

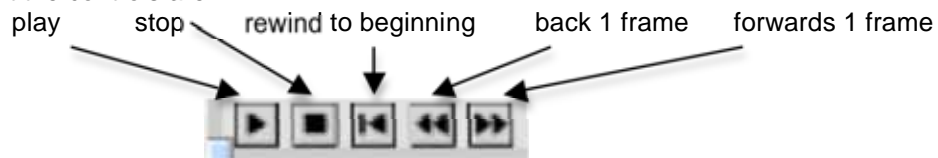
## How to Analyze a Video in Logger Pro

### Opening Logger Pro


1. Find your nearest Mac WAM lab on campus. There are 4 of them.
  - Computer Space Science Building Rm 3332
  - McKeldin Library Rm 1137
  - Parking Garage II Rm 0504
  - Worcester Hall Rm 0111
2. Find the link to the movie and the cmbl file (given in the homework problem) and download them to your desktop.
3. Open the Applications folder and then open Logger Pro folder and double-click the "Logger Pro" icon.

### Opening the file in Logger Pro

1. At the top of the screen, click "File", then "Open..."
2. A dialog box will open. Find the desktop directory, select your cmbl file, and click "open." Your movie should open up in a window.
3. Enlarge the video window by dragging the boxes in the corners of the video outwards. This will give you a better view of the video. After you have taken your data, you can automatically rearrange the windows by hitting the keys "Command-r". (The Command key has an apple on it.)
4. The video playback controls are in the lower left corner of the video window. From left to right the controls are:



### Analyzing a Video in Logger Pro

1. Click the  box in the lower right to open the video analysis sidebar. It looks like this. The buttons mean the following (from top to bottom).

- Select point
- Add point\*
- Set origin\*
- Set scale\*
- Photo distance
- Set active point
  
- Toggle trail
- Show origin
- Show scale

For now, we will only use the ones marked with a \*.

- Logger Pro can analyze the motion of objects (if you give it the points on the video), but it needs to know a couple of things first.




# How to Analyze a Video in Logger Pro

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## Setting a Scale

You need to tell Logger Pro the scales of things in the movie (to see if you are looking at something up close or from far away). You do this by telling it the length of one of the objects in the movie (usually a meter stick).

1. Click the “set scale” button  on the sidebar. To set the scale, you want to identify an object with a known length. Find any frame of the movie that contains an object that you know the length of. Click on one end of the object and, while holding the mouse button down, slide the pointer to the other end of the object. A green line will appear as you drag.
2. When you release the mouse button after you finish dragging the green line, a window will open asking you insert the length of the line in the movie. Enter the value and units and click “ok.”
3. If you need to redo the scale, just repeat step 1 and Logger Pro will automatically delete the old scale line.


## Setting the origin and coordinate system

Logger Pro will automatically make measurements at points you designate. To do this, it needs to know where the coordinate axes are. You need to think carefully about where to place the origin and how you want to orient the axes.

1. Click the “set origin” button  on the sidebar. When you click on a point on the video, the coordinate axes appear with the origin at that point. If you want to change where the origin is simply click a new spot on the video.
2. The yellow circle on the axes indicates the positive x direction. If you want to rotate the axes, click and drag the yellow circle.

## Selecting your Data Points

Logger Pro can’t track objects automatically; it needs a human to tell it where an object is in each frame of the video.

- Think about when you want to start placing data points (i.e. when you care about the motion? When do you not care?).
  - Think about where on the object you want to place the data points and why.
1. Click the “add point” button  on the sidebar. Now, using the video controls at the lower left of the video window, skip to the frame where you want to place your first point.
  2. Click on the video where you want to add your data point. A small dot should appear on the video where you clicked and the video should move to the next frame.
  3. Keep placing dots until you are finished taking data points. If you are unhappy with your choices (flip back through the movie to check the accuracy of your points) then you want go to the very top of the screen, click on “data”, and then choose “clear all data” from the list.

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### Making Graphs

1. If you now auto arrange the screen (by using “Command-r”), you will see that Logger Pro automatically has made an x-y graph. Reset the scales so the graph lies nicely in the middle by clicking on the numbers at the beginning and end of each scale. When you click each number, you can type in a new value. When you press enter, this value becomes the new endpoint of the graph.
2. To add a new graph, go to the top of the screen, click on “insert” and choose “graph.” Logger Pro will now insert a new graph.
3. The inserted graph will be some arbitrary scale. To change what is plotted on the two axes on this new graph, click on the axis label and select the variable you want to be measured on the horizontal and vertical axes.

### Replay

If you want to run the video and see how the graphs are correlated with it, select “Analyze” and “Replay” from the menu. When you select “Start” the movie will run and the graphs will appear in synchronization with the video.

### Curve Fitting

Logger Pro can try to tell us the equation of our graphs.

1. To fit a curve to a section of a graph, select a graph and click and drag a box across the part of the graph you want to fit. A light blue shading will indicate which points will be fit. Then go to the top of the screen and click “Analyze”, and then choose “curve fit...” – or just click the



“Curve fit” button on the toolbar at the top of the screen towards the right.

2. A new window will open with a picture of your graph and lots of “General Equations”. You can pick one of these general equations to try to fit your graph to by clicking in the circle in to the left of the equation and then clicking the “Try Fit” button at the bottom of the window. This will give you a preview of what the fit looks like compared to your graph. Try different fits and select the one that makes the most sense to you. When you’re done, click ok.
3. Now the fitted curve and equation show up on your graph. Move the equation box around so that it does NOT COVER UP your graph.

### Printing your worksheet

1. Delete the movie window now. You do not want to print the movie.
2. Use “Command-r” to auto arrange or move the windows around so you can see all the graphs and the data table. Try to not have graphs that are short and wide or skinny and tall. It’s hard to read those graphs.
3. Go up to the top of the screen and click “file” and then choose “page setup.” A window should open up for Page Setup. You want to change the orientation by clicking on one of the pictures where the man is sideways. This will print your data sheet in this orientation.
4. To print, click “file” and choose “print.” A window will open up with printing options. You want to click the “Print Footer” box and write in your name. Click “OK” and then print.