

Lab #6 – SHM and T-Pend

D.1. Spring Procedure

The setup of the apparatus is pictured below.



To test the accuracy of your estimates, you are asked to "Select DATA/New Column." You should actually select "DATA/New Column/Formula." You will perform this "manual fit" only until you get it right once. The remaining fits in this lab are all the "automatic" LoggerPro fits.

D.2. Torsion Pendulum Procedure

It's often difficult at first learning how to read Vernier scales. There are many helpful tutorials on the web. If you need help, take a look at <http://www.saburchill.com/physics/chapters/0095.html> or <http://badger.physics.wisc.edu/lab/manual/node36.html>. There is a cute JAVA applet available on the web that lets you practice making real time readings, however it uses a Vernier scale that is set up slightly different from the calipers you will use in lab: <http://www.phy.ntnu.edu.tw/java/ruler/vernier.html>

Start the pendulum rotating by twisting as shown below - but DO NOT GO PAST the mark at 45 degrees!



Try to eliminate any motion except rotation by lightly grasping the torsion rod.



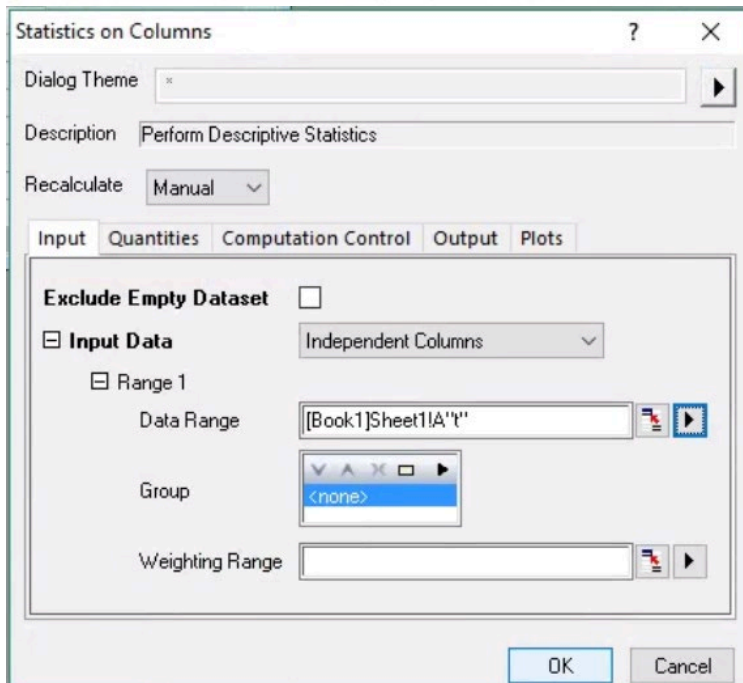
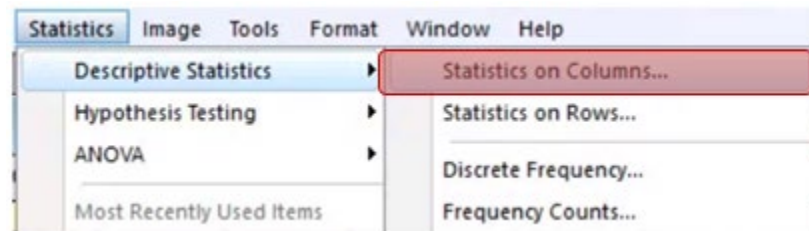
Before saving your LoggerPro data, make sure that the column listing the measured period shows enough decimal places (including at least one digit that is varying wildly from measurement to measurement). If the column does not list enough decimal places, select "DATA/Column Options," choose "Period," and increase the number of decimal places listed.

Lab 6: SHM Origin Guide

S(imple) H(armonic) M(otion) is one of the more fun labs to perform, in my opinion. Part of that reason is the lack of really hard *Origin* requirements.

Section E: Analysis

Part E.1 is quite simple. Just input the data, select the column, and go to *Statistics->Descriptive Statistics->Statistics on Columns* to get the information you need (it will show up on another tab, however, so it might not be immediately visible.)



