

# THE FOUNDATIONS OF STATISTICS RECONSIDERED

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## 1. Introduction

This is an expository paper on the evolution of opinion about the foundations of statistics. It particularly emphasizes the paths that some of us have followed to a position that may be called Bayesian or neo-Bayesian.

The intense modern growth of statistical theory of which this Symposium is a manifestation has been strongly oriented by a certain view as to the meaning of probability. I shall try to explain why another view seems now to be entering upon the scene almost of its own accord and to suggest what practical implications it brings with it.

## 2. Our frequentist background

Those who earlier in this century helped to mold the present great burst of activity in statistical thought seem to have been particularly concerned to adopt a clear and rigorous definition of probability. They were right to be so concerned, for the concept of probability has always been elusive and it lies at the heart of whatever any of us understand by “statistical theory” today. The concept of probability almost unanimously adopted by statisticians throughout the first half of the century, and the one that still seems to be regarded as fundamentally correct by the majority of statisticians today, is the frequency concept of probability, in which a probability is the relative frequency of some kind of event in a certain type of sequence of events or, according to some, in a set of events (as for example on page 109 of [12]).

It is completely understandable that a frequentist concept of probability should have come to the fore. The best known alternative concept when the modern renaissance of statistics was beginning was one I call the “necessary” concept of probability. Traditionally, this concept—apparently inspired by games of chance—represents an attempt to define probability of events in terms of the symmetry of the context in which they arise. In some modern views, probability is a logical relationship between one proposition (regarded as back-

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