

The Craft Of Scientific Writing

Part 3

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Illustration: Making the right choices

There are two types of illustrations: tables and figures.

Choosing Table

Tables can be used to present numerical data.

Table 10-1
Measured Constants

Name of Constant	Symbol	Measured Value
Avogadro's number	N_0	$6.022117 \times 10^{23}/\text{mole}$
Elementary charge	e	1.602192×10^{-19} coulombs
Planck's constant	h	6.626196×10^{-34} joules-sec
Rest mass (electron)	m_e	9.109556×10^{-31} kilograms
Rest mass (proton)	m_p	1.672614×10^{-27} kilograms
Rest mass (neutron)	m_n	1.674920×10^{-27} kilograms
Speed of Light	c	2.997925×10^8 meters/sec

**Table 10-2
Sequence of Events in the Chernobyl Accident**

Date	Time	Power (MW)	Event
4/25	1:00 am	3200	Operators begin power descent
4/25	2:00 pm	1600	Power descent delayed 9 hours Emergency core-cooling system disconnected
4/25	11:10 pm	1600	Automatic control switched off Power descent resumed
4/26	1:00 am	30	Power minimum reached
4/26	1:19 am	200	Operators pull rods beyond limits Two more coolant pumps started Coolant flow limits violated
4/26	1:23 am	2,000,000	Power surges by a factor of 10,000 in 5 seconds

Tables can present short parallel descriptions that otherwise would have to be listed in the text.

Choosing Figures

Graphs. Graphs are drawings that show general relationships in data.

Line graphs are the most common type of graph in scientific writing.

Another common graph in science and engineering is the contour plot.

Other kinds of graphs include bar graphs and pie graphs.

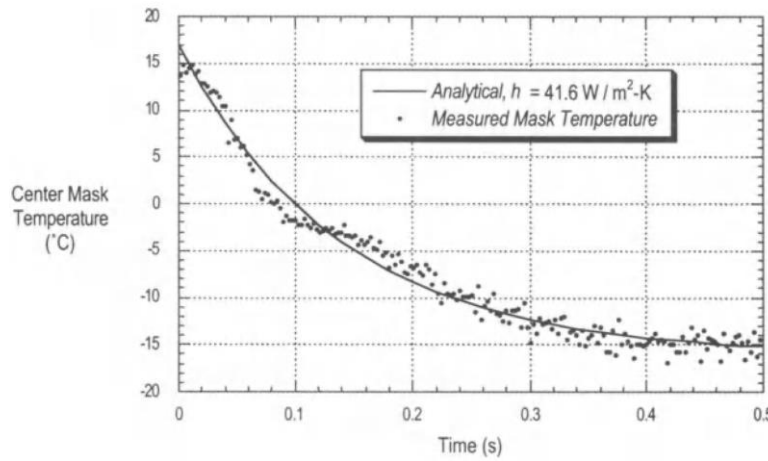


Figure 10-1. Temperature at the center of a silicon mask as a function of time [Laudon and others, 1995]. The mask was first heated by a plasma and then cooled with helium gas. The variable h is the heat transfer coefficient.