1 - Statistics on Columns (5/19/2017 11:44:00)

+ Notes

+ Input Data

- Descriptive Statistics

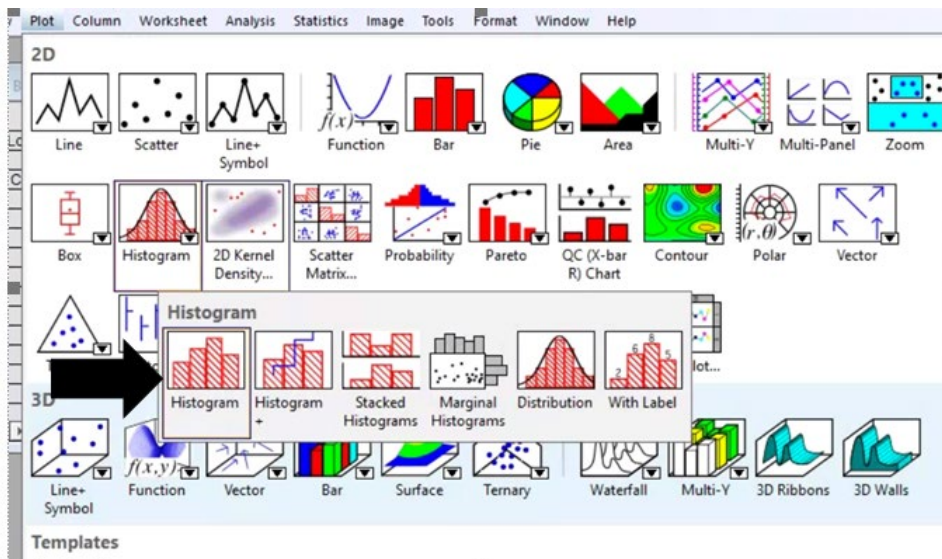
	N total	Mean	Standard Deviation	Sum	Minimum	Median	Maximum
t	10	4.8	10.33656	48	1	1	34

Part E.2 is a bit less simple, as you need to create a Histogram, which can be finicky at times.

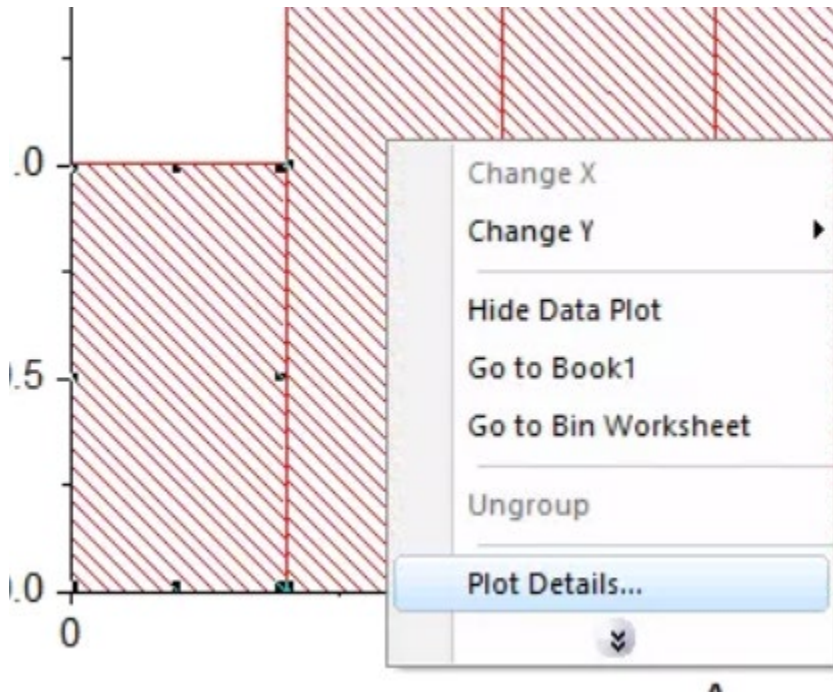
1. Import the *Logger Pro* data into *Origin* and remove any bad data at the ends, if needed. This should be quite easy by this point in the semester.
2. Once your data is in *Origin*, deselect any columns or cells. This is tricky, because while all graphing functions only care if you highlight a column, *Histogram* actually cares if you are highlighting even a SINGLE CELL! Make sure you have nothing highlighted at all (click in the grey area to deselect.)



