

# MARS STUDENT IMAGING PROJECT

## Graphing Information and Data Analysis

This activity is designed to help you organize data collected in order to graph and analyze it. The data table provided in this example is a sample only. Keep in mind that many data tables put together by researchers may have more data than what is shown on this sample table.

Goals of Activity: After completing this activity you will be able to:

- Use Excel to input any data you collect
- Use Excel to select and graph any pair of data you collect
- Make observations of data you graphed
- Make interpretations based on your observations

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## Graphing Information and Data Analysis

Presenting the information or data you gather from images can be done several different ways. Having your information in a data table is the first step and is extremely important. This will allow you to have an organized view of your data. This can also help you decide what to graph. Additionally, it will help you analyze your data. For this exercise, you will be asked to look at some sample data taken of channels. For this example, a number of channel widths and depths have been determined and are being compared. This information, along with other important information is presented in a data table. You could leave the information in the data table and make observations to analyze that data. It is important, however, to illustrate your data in a way that makes it easier for you to analyze.

Below is a data table that shows channel data from five THEMIS images. Please note that the THEMIS Image ID's are not real. Follow the instructions to graph this data:

	A	B	C	D	E
1	THEMIS Image ID	Longitude (E)	Latitude (N)	Channel Width (meters)	Channel Depth (meters)
2	V11111111	288.2	17.1	720	43
3	V22222222	177.6	-17.3	16952	926
4	V33333333	136	26.6	3626	301
5	V44444444	41.6	11.5	12836	658
6	V55555555	106.5	-41.4	4291	661

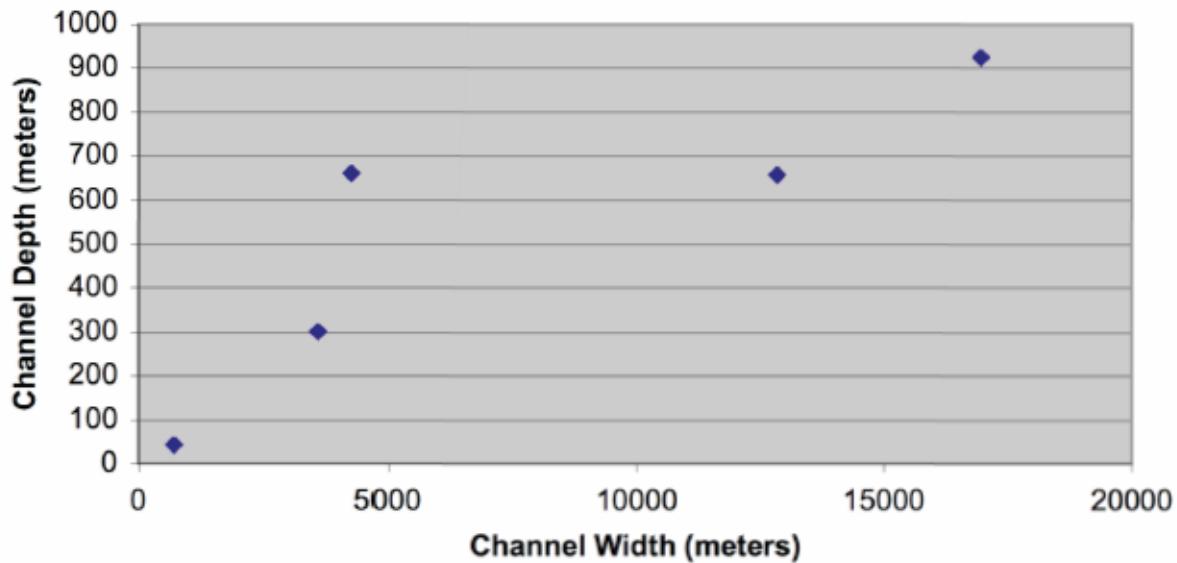
1. Open Excel by clicking on the green Excel icon on your computer. (  )
2. Choose a new Excel workbook.
3. Type in the data from the table above into your new Excel workbook. Make sure to enter the data from columns A through E from the white boxes only.
4. Click and drag your mouse over all the cells below **columns D** and **E**, including their titles ("Channel Width" and "Channel Depth").
5. Choose **Insert ▶ Chart**.
6. Choose a **XY (Scatter)** chart in the left-hand menu and click **Next**.

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## Graphing Information and Data Analysis (cont.)

