Example 9-7 Typical block diagram

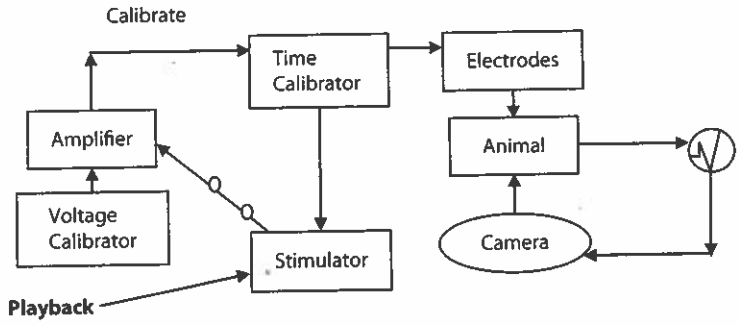

Figure 9.6

Guidelines for Developing Technical Block Diagrams

- Use no more than 8 to 10 blocks.
- Use short functional names for each block, and use exactly the same key terms as in the text.
- Do not clutter your diagram. Show only major actions and interactions to reduce confusion.
- Use arrows to indicate direction.
- When describing the diagram in the text, follow the direction of flow on the diagram and describe the entire diagram. The same applies when you present such a figure in a talk or poster.

Graphs

GUIDELINE 2:

Use line g\raphs for dynamic comparisons.
Use scatter plots to find a correlation for a collection of data.
Use bar graphs when the findings can be subdivided and compared.
Use pie charts to compare parts of a whole.

Present your data in graphs if the data show pronounced trends, relationships, or patterns. Graphs can be presented as bar graphs, line graphs, pie charts, box plots, or scatter plots. Often, these may be two- and three-dimensional.

Line Graphs

Line graphs are the most popular type of graph in scientific papers. Line graphs are used for dynamic comparisons, often over time.

Do not try to cram too much into one figure—but do not waste space either. Three or four curves should be the maximum in a line graph, especially if the lines cross each other two or three times. When curves must cross, show which lines run where by making them of different thickness or different patterns. Draw curves as straight lines between data points or as best fit, smoothed curves.

Scatter Plot

Scatter plots are useful for finding correlations for a collection of data. Scatter plots can be produced in two or in three dimensions. A line of best fit can be drawn through this collection to find any correlation between the variables, and a corresponding equation for the correlation between the variables can be determined by established best-fit procedures.

Bar Graph

Another common graph in science is the bar graph. Bar graphs tend to be more effective than line graphs for general audiences. If you use a bar graph, use a vertical rather than a horizontal bar graph because most readers are accustomed to the former. Use bar graphs in preference to line graphs when there is no evidence of a continuum between the experimental points or when the findings can be subdivided and compared in different ways. Make the bars the same width, and the space between bars one-half the bar width.

Pie Chart

Yet a different kind of graph is the pie chart. Whereas bar graphs allow you to compare different whole quantities, pie charts allow you to compare parts of a single whole. They are most effective when the segments are arranged from large to small, with the largest segment starting at the top (see Figure 9.7).

Box Plot

Box plots can be useful to display differences between data sets, especially in descriptive statistics. Box plots can be drawn either horizontally or vertically. This type of plot graphically depicts groups of numerical data through their five-number summaries: the smallest observation, lower quartile (Q1), median (Q2), upper quartile (Q3), and largest observation. The spacing between the different parts of the box help indicate the degree of dispersion or spread (see Figure 9.8).

Example 9-8 a **Sample pie chart**

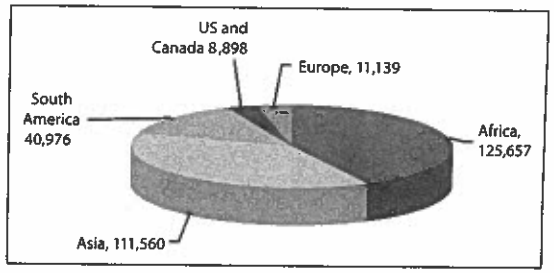

Figure 9.7: Annual death due to disease A, by region.

