

Perspective on Bayesian Statistics in the Life Sciences

Schedule Day 1 (6th April)

14:30 - 15:00	Registration
15:00 - 15:15	Welcome and Introduction
15:15 - 16:00	Prof. Stephen Senn
16:00 - 16:15	BREAK
16:15 - 17:00	Prof. Michael Goldstein
17:00 - 17:30	Open Discussion moderated by Dr. Richard Morey

Titles and abstracts

Prof. Stephen Senn (Luxembourg Institute of Health): **P-value wars**



P-values have been described as being *a practical success but a critical failure* [1]. Everybody seems to have it in for P-values and the recent supposed ‘crisis of replication’ in science [2] has been blamed on the ‘P-value culture’.

The American Statistical Association was so concerned that it got together a group of statisticians to draft a statement warning the wider scientific community of the dangers of undue reliance on P-values [3]. In this talk I shall consider some of these criticisms, concluding that it is, indeed, the case that P-values are often over and misinterpreted and over and misused. However, I shall also maintain that the replication crisis is not quite what it seems, that to the extent that there is a problem, banning P-values would not solve it[4] and that in attacking P-values, a proxy war is being carried out

between two schools of Bayesian inference. In particular, I shall show that the history of the development of P-values is not what it has been claimed to be and that a key issue is the difference between precise (or point) and dividing hypothesis. This distinction turns out to be crucial for Bayesians but less so for frequentists. I shall try defend my judgment of over 15 years ago that we should be calling for two cheers for P-values [1].

**Prof. Michael Goldstein (Durham University):
Bayesian uncertainty quantification for complex systems
modelled by computer simulators**



Most large and complex systems are studied by mathematical models, implemented as high dimensional computer simulators. While all such cases differ in their details, each analysis of a complex system based on a computer simulator involves the same underlying sources of uncertainty. There is a growing field of study which aims to quantify and synthesize all of these uncertainties, within the framework of Bayesian statistics, and to use the resultant uncertainty specification to address problems of calibration, forecasting and decision making. This talk will give an overview of aspects of this emerging

methodology, with particular attention paid to issues arising in the analysis of large simulators, and to assessment of the differences between the simulator and the true system.

References

1. Senn, S.J., *Two cheers for P-values*. Journal of Epidemiology and Biostatistics, 2001. **6**(2): p. 193-204.
2. Klein, R.A., et al., *Investigating Variation in Replicability: A 'Many Labs' Replication Project*. Social Psychology, 2014. **45**(3): p. 145-152.
3. Wasserstein, R.L. and N.A. Lazar, *The ASA's Statement on p-Values: Context, Process, and Purpose*. The American Statistician, 2016. **70**(2): p. 129-133.
4. Senn, S.J., *A comment on replication, p-values and evidence* S.N.Goodman, *Statistics in Medicine* 1992; **11**:875-879. *Statistics in Medicine*, 2002. **21**(16): p. 2437-44.