How to make figures and tables

All publications, all editors use a style manual

This is yours

It is based on AIP
Scientific papers include only

Figures
Tables
Equations
No Graphs
No Charts

Tables are not Figures
Figures are not Appendixes

Capitalized against my better judgment. AIP treats “Figure 1”
Numbering

*Number* Figures, Tables, and Equations in order in which they appear in text

Cite (call out) *every* Figure and Table in the text
But not necessarily every Equation

Locate every Figure and Table on *same page* as first citation
Or on *next page* (or group *all* at end of document)
Figure or Table may be located *above* first callout
Do not say “Figure X *below*”
Work equations into sentences!

The equation [no colon, usually no commas]

\[ x = y \] \hspace{1cm} (1)

is represented by a line at 45°.

Not

Equation (1) is represented by a line at 45°.

\[ x = y \] \hspace{1cm} (1)

Not a bad idea to *indent* for clarity
Watch out for μsoft’s (and TEX’s?) defaults:

The modulus of elasticity is given by

$$E = \frac{\sigma}{\varepsilon},$$

Where ...

*Not capitalized.*

Hit Edit – Undo

Autoformat (or turn
**In-line equations (unnumbered)**

The equation $x = y$ [usually no commas] is represented by a line at 45°.

*Variables* are usually not set off by commas either:

The symbol $x$ represents the independent variable.

**NOT**

The symbol, $x$, represents the independent variable.
Tables

Use horizontal rules sparingly, no vertical rules

Note title above table (tabletop)

Table 3.1. Common microscope objectives

<table>
<thead>
<tr>
<th>Magnification</th>
<th>Numerical aperture</th>
<th>Useful MP</th>
<th>$RL^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0.15</td>
<td>45</td>
<td>2.2</td>
</tr>
<tr>
<td>10</td>
<td>0.25</td>
<td>75</td>
<td>1.3</td>
</tr>
<tr>
<td>20</td>
<td>0.50</td>
<td>150</td>
<td>0.7</td>
</tr>
<tr>
<td>40</td>
<td>0.65</td>
<td>195</td>
<td>0.5</td>
</tr>
<tr>
<td>60</td>
<td>0.80</td>
<td>240</td>
<td>0.4</td>
</tr>
<tr>
<td>100(dry)</td>
<td>0.90</td>
<td>270</td>
<td>0.4</td>
</tr>
<tr>
<td>100(oil)</td>
<td>1.25</td>
<td>375</td>
<td>0.3</td>
</tr>
</tbody>
</table>

$^a$ in micrometers and at 550 nm.

Entries shd have been centered in columns (dec pts aligned too, Note only 3 rules

This slide is too busy
Common errors

Table 1. Caption is far too long for the width of the table.

<table>
<thead>
<tr>
<th>Source</th>
<th>Wavelength, nm</th>
<th>Etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>589</td>
<td></td>
</tr>
<tr>
<td>Helium</td>
<td>Etc.</td>
<td>Etc.</td>
</tr>
</tbody>
</table>

Table 2. Cells too wide and justified poorly [Gatesware’s defaults – text flush-left, numbers flush-right].

<table>
<thead>
<tr>
<th>Source</th>
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<th>Etc.</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Etc.</td>
<td>Etc.</td>
</tr>
</tbody>
</table>

Table 3. Too many rules.
What’s wrong with these figures?
Are you interested in making a difference?

Recent recruiter story,

Engineers at Company X had developed an excellent technical design of a pipeline that was to transport oil across a major portion of the U.S. They knew at the outset that the pipeline was to cross through a Native American reservation. However, no one from the pipeline design team spoke with the tribal leaders until the construction was near the reservation border. Officials at Company X were unsuccessful at negotiating a pipeline right-of-way across the reservation. Consequently, oil is now pumped into a truck when it reaches the reservation border, transported by truck to the opposite end of the reservation and pumped back into the pipeline to continue its journey to the refinery.

Recruiter response,

“We need engineering graduates with increased sensitivity to societal and cultural issues”.

Engineering Technical Electives

Groundwater Mapping
Timber and Masonry Construction
Understanding Landslides
Practical Design of Small Renewable Energy Systems
Applications to Control Systems

Minor Program Requirements:

Humanitarian Studies and Technology Minor: (18 credit-hours)

3 credit-hours selected from the following LAIS core courses
Introduction to Ethics
Political Philosophy and Engineering

6 credit-hours selected from the following LAIS core courses
Engineering Cultures in the Developing World
Technology and International Development
Cultural Dynamics of Global Development
Writing Proposals for a Better World

6 credit-hours selected from one of the International area studies tracks
(USA, Latin America, Asia, Africa and the Middle East, Foreign Languages, Engineering Economics, and Energy Economics)

3 credit-hours selected from the engineering technical elective list (lower left)

Humanitarian Engineering Minor: (27 credit-hours)

A minor in Humanitarian Engineering requires all of the above requirements for the Humanitarian Studies and Technology Minor (18 credit-hours) plus the following courses, which are required of all undergraduate students in the engineering division, or similar courses required of other engineering programs on the CSM campus:

3 credit-hours of Multidisciplinary Engineering Lab (MEL) I & II:

6 credit-hours of Senior Design:
Engineering students enrolled in the minor and ASI programs will receive preference in the assignment of humanitarian projects.

Area of Special Interest (ASI):

Humanitarian Engineering Area of Special Interest: (12 credit-hours)

9 credits must be from the Liberal Arts and Int’l. Studies (LAIS) core courses
3 credits must be from associated LAIS or Economics and Business (EB) courses.
Moral

Use *color* sparingly
   And only when necessary

Make the figure intelligible in black-and-white
   Only then add color

Use *white* background

*Because photocopies of your paper will not show color*
What's wrong with this graph?

Fig. 1. Graph according to Gates

y = 0.9993x - 0.0802

$R^2 = 0.9911$
Fig. 1. Graph according to Gates

\[ y = 0.9993x - 0.0802 \]

\[ R^2 = 0.9911 \]
Fig. 2. Properly formatted graph

\[ y = 1.00x - 0.08 \]
Good figure, color appropriate

(Not our style manual, but who’s looking?)

The top image is produced by 0.25-NA EUV optics, while the bottom was made with 1.30-NA ArF (193 nm) optics. Scales are in nm. The contrast in the EUV image is much higher. One could still make a printed image from the ArF optics, but it would require enhancements to the reticle and much more work to optimize the process.