

# When Experiments “Don’t Work”

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## Three Possibilities

What should you do when the results of your experiment do not match what you expected? Here are three basic explanations for such an occurrence.

### 1. You Made a Mistake

There are lots of mistakes to be made in any experiment. Maybe you wrote down the wrong number at some point. Maybe you accidentally measured something in inches instead of centimeters. (This is a painfully frequent mistake.) Maybe your circuit was connected improperly. You get the idea. There are also mistakes that you can make on the theoretical side. Maybe the experiment doesn’t match your predicted result because you made a mistake in a calculation while making your prediction. Did you divide by  $2\pi$ ? Or did you actually divide by 2 and then multiply by  $\pi$ ?

### 2. Your Estimate of Uncertainty is Not Reasonable

Maybe the discrepancy between your results and your prediction is not actually significant. Let’s say you assigned an uncertainty of 0.01 mm to a length that you measured with a standard ruler. That uncertainty is way too small! Maybe if you use a more reasonable value like 0.5 mm your results and your prediction will no longer have a meaningful discrepancy.

### 3. Your Theory Is Wrong

This is the most exciting prospect. (This is the kind of thing that might lead to a Nobel Prize.) In Intro Lab, this is more likely your chance to correct a misconception. Maybe you predicted that a straight line would fit your data from a certain experiment. After seeing that your data actually follows a parabola, maybe you look back at your notes and realize that you had used the wrong equation to make your prediction. When you apply the correct equation, you might see that the parabola is exactly what you would expect.

## Summary

If your results to any experiment don’t match your predictions, that’s not a good place to stop. Make sure you check for mistakes, underestimations of error, or predictions based on inappropriate theory.

## Examples - Check out these Scientific American Articles!

<http://www.nature.com/scientificamerican/journal/v310/n2/pdf/scientificamerican0214-32.pdf>

<http://www.nature.com/scientificamerican/journal/v314/n4/pdf/scientificamerican0416-36.pdf>