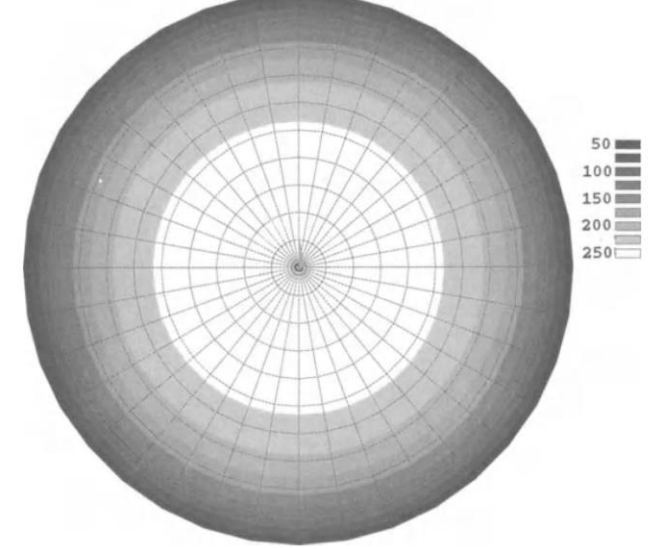


Figure 10-2. Steady-state temperatures (°C) across a silicon mask that is heated by a plasma [Laudon and others, 1995]. Scientists use this mask in x-ray lithography to pattern circuits on silicon wafers.

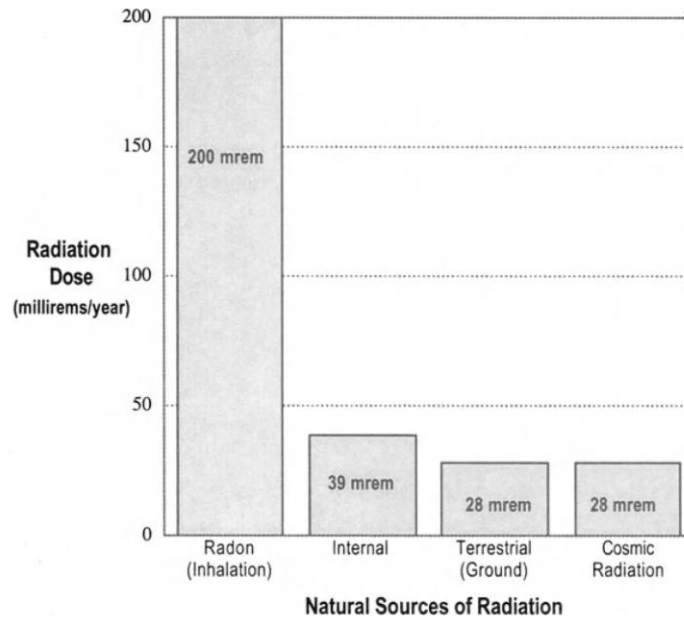


Figure 10-3. Sources of natural radiation that the average person in the United States receives each year [Radiation, 1994].

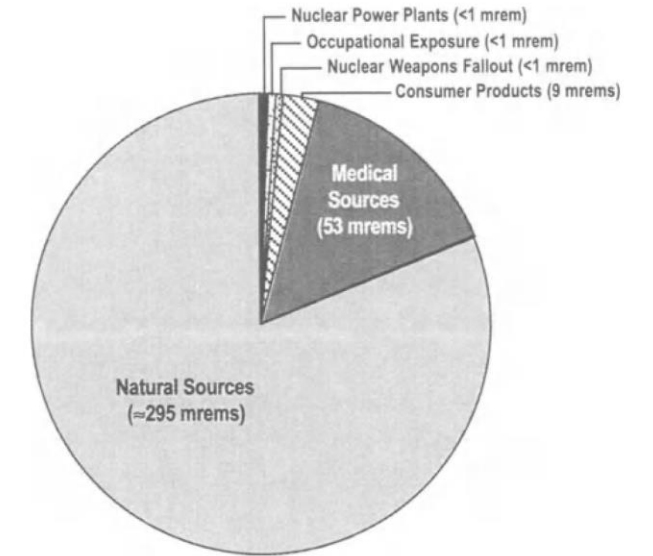


Figure 10-4. The breakdown of annual radiation dosage to the average person in the United States from all sources [Radiation, 1994]. The total is about 360 mrem per year.

Drawings. Drawings include line sketches and artists renditions. The major advantage of drawings is that you can control the amount of precision.

