Experimental Design

Experimenting for successful analysis and understanding

This course teaches how to design experiments so that they can be successfully analysed and understood. In particular, it describes the dangerous phenomena that prevent successful analysis – boas, confounding and lack of power. But it also describes how to avoid these problems or, where the problems are built into existing data or experimental set ups, make the necessary changes to ameliorate the effects of the problems.

Course content

- Introduction: the basics; probability, distributions, hypotheses,
- Understanding significance, bias and power
- Designing for success: choosing tests, back-up plans, adequate replication, planning and time tabling
- Sampling: random or haphazard, blocking techniques and scale matching
- Designing general linear models GLM), fixed and random factors
- Nesting and repeated measure tests, non-independent data, measuring and correcting non-independence
- Regressions and correlations: which is which, different regression models, robust correlations
- Spatial and temporal patterns: time series (autocorrelation, ARIMA, fourier, wavelets, de-noising), time-structured models, spatial and quasi-spatial patterns (mantel and manly tests, variograms, nearest neighbour, sadie)
- Resampling: bootstrapping, jack knifing, simulation, subsampling and related methods for increasing precision
- Variance reduction: ranked set sampling
- Rescue: when things go wrong, imperfection, contamination, and the unexpected

Trainer
The trainer works at the Institute of Zoology, University of Göttingen. With a PhD in Zoology from University College Cardiff, Wales, UK, he now specializes in biology, ecology and environment. He has extensive experience in teaching post-graduate students in scientific writing & publishing, manuscript preparation, experimental design & statistics.