Intro to Excel

(Adapted from Elizabeth Wenk, 2001)

Excel can do a lot of things, but you need to know the tricks. This handout contains some of my favorite short cuts. I have not included information on the basics. To familiarize yourself with the basics, spend an hour looking at the menus. You can add and subtract columns and cells using either the menus or a mouse.

Useful keyboard shortcuts:

Moving around the spreadsheet:

Once you've selected/hi-lighted in a single cell:

- SHIFT + arrow keys = increases the number of cells selected by 1
- CTRL + arrow keys = moves the cursor to the end of the group of filled cells in the direction chosen or jumps you to the start of the next block of filled cells if you're already at the end.
- SHIFT + CTRL + arrow keys = selects all the cells to the end of the group of filled cells in the direction chosen
- TAB moves you to the next column
- ENTER moves you to the next row

Formatting cells

- Under the FORMAT menu is an option FORMAT CELLS
- NUMBER- This lets you choose how you want to format your data – a number, a date, text, a number in scientific notation, etc. 'Number' is the default. Within each category there are lots of choices. For instance, if you have a number, how many decimal places do you want.
- ALLIGNMENT - 'Wrap-text' is under alignment; the rest is self-explanatory.
- FONT - self-explanatory
- BORDER - self-explanatory
- PATTERNS - self-explanatory
- PROTECTION - I've never used this

Formulas

- There are many functions programmed into Excel, which can be accessed by choosing FUNCTION under the INSERT menu..
- The best way to learn these is to scroll through them and look at the 1-sentence description of them.
- In each case you can either type the formula in yourself or choose the insert FUNCTION option. If you insert a FUNCTION Excel does a good job of walking you through what values you want to include.
- Formulas include basic mathematical functions like: AVERAGE, SQRT (squareroot), SUM, MIN, MAX as well as IF/THEN commands, CONCATENATE (which lets you link the data in multiple cells into a single cell), etc.

Cutting and pasting

- Be careful when cutting and pasting cells that contain the results of formulas, as references to other cells will remain linked. That is, if your formula is in A3 and refers to A1 and A2 and you cut and paste A3 into B3 it will still refer to the data in A1 and A2. If you copy and paste A3 into B3 it will refer to data in B1 and B2. I often find this very frustrating.
- One solution: Once you've done the calculating, remove the formula. Select the cells of interest. Under the EDIT menu select COPY. Now leave the same cells hi-lighted and from the EDIT menu

select PASTE SPECIAL. From the PASTE SPECIAL window select 'values only'. This eliminates the formulas.

Sorting

- Excel will sort you data for you. This is especially relevant when creating graphs, because scatter plots like your data to be in numerical order with respect to the X variable if you want to connect points.
- Select all of your data - otherwise your columns will be scrambled relative to one another.
- From the DATA menu choose SORT.
- If you have HEADER ROWS, make sure HEADER ROW is selected.
- Decide which column of data you want to sort. (If you are sorting by row, go to OPTIONS and choose ROW.)
- If you want to sort by multiple columns you have this choice as well.

'Fill' options

- Under the EDIT menu is the FILL submenu
- At the simplest level, you can type a value in a cell and FILL DOWN or FILL RIGHT and that value will be duplicated in all cells selected.
- With dates and times and formulas Excel automatically increases the increment by one in each cell.
- A neat option is to FILL SERIES. If you type in a number and want it to increase by an increment of 1, type 1 as the STEP VALUE. Or whatever STEP VALUE you want.
- You can also use the mouse to do these options:
- Type in a single number, select the cell, place the mouse in the lower right hand corner until a cross appears and then drag down.
- If you want the same date or time to appear in all cells and Excel did not obey, once you've dragged down, hit CTRL<D>.
- If you want a series, type the first two items in the series in two adjacent cells, select both, get the cross to appear in the lower right hand corner of the second cell and drag. For instance, if you've entered 1,3 the cells will fill with 1,3,5,7,9, etc.

