

Laudatio Sir David Cox

W. Schaafsma

*Rijksuniversiteit Groningen, Vakgroep Wiskunde
Postbus 800, 9700 AV Groningen, The Netherlands*

This laudatio will not be about the technical aspects of the work of Professor Cox because the context of this meeting requires a more philosophical approach. Another reason is, of course, that I have only read a small part of the 15 books and 300 papers Professor Cox has published. Finally, almost everybody in the audience knows that Professor Cox has done an enormous amount of work, that he is a wise and very kind person and that he is well-known in the scientific world, especially because of his proportional hazards model.

My philosophical introduction provides suggestions why the mathematical foundation of probability theory has largely been the result of the thinking of mathematicians from continental Europe whereas the foundation of mathematical statistics has been the work of the British, at least in the beginning. The purpose of this introduction is not to enhance these differences but to develop a spirit of mutual understanding. To fix the ideas, a figure is presented with some big names. Please do not take this serious: I am not an expert in this field. Nevertheless I hope that you will join me in thinking for a while about the differences between, on the one side, Plato and on the other Aristotle, and about the other pairs of names in this figure:

Plato (Ideas)	Aristotle (Orientation on The World)
Descartes (Rationalist)	Bacon (Empirist)
Bernoulli (Mathematician)	Newton (Alchemist)
Mainland	United Kingdom
Kolmogorov	Fisher
Induction a myth	Induction a must
	Neyman
	Van Dantzig

I shall support this figure with quotations emphasizing the special attitudes involved. My first quotation is from Jakob (i.e. James) Bernoulli. I claim that there is some German-Swiss idealism behind the following words: "If all events from now through eternity were continuously observed (whereby probability would ultimately become certainty), it would be found that everything in the world occurs for definite reasons and in definite conformity with law, and that hence we are constrained, even for things that may seem quite accidental, to assume a certain necessity and, as it were, fatefulness. For all I know that is what Plato had in mind when, in the doctrine of the universal circle, he maintained that after the passage of countless centuries everything would return to its original state".

Is it not this universal circle which we see represented in the Bernoulli monument in Paddepoel?

The next quotation is in contrast with this Bernoullian idealism. It is from Cox and Oakes and goes as follows: "In clinical practice it is quite common for information on 100 or more variables to be routinely collected in each patient, giving the statistician the unenviable task of summarizing the joint effect of these variables on survival".

This task may be unenviable, it is unavoidable as well, at least for the medical statistician because he is supposed to be the expert in this field. Here we see that induction, statistical inference is a *must*, we cannot do without it. It may be true that logical validity is unattainable in this area but Popper's statement that induction is a *myth* should not be understood in the sense that the medical statistician should not be allowed to do his work. Nevertheless, as a comment to this British wish to let the data speak, we may use Jakob Bernoulli's statement which goes as follows: "But what mortal, I ask, could ascertain the number of diseases, counting all possible cases, that afflict the human body in every one of its many parts and at every age, and say how much more likely one disease is to be fatal than another, and on that basis make a prediction of the life and death in future generations?"

The conflict I am trying to describe is that between the British empirists like Professor Cox who know and fully accept that induction is a *must*, and the mainland rationalists who follow Popper in arguing that induction is a *myth*, a mission impossible.

My personal sympathy is with the British, with the people who will try to make the inference, express the statistical uncertainties involved, etc., even if they know that they may fail and will display some lack of probabilistic coherency. People like Bayes, Galton, Pearson, Fisher, Rao, and Cox. And yet there is a reason to be concerned. In this respect we can still learn from the lecture "Mathematical and empirist foundations of the probability calculus" given by Van Dantzig in 1940 in Delft. Van Dantzig argued forcefully that by the axiomatic treatment of Reichenbach, Kolmogorov, and others, the *mathematical* problem of the foundation of probability calculus is separated from the corresponding *empirical* problem. The mathematical problem could be regarded as solved whereas the empirical problem, i.e. that of the foundation of mathematical statistics, had only been touched upon. It was clear from his

lecture that Van Dantzig wanted to follow Neyman in his attempts to develop a *nondogmatic* theory of statistics. I am sure that Professor Cox tries to establish something similar: Professor Cox is sometimes using the word *eclectic* to describe his own attitude. In 1958 he wrote, quite optimistically, about the range of solutions from which to choose: "It is very probable that in many instances investigation would show that the same answer would, for practical purposes, result from the alternative types of method one might discuss. But suppose that in a practical instance there is disagreement. What should we do?" Professor Cox more or less recommended that the variety of conclusions should be reported, together with the conditions on which they are based.

It is now forty years later. We in Groningen, at least some of us, are less optimistic about the possibility of consensus. We believe that there is a considerable number of instances where inferences are required to be of a non-trivial type and the disagreement among reasonable approaches is so large, even if the same data are evaluated, that the problem should be returned to its owner without trying to specify the range of allowable inferences: this range is too wide and too fuzzy. Discussing a less vexed situation, Van Dantzig emphasized that, nevertheless, one should choose and accept responsibility for this choice. I would sometimes prefer not to follow this advice: making a statistical inference is not the same as providing an educated guess. We statisticians are primarily involved in scientific inference, not in guessing, betting, or decision making. I am curious to see whether Professor Cox is as optimistic as he was 40 years ago.



Sir David Cox. © Alex MacNaughton. Courtesy NRC Handelsblad