Example 9-8 b Sample box plot

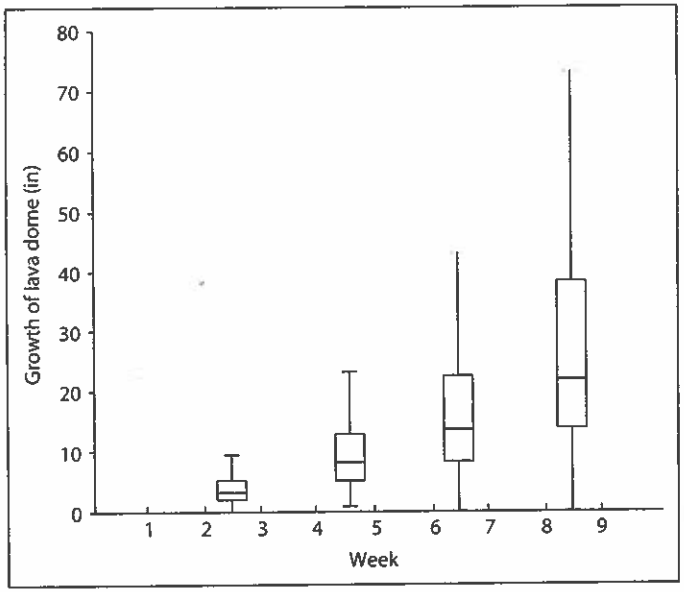

Figure 9.8: Box plot. The plot displays the median, interquartile ranges (box), and extreme values (whiskers) from collected data.

9.6 FORMATTING GRAPHS

FIGURES GUIDELINE 4:

Place the independent variable at the x-axis and the dependent variable at the y-axis.

Readers expect to see information in figures at certain places. For line graphs and bar graphs, readers expect to find the independent variable at the *x*-axis and the dependent variable at the *y*-axis. If information is placed as expected, readers are much more directed and do not have to spend extra time trying to understand illustrations.

The important information (the data) should be immediately recognizable. Information will be immediately obvious if you emphasize it by using different line weights. For example, in line graphs, curves should be the darkest lines; letters in axis labels should be less dark; and axes, tick marks, error bars, keys, and curve labels should be least dark. Make plotted points stand out well. If they fall on an axis line, break the axis on each side of the point. Plan graphs so that they need as little lettering as possible. Draft short but informative descriptions for the axes. Use the same symbols when the same entities occur in several figures, and use the same coordinates for different figures if values in them are to be compared. If you measured two variables in different ways, do not compare them on

the same axes. Draw the curves for the two variables separately, using one common axis where appropriate.

An example of a well constructed line graph is shown in Example 9-9 (Figure 9.9).

Example 9-9

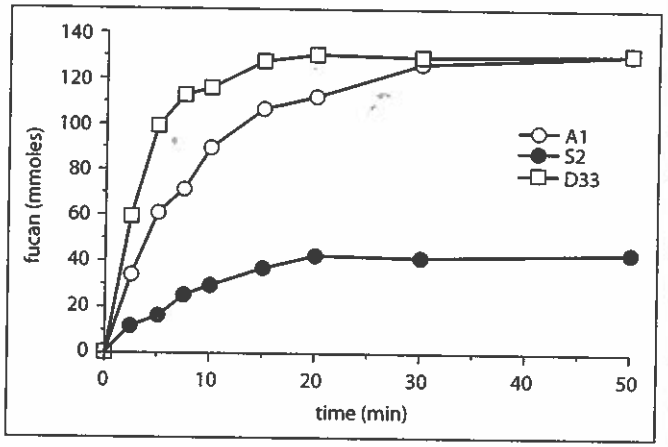

Figure 9.9: Well organized line graph. Curves and data points are easily distinguishable. Data stand out well, and axis are designed and labeled clearly.

As an additional example, a well constructed scatter plot is also shown in the next example (Figure 9.10).

Example 9-10

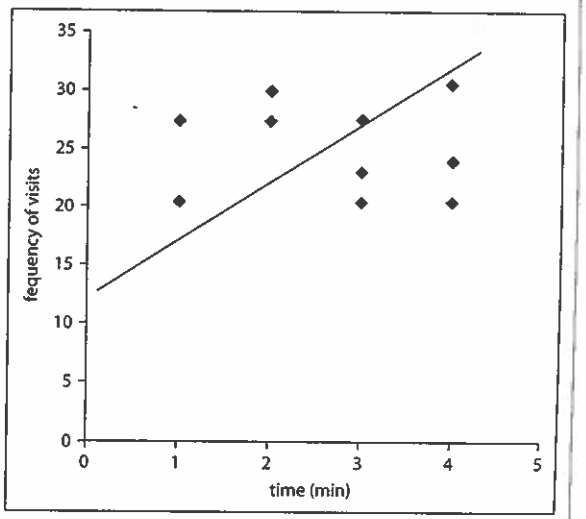

Figure 9.10: Well-presented scatter plot. Data stand out well, and axes are designed and labeled well.