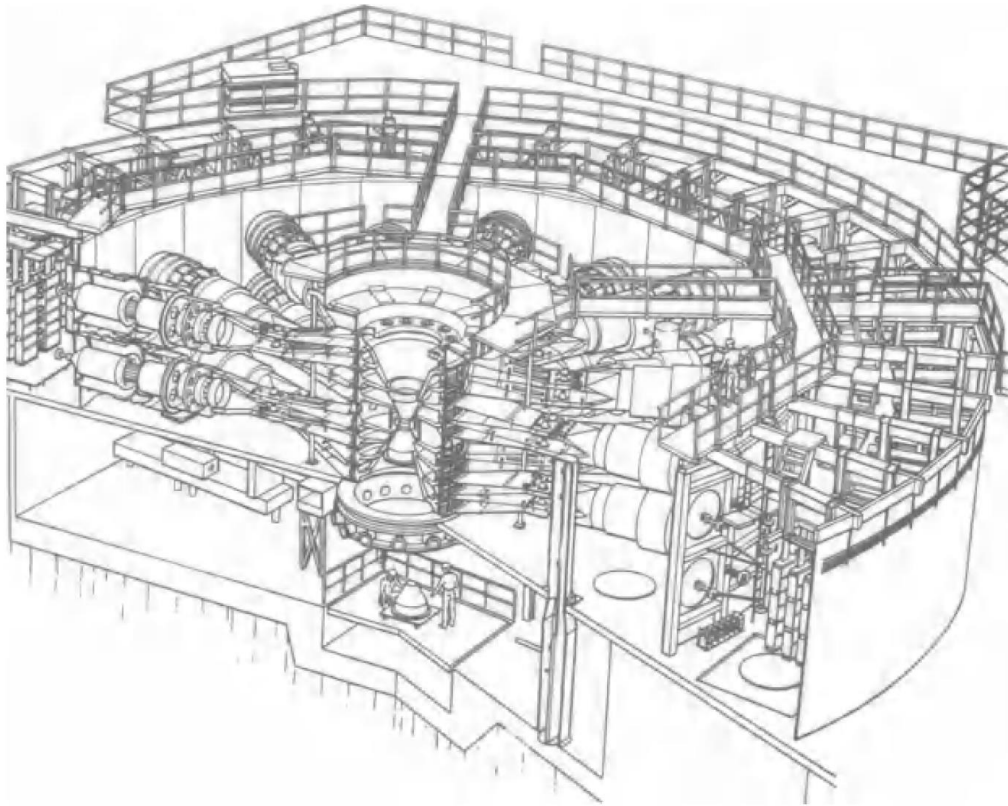


Figure 10-7. Cutaway view of a nuclear fusion experiment at Sandia National Laboratories [VanDevender, 1985].



Figure 10-6. Nuclear fusion experiment at Sandia National Laboratories. Here, an accelerator focuses lithium ions onto deuterium-tritium pellets to produce nuclear fusion [VanDevender, 1985].

Diagrams. Diagrams are drawings, such as electrical schematics, that communicate through symbols and do not try to depict an object's physical characteristics.

The principal advantage of diagrams is that they show how the different parts of a system relate to one another.

