# Chi-Square

How do you know if your data is the result of random chance or environmental factors?

# Why?

Biologists and other scientists use relationships they have discovered in the lab to predict events that might happen under more real-life circumstances. At some point those predictions are either supported or not by real data. It would be nice if the two sets of data matched exactly, but more often than not they don't. This could be attributed to random fluctuations in the variables, or it could be due to a factor that the scientists overlooked. How does the scientist know? There are many statistical calculations that help answer this question. One that is commonly used by biologists is **Chi-Square**.

# Model 1 − Calculating Chi-Square (χ²)

Hypothesis: There is an equal chance of flipping heads or tails on a coin.										
Coin A										
	Observed data (o)	Expected (e)	(o - c)	(o - e)2	(o - c) <sup>2</sup>	$\chi^2 = \Sigma(o-c)^2$				
Heads	108	100	8	64	0.64	1				
Tails	92	100	-8	64	0.64					
Total	200	200				1.28				

Coin B									
	Observed data (o)	Expected (e)	(o - c)	(o - c)2	(o - c) <sup>2</sup>	$\chi^2 = \frac{\Sigma(o-c)^2}{c}$			
Heads	120	100	20	400	4				
Tails	80	100	-20	400	4				
Total	200	200				8			

1. What is the hypothesis that is being tested in Model 1?

There is an equal chance of flipping heads or tails with a coin.

Describe in one or two complete sentences the experiment being performed in Model 1.

A coin is being flipped, and the number of times it lands on heads and tails is recorded.

3. How many flips of the coin will be conducted in each trial for the experiment in Model 1? 200

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**Richard Samuel Moog** 

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