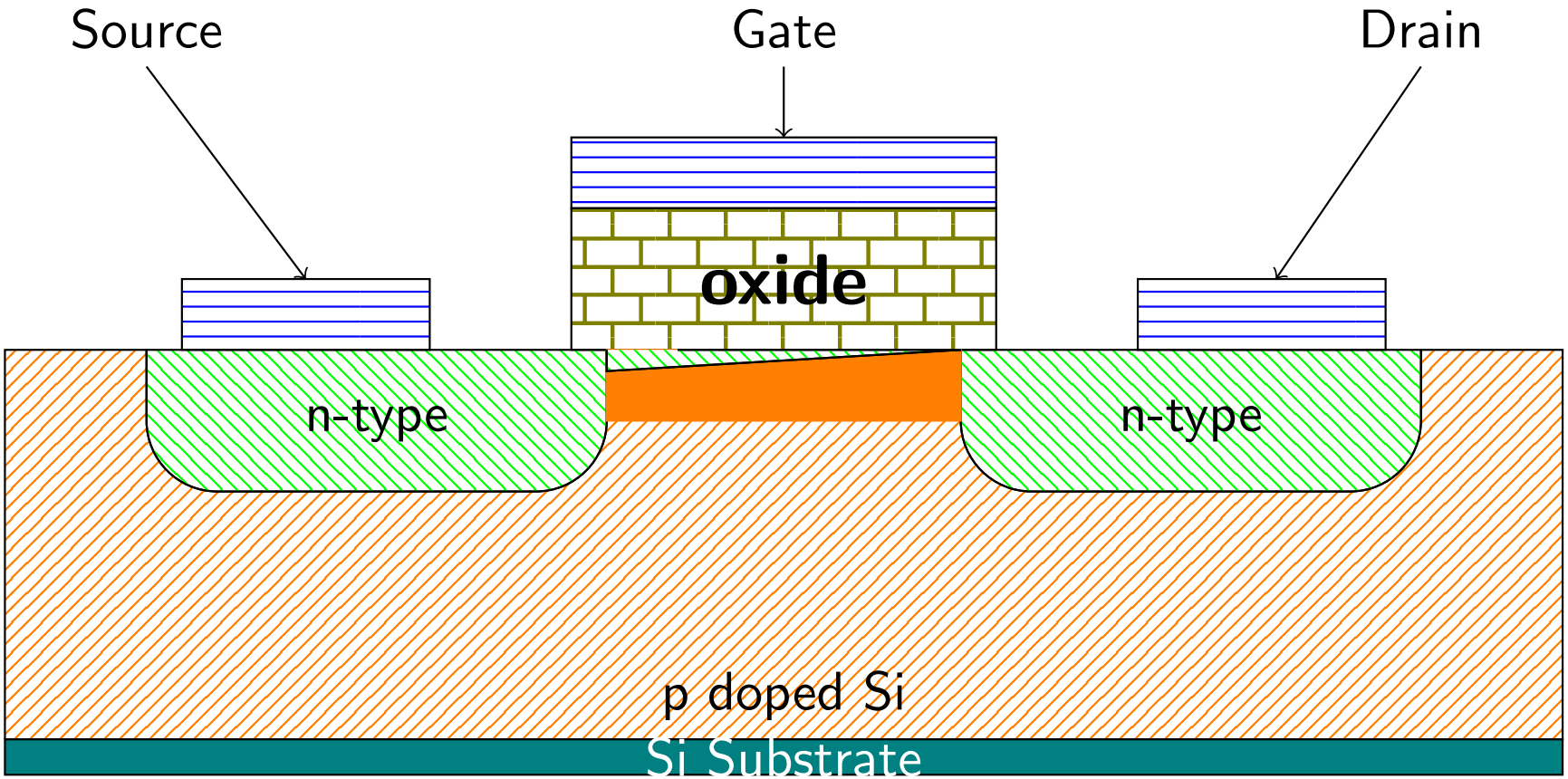
MOSFET



$$V_{GS} \geq V_{threshold}$$

$$V_{DS} > V_{GS} - V_{threshold}$$

MOSFET



$$V_{GS} \geq V_{threshold}$$

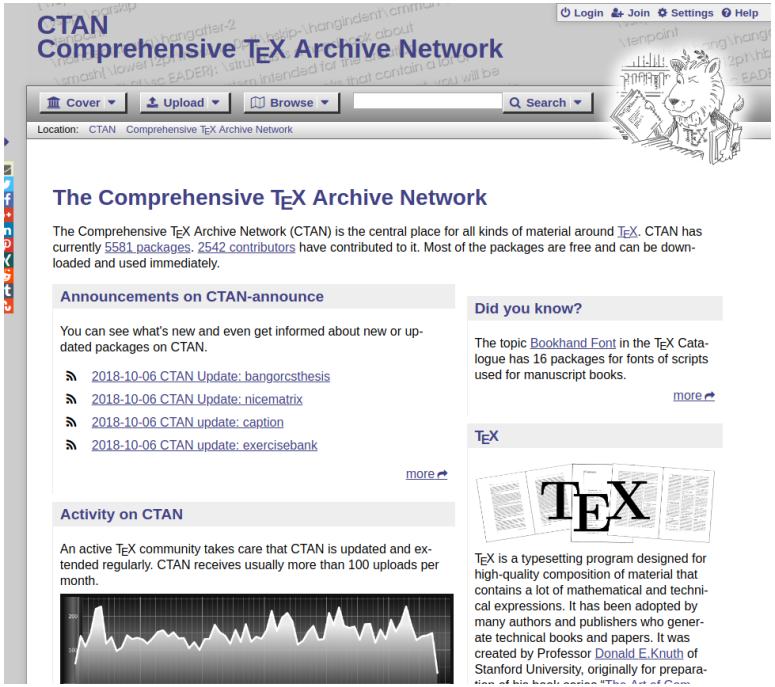
$$V_{DS} > V_{GS} - V_{threshold}$$

Super Powerful for Theses

RTFM

The Comprehensive TEX Archive Network is a package repository

This also includes manuals and examples



When in doubt: Google

TEX is older than the Happy Meal.

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Someone has likely experienced your pain.

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https://tex.stackexchange.com/

At your local library

OU libraries has a LaTeX expert:

Amanda Schilling
: Stem Services
: (405) 325-6126
: amanda.schilling@ou.edu

Or contact me

I'm just a LaTeX junkie:

Wesley T. Honeycutt
: Personal Site
: *I have an office phone?*
: honeycutt@ou.edu
: https://github.com/BlueNalgene

- First.
- Second.
- Third.

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

$$x^2 + y^2 = z^2. \qquad (1)$$

```
\begin{equation}
  x^2 + y^2 = z^2.
\end{equation}
```