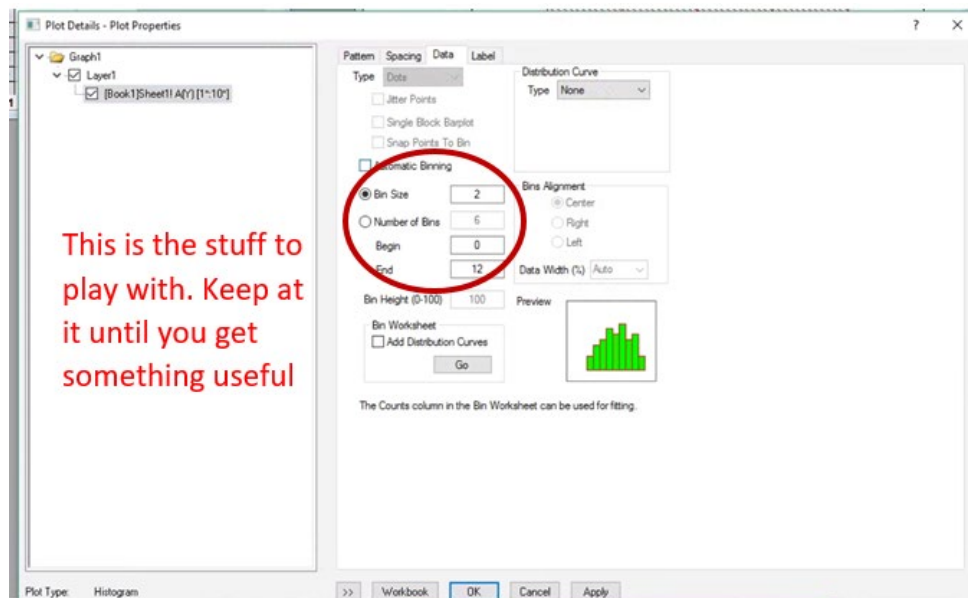
3. Once everything is deselected, go to *Plot->Statistics->Histogram*. This should bring up a dialog box to select which columns you want. Select the column you want and press OK. If everything went correctly, you should have a nice histogram. If not, ask your TA for assistance.



