Technique Lab 1
Introduction to JMARS -
Beginning to conquer the Martian Datasets!

First you will need to go to the JMARS website and register, if you have not done so already: http://jmars.asu.edu/ You can create a new account in the login window. You need to do this before you will be able to do anything else in the lab. You can download the program onto your own computer or use the computers in the lab.

JMARS has a series of tutorials on basic skills. These useful introductions can be found here:
http://jmars.asu.edu/videotutorials

This lab will lead you through an initial use of JMARS including loading different layers and stamps and looking at a specific region on Mars using several different types of Martian data. You may find watching some (or parts) of the tutorials useful as well.

Read through each section before beginning it!

Section 1: Basics

1. Load JMARS, log in and maximize the map window.
2. Load the following layers
   -Nomenclature (it should be preloaded)
   -Viking MDIM 2.1
   -MOLA Shaded relief / Colorized Elevation
   -THEMIS Night IR 100. Global Mosaic
   -Lat/Lon Grid (it should be preloaded)
   -MOLA shaded relief (it should be preloaded)
   By selecting the 'add new layer' button on the layer manager window and searching under global mosaics. The MOLA shaded
   Place them in the order shown above. Try playing with the transparency slider bar to drape with Viking MDIM over the MOLA Shaded relief
3. Double click on each layer and read the information about the data set. Answer the questions on the answer sheet about each data set.
4. Using the zoom, pan, and feature finder (double click on nomenclature layer) – explore some locations on Mars.
5. Using the feature finder (double click nomenclature, navigation), select feature of 'crater' and the crater named 'Gratteri' and hit 'go to'.
6. Zoom in (using the zoom box) to 512 on Crater Gratteri. Using the ruler tool, make a scaled drawing of Crater Gratteri using the Viking MDIM 2.1 layer as your base map. Include the crater and ejecta blanket and any interaction

with surrounding terrain (other craters, topography, etc). Note – the drawing should not be of the entire Window – just of Crater Gratteri.

7. Using the ruler tool, measure what you estimate to be the maximum distance the ejecta blanket extends beyond the crater rim.
8. Switch the base map to the MOLA shaded relief. Compare and contrast this view of Crater Gratteri to the Viking MDIM 2.1 base map.
9. Switch the base map to THEMIS Night IR. Using the ruler tool, make a scaled drawing of Crater Gratteri using the Viking MDIM 2.1 layer as your base map. Include the crater and ejecta blanket and any interaction with surrounding terrain (other craters, topography, etc). Note – you may need to adjust the zoom on the window.
10. Measure the maximum distance of the ejecta blanket from the THEMIS Night IR. Compare and contract the information you gather about the ejecta blanket from the three different data sets.

Section 2: Topography

Now we are going to look at some MOLA (topography) data. The MOLA data sets are notorious memory hogs…so delete the THEMIS IR layer and anything 'extra' that you were experimenting with uploading in the previous section.

11. Under Add New Layer – select instrument and MOLA. Load MOLA Shaded Relief / Colorized Elevation + 1 plots. These will use a lot of memory – so be patient as they load and as you move them around. Move the MOLA Shaded relief to the top layer. It will look like the colorized map on the wall. If you select the measure tool and allow it to 'hover' over a location, it will show you the elevation.
12. There is a feature called Apollinaris Patera (AP) located to the Northwest of Gratteri. You can either drag your window to this feature, use the nomenclature search, or use the coordinates.
13. Zoom in on AP so that you have a good view of the feature, it is centered on the feature, and you have some of the surrounding terrain. Save this view as a JPEG by File -> Capture to JPEG. Make sure that when you name the file, you add a ".jpg" to the end of the file name in the File Name box and ALSO make sure it is a JPEG in the "Files of Type" box. You will need to print this file out to hand in as part of the lab. What do you think this feature is?
14. Take an elevation profile of AP double clicking on the MOLA Colorized Elevation – select chart and 'dock' the chart for use. Take several profiles across AP to observe the topography. When you are satisfied with your profiles, save your best profile by right clicking on the graph and saving the profile data. Right click and save as 'csv' file. Note: you will need to add the extension (' .csv ') to the file name.
15. Open this data file up in Microsoft excel (import a csv file). And make a graph of distance and elevation using the data. Save this graph and print it to turn in.

Cutting Edge Workshop Notes:
This is typically introduced simply as a 'technique' very early in the semester – prior to much discussion on Mars. I don't ask for much higher order thinking in the first lab, because getting logged in is typically 'enough'! With later technique labs (which build on other remote sensing principles), I typically conclude the lab with a broader 'thought question' which prepares them to develop a research question. For this exercise, I've included this type of question for you to 'play' with. As a note – these attached images are available in different versions as layers or uploads for JMARS. For convenience, they are attached.

Look at the provided global maps of Mars – they show properties (like magnetism and crater distribution).

1. As a group, for each image, make as many observations as you can about the image in 2 minutes (make a list on a sheet of paper).
2. Now, make as many connections (either similarities or differences) as you can between the images.
3. How many patterns do you notice in your observations? List them. How many questions do these observations bring up? List your questions/uncertainties.
4. Take a look at your observations and questions/uncertainties. Pick the three most interesting/intriguing and circle them. How could taking topographic profiles lend new information to your observation or question?
5. Formulate a hypothesis using your observations/questions that can be addressed using topography. Avoid 'yes/no' hypothesis statements and move toward open ended data collecting hypothesis questions (see example).

Example hypothesis:
Say you are looking at a road map, population map, geologic map, and vegetation map of the United States. You notice a pattern between the road maps and the vegetation maps. You have access to the topography of the United States and need to formulate a hypothesis to explore this road map/vegetation pattern. A 'yes/no' hypothesis might be something like, *The topographic profiles around roads with grass vegetation are always flat*. A more open ended, data collection hypothesis might be something like, *How does the topography between roads with grass vegetation and roads without grass vegetation vary*? Aim to develop your hypothesis with phrases like how does, comparing between, change across, etc.