7. Make sure your chart looks alright in the preview box. Then click **Next**.
8. In the Chart Options dialog box click on the *Titles* tab and enter a title for your chart. Then enter the titles for each X and Y axes in the “Value” boxes. For example, the “Channel Width (meters)” would be the X-axis title. Also, be sure to include the correct channel dimension for your Y-axis.
9. Under the *Legend* tab, uncheck **Show Legends**, then click **Next**.
10. Choose to place your chart “as new sheet” and click **Finish**. Your chart should look similar to the one below.

**Comparing Channel Width to Channel Depth**



## Graphing Information and Data Analysis (cont.)

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Now that you have graphed channel width versus channel depth from the data table, it's important to determine what these data mean scientifically. This can be done in two important steps: 1) making **observations** of your data, and 2) using these observations to make **interpretations**.

**Observations** are made by looking at data and stating their general characteristics, including any patterns or trends. For example: This graph shows that channels with greater widths are generally deeper.

**Interpretations** are made by taking observations and explaining what they may mean scientifically. For example, an interpretation of why wider channels tend to be deeper, could be that wider channels were formed by greater amounts of water. Channels that *don't* follow this trend may indicate that there are other processes at work on Mars that need to be considered. There can be more than one possible interpretation of a set of observations.

Make one observation of your own of the channel data in the graph:

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Make one interpretation of your own of what your observation may mean:

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For your science project and question, list two specific pairs of information you could graph, including what the graph could tell you about these data. (For the above example it was channel width versus channel depth. This told us if there was a relationship between the width and depth of channels - which there was.)

1. \_\_\_\_\_ versus \_\_\_\_\_

Can tell you \_\_\_\_\_  
\_\_\_\_\_

2. \_\_\_\_\_ versus \_\_\_\_\_

Can tell you \_\_\_\_\_  
\_\_\_\_\_

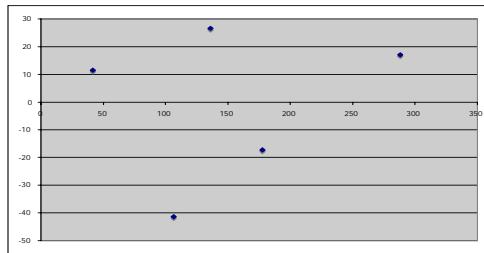
## Graphing Information and Data Analysis (cont.)

It may also be helpful when analyzing your data to plot the latitudes and longitudes of your

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THEMIS images on a map of Mars which will give you a different type of graph! One reason for doing this is to see where your channels (or whatever feature you are studying) are located on the planet, including where they are in relation to each other. You could also see other geologic features present in the region that may have a relationship to the channels you observed. These types of relationships are difficult to see in a data table!

1. To see the table of data you entered in the previous exercise, click on the “Sheet” tab at the bottom of your screen. Then click and drag your mouse over all the cells below columns B and C, including their titles (“Longitude” and “Latitude”).
2. Choose **Insert ▶ Chart**.
3. Choose a **XY (Scatter)** chart in the left-hand menu and click **Next**.
4. In the preview box, your graph should look like the example below:



Then click **Next**.

5. In the next **Chart Options** dialog box, do the following:
  - a. Under the *Titles* tab, enter a title for this chart (it should not be “Latitude (N)”) and label the X- and Y-axes. Note, the X-axis is Longitude (East), and the Y-axis is Latitude (North).
  - b. Under the *Gridlines* tab, uncheck all grid line boxes.
  - c. Under the *Legend* tab, uncheck “Show Legend”.
  - d. Then click **Next**.
6. In the **Chart Location** dialog box, choose to place your chart "as new sheet" and click **Finish**.

