## A pitfall in estimating contributions of systematic errors

A common practice in evaluating the contribution of various systematic uncertainties to a result is to evaluate the contribution of each uncertainty separately (typically changing the parameter by what are felt to be + and one sigma of systematic uncertainty), then to add the induced changes in the result in quadrature. Statisticians would refer to this as "One Factor at a Time" experimental design (see the plenary talk by Nancy Reid). This practice is in general not recommended by statisticians, despite its popularity with working scientists. Typically if pressed for a justification, the first order error propogation formula is invoked: the individual systematic effects are statistically independent, so that their effects should also add in quadrature with no cross terms because of their independence. However, if the response to the uncorrelated parameters being varied contains nonlinearities, in particular the response of one parameter depends on the value of another parameter ("interaction" in the statistical Design of Experiments jargon), a significant portion of the actual uncertainty may be missed by applying the usual formula.

Author: LINNEMANN, James (Michigan State University)

Presenter: LINNEMANN, James (Michigan State University)