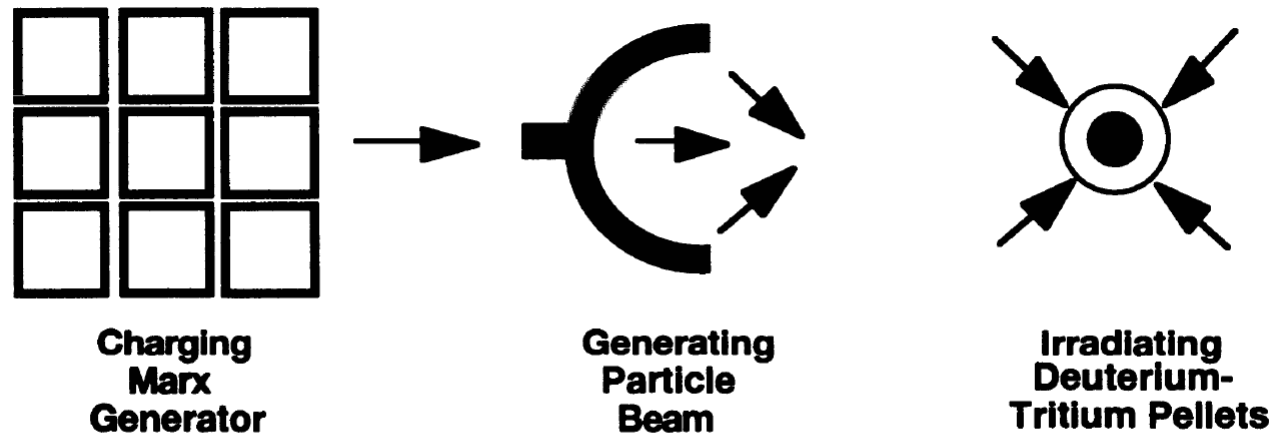


Figure 10-9. Energy flow diagram through the nuclear fusion experiment of Figure 10-6 and Figure 10-7 [VanDevender, 1985].

Illustration: Creating the right designs

Being precise, clear, fluid and familiar

Being precise

A common mistake in scientific writing is to present a figure that is much more complex than the text

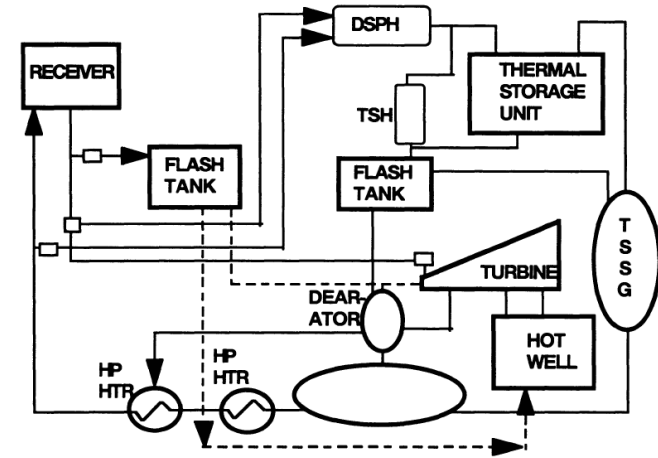


Figure 11-1. Thermal storage system schematic (this schematic is too detailed for the accompanying text).

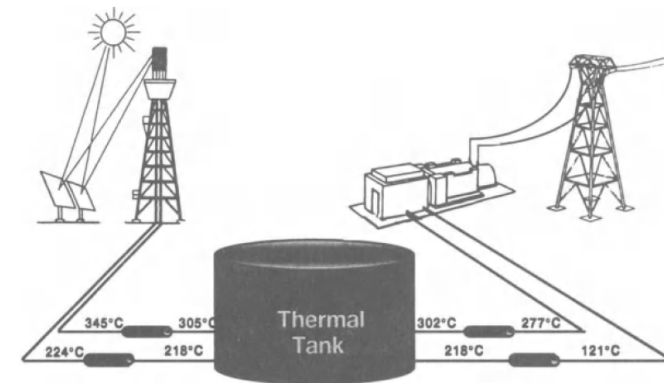


Figure 11-2. Thermal storage system drawing [Radosevich, 1986]. This drawing matches the precision in the accompanying text.

