中央研究院統計科學研究所
學　術　演　講

講　題： Statistical methods research done as science rather than mathematics

演講人： Prof. James Hodges
Division of Biostatistics, School of Public Health,
University of Minnesota

時　間： 2019年12月30日（星期一）上午10:00-11:30

地　點： 中央研究院統計科學研究所6005會議室(環境變遷研究大樓A棟)

※茶　會： 上午 09：40 開始

Abstract

This paper is about how we study statistical methods. As an example, it uses the random regressions model, in which the intercept and slope of cluster-specific regression lines are modeled as a bivariate random effect. Maximizing this model's restricted likelihood often gives a boundary value for the random effect correlation or variances. We argue that this is a problem; that it is a problem because our discipline has little understanding of how contemporary models and methods map data to inferential summaries; that we lack such understanding, even for models as simple as this, because of a near-exclusive reliance on mathematics as a means of understanding; and that math alone is no longer sufficient. We then argue that as a discipline, we can and should break open our black-box methods by mimicking the five steps that molecular biologists commonly use to break open Nature's black boxes: design a simple model system, formulate hypotheses using that system, test them in experiments on that system, iterate as needed to reformulate and test hypotheses, and finally test the results in an "in vivo" system. We demonstrate this by identifying conditions under which the random-regressions restricted likelihood is likely to be maximized at a boundary value. Resistance to this approach seems to arise from a view that it lacks the certainty or intellectual heft of mathematics, perhaps because simulation experiments in our literature rarely do more than measure a new method's operating characteristics in a small range of situations. We argue that such work can make useful contributions including, as in molecular biology, the findings themselves and sometimes the designs used in the five steps; that these contributions have as much practical value as mathematical results; and that therefore they merit publication as much as the mathematical results our discipline esteems so highly.

中 央 研 究 院
統計科學研究所