## Graphing Information and Data Analysis (cont.)

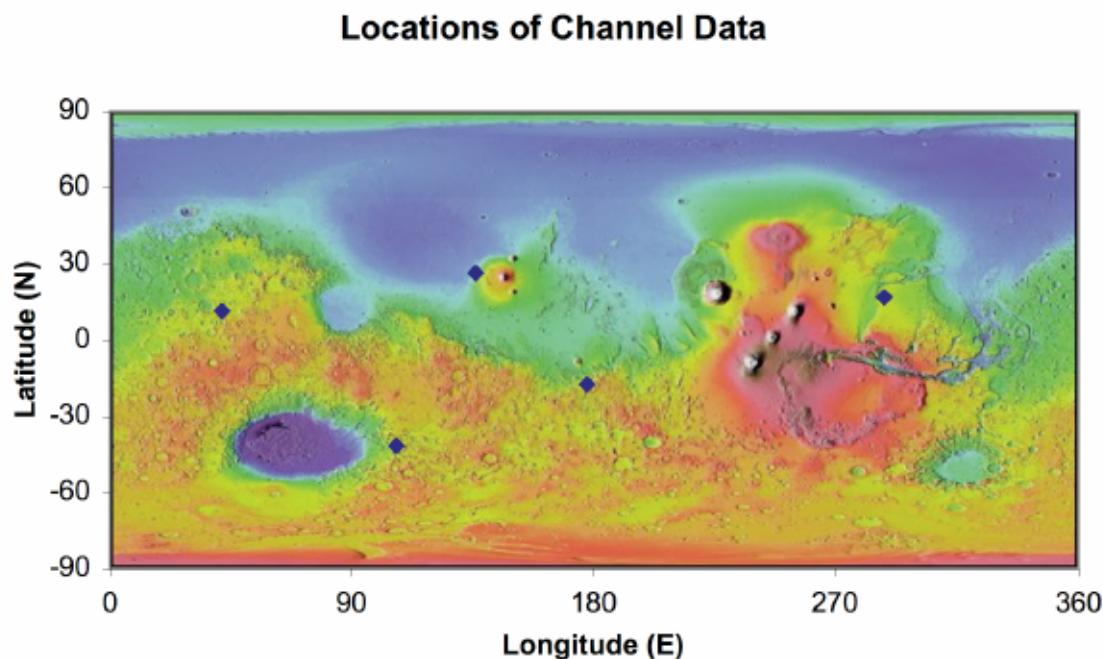
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7. You're almost there! Now you will need to set up your graph to look like a map of Mars.
  - a. For the lines of latitude (the Y-axis), put the mouse directly over the Y-axis and double-click. Then click on the **Scale** tab and enter the following in the Value (Y) axis scale boxes:
    - Minimum: -90
    - Maximum: 90
    - Major Unit: 30
    - Minor Unit: leave as is
    - Value (X) axis Crosses at: -90
    - Make sure that all boxes are unchecked.
    - Then click **Ok**.
  - b. For the lines of longitude (the X-axis), double click on it also, and enter the following in the Value (X) axis scale boxes:
    - Minimum: 0
    - Maximum: 360
    - Major Unit: 90
    - Minor Unit: leave as is
    - Make sure that all boxes are unchecked.
    - Then click **Ok**.
  - c. Look at the structure of your graph and check to see that the latitude and longitude data from your table are correctly displayed in the graph. The longitude should range from 0 to 360 degrees East, and the latitude should range from -90 to 90 North.
8. Now, for the final step, to add the color MOLA background map of Mars to your graph.
  - a. Double-click on the gray area in your graph to open the **Format Plot Area** box.
  - b. Underneath the “Fill” category, click on the **Color** drop down menu and then “Fill Effects”. Note: if you are using a PC computer, click on the **Fill Effects** button.
  - c. Go to the *Picture* tab. Then click on the **Select Picture** button.
  - d. Go to the desktop and click on the file “MOLA\_Map\_of\_Mars.jpg” file. Click **OK or Insert**.
  - e. Click **OK** on the **Fill Effects** window, and **OK** on the **Format Plot Area** window.

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## Graphing Information and Data Analysis (cont.)

9. Your map of Mars should be underneath your data! Your map may be stretched to high. To adjust the shape of your map, click and drag the black square at the top or bottom center of the plot area. You may want to change the color and size of your location points. Double click on the points to make changes. Your map should be complete as in the example below:



Now that you have plotted channel data on a map of Mars, make one observation of these data from the graph:

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Make one scientific interpretation of this observation:

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## Graphing Information and Data Analysis Summary

After completing these activities, you are now able to:

- **Create a Data Table in Excel**
  - Keep in mind that your data table may have additional information that you may need for your particular research. It's important that you include all your data on your table and select the two variables you wish to compare.
- **Create a Graph any Pair of Data**
  - Remember that each graph needs to have a TITLE that indicates what the graph is illustrating.
  - You should also be careful to label your X and Y-axes correctly. Always be sure to include the appropriate units. For example: Channel depth (meters).
- **Make Observations of Data you Graphed:**
  - Remember that observations state general characteristics and trends. They do not attempt to explain why those trends may (or may not) exist.
- **Make Interpretations of your Observations**
  - Keep in mind that interpretations attempt to explain what one or more observation may mean scientifically.