Being clear

Many scientists and engineers mistakenly assume that an illustration is worth a thousand words. That is not so. A picture or photograph may raise more questions than it answers.

wrong

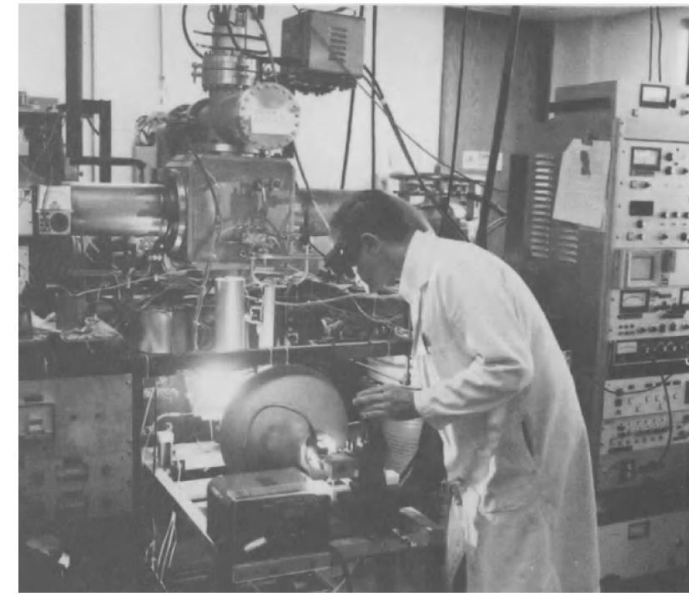


Figure 11-3. Photograph that allegedly shows a chemical reaction driven by solar energy. The background overshadows the central image.

right

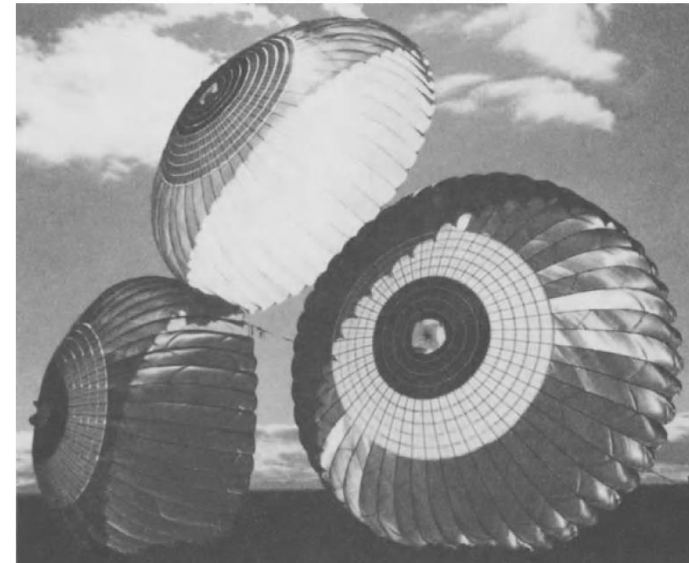


Figure 11-4. Parachute system designed for the crew escape module of the F-111 fighter jet [Peterson and Johnson, 1987].

Being fluid

The most important way to smooth the transition between what you say and what you show is to match the information in your text with what's in your illustration.

Being familiar

To make your illustrations familiar, you should consider what your audience does and doesn't know.

Too often, scientists and engineers miss the opportunity to show relative size of an image by including either a scale or familiar-sized image alongside the depicted image.

