

Random Error ^[1]

Siddharth Kalla ^[2]86.4K reads

A random error, as the name suggests, is random in nature and very difficult to predict. It occurs because there are a very large number of parameters beyond the control of the experimenter that may interfere with the results of the experiment.

Random errors are caused by sources that are not immediately obvious and it may take a long time trying to figure out the source.

Random error is also called as statistical error because it can be gotten rid of in a measurement by statistical means ^[3] because it is random in nature.

Unlike in the case of systematic errors ^[4], simple averaging out of various measurements of the same quantity can help offset random errors. Random errors can seldom be understood and are never fixed in nature - like being proportional to the measured quantity or being constant over many measurements.

The reason why random errors can be taken care of by averaging is that they have a zero expected value, which means they are truly random and scattered around the mean value. This also means that the arithmetic mean ^[5] of the errors is expected to be zero.

There can be a number of possible sources of random errors and their source depends on the type of experiment and the types of measuring instruments being used.

For example, a biologist studying the reproduction of a particular strain of bacterium might encounter random errors due to slight variation of temperature or light in the room. However, when the readings are spread over a period of time, she may get rid of these random variations by averaging out her results.

A random error can also occur due to the measuring instrument and the way it is affected by changes in the surroundings. For example, a spring balance might show some variation in measurement due to fluctuations in temperature, conditions of loading and unloading, etc. A measuring instrument with a higher precision means there will be lesser fluctuations in its measurement.

Random errors ^[6] are present in all experiments and therefore the researcher should be prepared for them. Unlike systematic errors, random errors are not predictable, which makes them difficult to detect but easier to remove since they are statistical errors and can be removed by statistical methods like averaging.

Links

- [1] <https://explorable.com/random-error>
- [2] <https://explorable.com/users/siddharth>
- [3] <https://explorable.com/statistical-mean>
- [4] <https://explorable.com/systematic-error>
- [5] <https://explorable.com/arithmetic-mean>
- [6] http://en.wikipedia.org/wiki/Random_error