Creating a graph:

Entering your data:

- It is best to have your x-values down rows and your data series (different groups) across the columns, although you can make your graph work either way.
- Make sure each row and column has a title.
- Make sure you've sorted your rows if you're making a scatter plot or line graph where you want to connect your lines in increasing order. For instance, if you're making a light response curve order your data points by light level.
- If you are going to make a line graph or a column/bar graph (see below) make sure you do not have a label in the upper left hand corner - that is make sure you don't have a label for your title row.
- Select the cells you want to graph with the mouse.
- If you want to include discontinuous cells scroll down the first column, press down <Ctrl> and scroll down the second column.
- Select the type of graph you want
- If you want to plot two continuous variables choose 'xy-scatter'
- If you have one continuous and one categorical variable choose 'line graph', column graph, or bar graph, depending on how you want to represent your data. I think line graphs are better for representing trends across multiple 'x categories' and column/bar graphs are better for comparing values at a single 'x category'

Creating your graph:

- Next select the exact graph style you want by 'clicking' on the appropriate figure to the right. For instance do you want your points connected and if so, do you want them connected by straight lines or curved lines. A curved line is only appropriate if the purpose of your analysis is to look at a gradual change in Y do to a change in X.
- Go to 'NEXT'
- Decide if your data are in columns or rows - look at the graph excel shows you and if it doesn't look right try the other choice.
- If you've got data series you don't want or extra/missing data points, choose SERIES and make the necessary changes. You can remove data series and manually change the data points that are being graphed.
- Go to 'NEXT'
- You now have a screen with 'titles', 'axes', 'gridlines', 'legend', etc. across the top
- Scroll through each of these and change any features you want.
- Be sure to label axes and title your graph under 'TITLES'.
- You are unlikely to make changes to 'AXES'
- You may want to change which 'GRIDLINES' are shown and where you want to place your 'LEGEND'.
- Under 'DATA LABELS', your graph will usually look cluttered if you show values, so I skip it.
- Likewise, it isn't necessary to include your 'DATA TABLE' most of the time.
- Go to 'NEXT'
- Decide if you want your graph as its own worksheet or as a figure within your current worksheet. I usually choose the latter.
- Select 'FINISH'

Formatting your graph:

- Maybe you like how your graph looks and don't want to format it further - but I usually dislike the Excel defaults and start playing.
- As a general rule, double click on anything you want changed!
- Double click on an axis and you'll get 'FORMAT AXIS' with options to format the PATTERNS, SCALE, FONT, NUMBER, and ALLIGNMENT. (or right-click on a data point and choose FORMAT AXIS)
- PATTERNS - do you want tick marks on your graph and in what format?
- SCALE - Excel chooses defaults for you. If you dislike them, type in your choice of minimum, maximum, etc. in the appropriate boxes. You can also choose to have your axis in the reverse order or choose to have the axes cross one another at the maximum value
- FONT - Change the font as you choose
- NUMBER - If you don't like the number format that Excel has chosen, change it, as described before. Usually the number format should be the same as in your spreadsheet. The main change I make is reducing the number of decimal places on 'numbers'
- ALLIGNMENT - Decide what text orientation you want. Just move the dial to your position of choice.
- Double click on a data point and you'll get 'FORMAT DATA SERIES' with options to format PATTERNS, AXIS, Y-ERROR BARS, DATA LABEL, SERIES ORDER, and OPTIONS. You have to click on each data series individually to format it!!! (or right-click on a data point and choose FORMAT DATA SERIES.)

  PATTERNS
  - If you have a line graph or a scatter plot: Here you can choose whether or not you want your data to be connected by a line, what color you want the line to be, what sort of a symbol you want representing your data points, and how large you want that symbol to be. Have fun!

- If you have a bar graph: Here you can choose what color bar you want and whether or not you want your bar to have a border.

AXIS

- If you have a line graph or a scatter plot: If you have multiple items plotted on your graph that have vastly different scales you can choose for one of your items to be a secondary axis. For instance, if you want to plot photosynthesis and conductance on a single graph, you might double click on a conductance point and select it to be a secondary axis.
- If you have a bar graph: same as for a line graph

Y-ERROR BARS

- If you have a line graph or a scatter plot: If you are doing statistics and have values for standard deviations or standard errors that you want to include as error bars, here is where you do it. You can either type in values or select spreadsheet cells. If you type in values and there is a different value for each x-value, type in a series of numbers separated by commas.
- If you have a bar graph: same as for a line graph
- If you have a scatter plot you also have an option of X-ERROR BARS. The same rules apply to these.

DATA LABEL

- these are the same options you had while 'creating' your graph, in case you now decide you want to add data labels or values.

SERIES ORDER

- This choice is more relevant for bar and column graphs. With line graphs or scatter plots you will only see a change in the order of names in the legend. Usually your spreadsheet should contain your data series in the same order you want them represented in your graph. But if you didn't or if you change your mind you can use this option to change the order by selecting a 'data series' and moving it up or down until it is in the correct location.