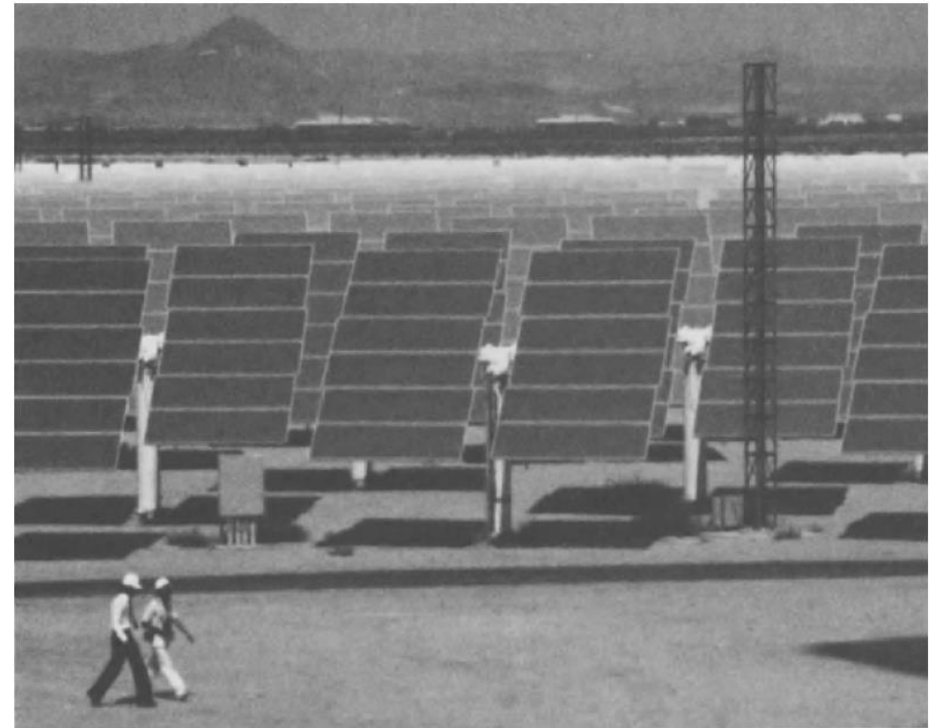


Figure 11-8. Solar mirrors at the Solar One Power Plant [Falcone, 1986]. Each mirror stand has a surface area of 39 square meters.

Format: Dressing Document for Success

Typography of Documents

**Table 13-1
Common Typestyles in Scientific Documents**

Typestyle	Characters	Type	Uses
Antiqua	abcdefghijklmnop qrstuvwxyz	serif	correspondence, reports
Old English	abcdefghijklmnop qrstuvwxyz	serif	(out of date)
Palatino	abcdefghijklmnop qrstuvwxyz	serif	correspondence, reports, articles
Schoolbook	abcdefghijklmnop qrstuvwxyz	serif	correspondence, reports, books
Times	abcdefghijklmnop qrstuvwxyz	serif	correspondence, articles
Arial Narrow	abcdefghijklmnop qrstuvwxyz	sans serif	illustrations, visuals, headings
Helvetica	abcdefghijklmnop qrstuvwxyz	sans serif	illustrations, visuals, headings
Optima	abcdefghijklmnop qrstuvwxyz	sans serif	illustrations, visuals, headings

Table 2
Uses for Different Typeface Sizes

1. Do not use too many typestyles in a document.
2. Rely on serif fonts for the texts of documents
3. Be conservative with options such as boldface or italics
4. Use a size that is appropriate for the occasion.

Size	Use
36 points	posters, visuals
24 points	posters, visuals, titles
18 points	visuals, titles, headings
14 points	titles, headings
12 points	text, illustration call-outs
10 points	text, illustration call-outs
<10 points	footnotes

Layout of Documents

Layout includes the number of columns, the spacing between lines, and the widths of margins.

1. Consider subject matter and audience in layout decisions.
2. Be generous with white space.
3. Choose a hierarchy for the headings and subheadings.

1st Level: 18 or 14 point, bald; 3lines before, 2lines after; centered

2nd Level: 14 or 12 point, bald; 2 lines before, 1 line after; left justified

3rd Level: 12 point, bald; 1 line before, 0 lines after; indented and at beginning of paragraph

Actually Sitting Down to Write

Getting in the Mood

Clear your mind.

Find a block of free time.

Prepare yourself mentally for the task ahead.

Writing First Drafts

Set realistic goals.

End your sittings by writing into the next section.

Watch what you eat.

When you finish a draft, store it on your computer under a separate file name.

What do you do if you've got writer's block?

First, you can't think of the right word.

Second, you can't find the sentences to express an idea.

Third, you hear voices.

Revising, Revising, Revising

Change the look of your document when you revise.

Get some distance between each revision.

Solicit criticism of your writing.

Thanks