Many statistics programs ignore normal probability distributions, but they are important in our work: William Van der Kloot has written articles on their merits for detecting multiple populations, as does our review here.

Normal probability plotting provides a graphical method for determining whether sample data conform to a normal distribution based on visual examination of the plot. The data are plotted against a theoretical normal distribution for which the points form a straight line. Departures from this line indicate departures from normality, and if the plot is fit with more than one line, multiple populations are present. We find it useful for analyzing quantal release events and for examining whether the activity of large numbers of synaptic terminals measured optically can develop multiple populations (see the papers by Nigel Bamford and Niko Gubernator from the publicatons page)- which we suspect is how the brain selects particular synapses for learning and behavior.

To make a normal probability plot:

a. All of the data points (for example, times to half destaining of a synaptic terminal or quantal size) are ranked from smallest to largest (xi): this can be done in Excel with a "sort" function.

Then, the theoretical normal distribution of your sample (that is, what the distribution of each point would be if it were genuinely normal) is determined (yi):

b. For each observation xi, the cumulative frequency (pi) is calculated as i/n,where n is the total number of data points.

c. For each yi, the inverse of a cumulative standard normal distribution with a mean of zero and a standard deviation of one is calculated using yi =NORMSINV(pi) function in Excel.

d. The dependence of xi (your genuine data) on yi (where the data would fall if it were normally distributed) produces a normal probability plot, which presents each data point in terms of its deviation from the predicted mean of the population.

Here is a sample Excel spreadsheet you can adapt. There is also a means to get a regression statistic that reports how good the fit of the real data is to the normal distribution. However, I think the real value of this plot is that it allows smaller populations that would otherwise be hidden in the tails of a histogram to be noticed. While biology tends to be interested in mean values and not to be interested in these outliers, they presumably play an important role in plasticity of the nervous system.

6. video of Glyt-1 effects on neuronal branching (see Schmitz et al 2009 J Neurosci)