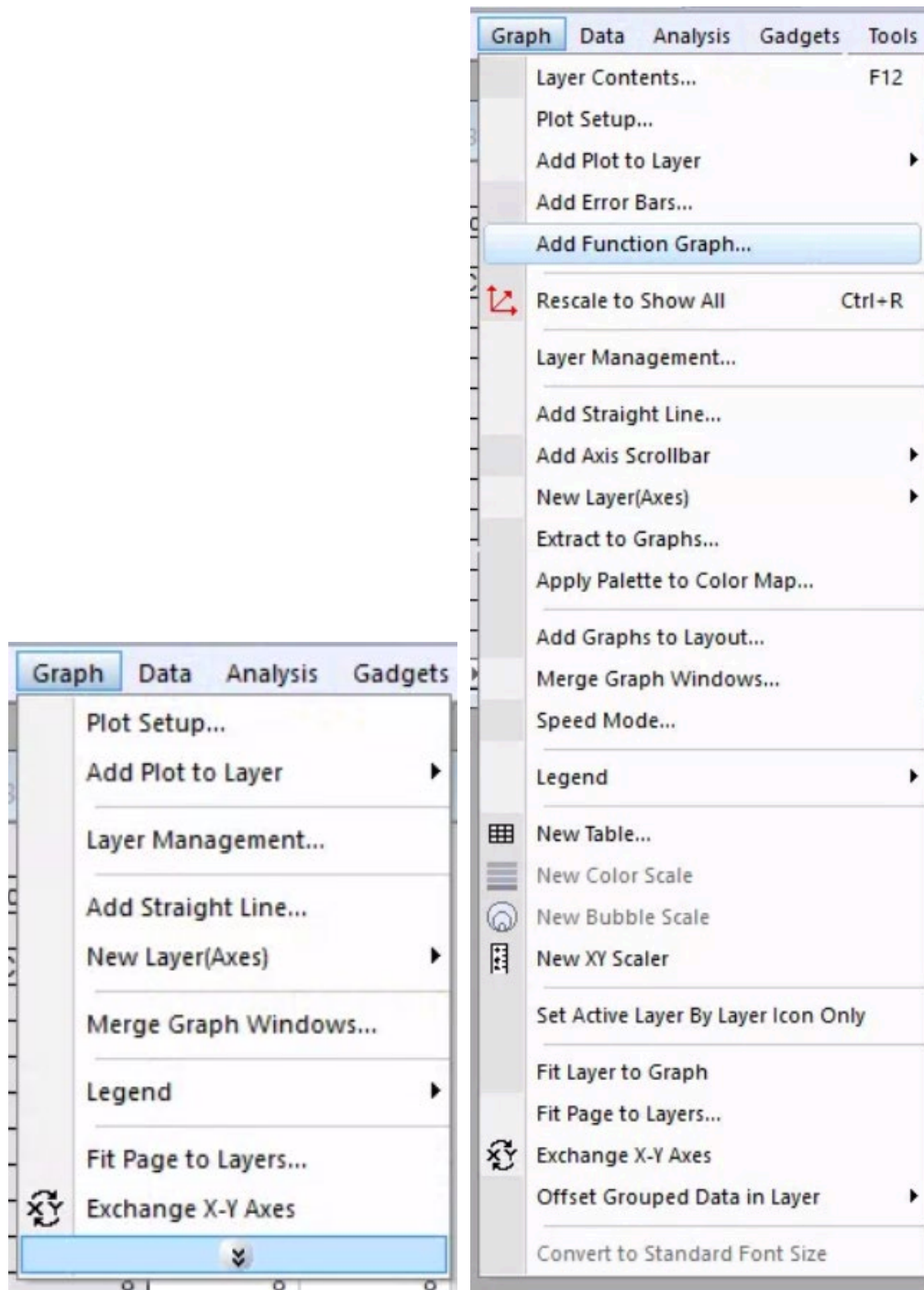
4. You probably noticed that the graph has spaces in it, or just looks weird. That is expected; you need to alter the details of the histogram. Do this by right-clicking on the bars and go to *Plot Details*. You can also Double-click the data, but this can sometimes cause confusion if you miss and click the wrong part.



5. In the dialog box that just showed up, you can change the way the graph counts. Change these values until you get something that looks appropriate to what you want to measure.



6. Once your graph looks good, you need to get statistics on the columns. Go back to your data list, select the column you plotted, then go to *Statistics->Descriptive Statistics-> Statistics on Columns*. This will give you all of your statistical data, which you need to put on to your graph somehow (make it look nice.)
7. You now need to add in a Gaussian to check your data against. You can do this by going to *Graph->Add Function to Graph*.



8. In the dialog box that appears, type in the appropriate function, replacing constants with things you have found from before.

Line	Panel	Function	Drop Lines	Label
		Points	From	To
x		<input type="text" value="100"/>	<input type="text" value="1"/>	<input type="text" value="100"/>
		<input checked="" type="checkbox"/> Auto		
Y(x) =	$\text{MAX} * \exp \left(- (x - T)^2 / (2 * s^2) \right)$			

9. If you did everything correctly, you should have a nice looking bell curve on your histogram. Clean up the graph and save it to the L: drive, so that you can get it on your computer and then attach it to your report. Make sure that you label your axes with the quantities plotted and their units, you give your graph a title, and write your names on the graph, as well.