OPTIONS

- If you have a line graph or a scatter plot: I have never used these options.
- If you have a bar graph: The gap width is nice to adjust. This is the distance between bars or columns. By decreasing the gap width you are increasing the bar/column width - that is you are filling in more of your graph.
- Double click on the 'chart area' to change the fill color or eliminate the fill color. The 'chart area' is the region around the outside of the plot without any writing on it. You can also choose whether or not to have a border around the 'chart area'. (or right-click and choose FORMAT CHART AREA)
- Double click on 'plot area' to change the fill color or eliminate the fill color. The 'plot area' is the region inside the plot that is NOT occupied by gridlines or data. You can also choose whether or not to have a border around the 'plot area' (or right-click and choose FORMAT PLOT AREA).
- Double click on the legend to change its position or the font. You can also delete individual legend entries by secondarily single-clicking on them, without affecting the data part of your graph. (or right-click on the legend and choose FORMAT LEGEND).
- Double click on the gridlines to change the pattern or scale of the gridlines (or right-click on the gridlines and choose FORMAT GRIDLINES).
- More right-clicking options: If you 'Right-click' on the central part of your graph you'll have the following options: CHART TYPE, SOURCE DATA, CHART OPTIONS, LOCATION, etc. These are the original windows you saw when creating your graph and allow you to make fundamental changes in your graph if you change your mind about something.
- CHART TYPE - If you suddenly decide you should have a different type of graph, here is a way to change it.
- SOURCE DATA - If you suddenly decide that you want to change the range of data that you are plotting here is the way to change it. One way to use this function is if you want to make two

graphs which are identically formatted. Select the first graph and copy it. Then change the source data on the second graph.

- CHART OPTIONS - This returns you to the window which lets you enter axis titles, format gridlines, etc.
- LOCATION - This returns you to the window which lets you decide if you want your graph embedded in your original worksheet or placed in its own worksheet.
- Even more right-clicking options: If you 'Right-click' on a date point in a line graph or scatter plot, in addition to the options already discussed you get ADD TRENDLINE, under which there are two options: TYPE and OPTIONS. A trendline is basically a regression line without the statistics. Excel will tell you however what the equation of the line is and what the R2 value is. The R2 value tells you how much of the variation in the points is explained by the line, ranging from 0-1
- TYPE - Do you want a straight line, an exponential curve, or some other polynomial drawn through your data points. You have to choose each data series individually.
- OPTIONS - Options include naming your trendline (which is then included in your legend), whether or not you want to force your trendline through the (0,0) point, and whether you want the equation displayed on your chart, and whether you want the R2 value displayed on your screen. I do not know what 'forecast' refers to and have never used it.
- Whenever you right-click on ANYTHING you are given the option to CLEAR. You might want to use this to delete the legend or the gridlines, although single-clicking on them and hitting delete works just as well.

Random Hints:

- If things aren't working, make sure the upper left hand cell is empty.
- If you want to change all text to a certain font and/or size, single click on the entire graph (click in the chart area), hit CTRL<A> (select all), right click, and choose FORMAT CHART AREA, and then FONT.

Statistical analyses on Excel:

- Under the menu TOOLS select ADD-INS. Then select 'Analysis ToolPak' and click 'OK'.
- Under the TOOLS menu there should now be a DATA ANALYSIS option. Select it.
- There are many, many analyses listed here. If you've had a stats class they'll make sense to you. Otherwise, I've described a few of the simplest ones below. But first - some rules. Statistics tells you whether different groups are different from one another. To do statistics you need at least 3 measurements per group. A 'group' can be a species, groups of individuals in different environmental conditions, etc. I'm not going to try and teach statistics, but each of the following (except a histogram, which is really a type of graph) will spit out a 'p-value'. The magic rule is if the p-value is less than 0.05 the groups are significantly different from one another. What this says is that there is less than a 5% chance that the differences between the two groups are due to random chance.

Some examples:

- t-test: paired two sample for means: This lets you compare whether the values for two different groups are different from one another. In other words if you want to compare the photosynthetic rates of two different species or individuals in two different environments. There are three boxes you have to fill in: The range of data for variable 1 (species 1), the range of data for variable 2 (species 2), and the hypothesized difference. In most cases the hypothesized difference will be zero - you are interested in testing whether the difference between the two species is greater than zero.
- ANOVA: single factor: This lets you compare whether the values for multiple groups are different from one another. In other words, if you want to compare the photosynthetic rates of four different species. Select the data you wish to compare. This should include title rows - but be sure to click on the box that says you have title rows.

- Histogram: This is a type of graph which records how many observations there are in each of several categories. For instance, how many people scored between 75-80, 80-85, 85-90, 90-95 and 95-100 on a test. Chose the input range (i.e. the students scores) and the bin range. The bin range is a separate column you'll have created telling the computer the cut-offs you've chosen. In this case: 70, 75, 80, 85, 90, 95.