

ANCILLARY HISTORY

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Ancillarity has long been a shadowy topic in statistical theory. — D.R. Cox (1982).

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1 Introduction

The origin of the term “ancillary statistics” is clear and well known. It was introduced in 1925 by Ronald A. Fisher in his paper “Theory of Statistical Estimation” (Fisher, 1925); it then lay dormant for nearly a decade until Fisher returned to the topic in his “Two new properties of mathematical likelihood,” which was sent to the Royal Society of London in December 1933 and published as Fisher (1934). The term arose in these two papers in Fisher’s characterization of statistical information and its relationship to the likelihood function. When a single sufficient statistic existed it would contain all of the information in the sample and serve as the basis for a fully efficient estimate, that estimate to be found from differentiating the likelihood function to find the maximum. When this was not the case, auxiliary or “ancillary” information was needed and could frequently be obtained from statistics arising from looking more closely at the likelihood in the neighborhood of the maximum, in particular at the second or higher order derivatives there.

Fisher expanded upon his earlier usage a year later, treating “ancillary” as a broader term of art not specifically wedded to local behavior of the likelihood function in “The Logic of Inductive Inference,” read to the Royal Statistical Society on December 18, 1934 and published with somewhat acrimonious discussion as Fisher (1935). Partly as a result of this broadened view, the precise nature of the concept, and hence of its history both before and after the introduction of the term, has been elusive. In these early publications (and indeed also in later ones), Fisher explained the term most clearly by describing what “ancillary statistics” accomplished rather than what they were: They supplied auxiliary information to supplement the maximum likelihood estimate. In Fisher (1935) he wrote that when the best estimate fails to use all the information in the sample, when it “leaves a measurable amount of the information unutilized,” he would seek to supplement the estimate to utilize that information as well. He asserted that “It