Life of R A Fisher

A P Gore

R A Fisher - The Life of a Scientist
Joan Fisher Box
John Wiley & Sons, New York, 1978.
512+xii, US $26.95

Ronald Aylmér Fisher (17 February 1890-29 July, 1962) can be rightly considered the father of modern statistics. Geneticists and evolutionary biologists are often surprised to know that his basic background was in mathematical statistics and he rose to eminence first through his work on foundations of statistical inference and then on design of experiments, analysis of variance and other statistical methods.

After schooling in Harrow, Fisher went to Gonville and Caius College, Cambridge on a scholarship to become a Wrangler in 1912. He received D.Sc. from Cambridge in 1926 and F.R.S. in 1934. He was knighted in 1952. Ironically, in his entire career, Fisher never held a professorship of statistics. In 1933 he joined University College, London as professor of eugenics and in 1943 became professor of genetics at Cambridge from where he retired in 1957.

Fisher's first scientific job after teaching in schools for 5 years was at the Rothamstead Experimental Station to which he was recommended by Leonard Darwin, nephew of Charles Darwin. Here he was asked to examine long term records of wheat yields etc. and to develop new insights. He did much more. He developed an entire range of statistical methods for agricultural and other research. He trained many statisticians from all over the world and his book *Statistical Methods for Research Workers* became very popular.

The aim of statistics is to draw valid inferences from a sample. Fisher's method of maximum likelihood estimation is one of the most successful approaches to inference. He founded the branch called *design of experiments*. Until then, scientific method involved experiments in which one aspect was varied at a time and any consequent changes in response were attributed to that variation. Fisher dazzled experimental scientists by showing them how to design experiments in which many factors are changed simultaneously and how to extract valid information from them.

Right from his student days Fisher was keenly interested in the field of eugenics and hence in the new science of genetics. There were two major schools in genetics. Mendelians claimed that inheritance was particulate and predicted how different phenotypic proportions should turn out in different crosses. Traits studied by Mendelians (eye colour, hair colour, etc.) were considered trivial by the other school

lead by Francis Galton and Karl Pearson who were interested in intelligence, height, yield etc. Fisher showed convincingly that discrete and continuous traits differed only in detail but the same basic formulation explained both. This synthesis played a fundamental role in genetics as well as in evolution.

Darwin had explained that evolution through natural selection was based on phenotypic variation in a population. Fisher showed, in the fundamental theorem of natural selection, that speed of evolution was proportional to the variance in the trait of interest.

When data are large, they have to be summarized, which inevitably means loss of information. Fisher introduced a mathematical measure of this information and showed that loss of information is zero if the summary is based on the so called *sufficient statistics* developed by him.

Fisher was one of eight siblings. He collected data on thousands of British families with eight children and found that the pattern of the number of daughters and sons differed a lot from a model of throwing a coin eight times. It appears now that a better model is one in which probability of couples to have a son varies considerably.

Fisher had very poor eyesight. Hence, when he volunteered to join the British armed forces in the first world war he was rejected. An Indian agricultural statistician, Koshal had written a paper comparing favourably Fisher's method of maximum likelihood with Karl Pearson's classical method of moments. Karl Pearson, the grand old man of statistics at that time attacked Koshal venomously. The Indian Government even contemplated sacking Koshal. Fisher wrote a scathing rebuttal partly to protect Koshal and partly to point out Pearson's errors. This article is worth reading (Collected Works of Fisher, Vol. IV, paper 2).

Fisher inspired a whole generation of statisticians. He was very helpful in promoting statistics in India. He impressed upon the colonial government the need to support the endeavours of P C Mahalanobis. He was the Ph.D. guide of C R Rao, perhaps the most famous living Indian statistician today.

A peculiar feature of Fisher's life is the fact that with one of the most illustrious careers in science in this century, Fisher found himself foot-loose after retirement. He spent his last years not in his home country but in Australia where a former student looked after him.

For young statisticians, Fisher's life has two messages. Statistics cannot survive (let alone thrive) in a vacuum. One must identify a genuine problem in science or technology and develop statistical tools to solve it. Secondly, one must delve deep into the

subject matter to which statistics is to be applied. Fisher became an ecologist, evolutionary geneticist and agronomist all in one. He was a living example of interdisciplinary research. This book written by his daughter, Joan Fisher Box is inspiring reading for any budding scientist.

Suggested Reading

- Fisher, R.A., 1925 (most recent edition, 1970). *Statistical Methods for Research Workers*. Oliver and Boyd, Edinburgh.
- Fisher, R.A., 1958. *The Genetical Theory of Natural Selection*. Oxford University Press, Oxford.
- Fisher, R.A., 1935 (most recent edition, 1966). *The Design of Experiments*, Oliver and Boyd, Edinburgh.
- Fisher, R.A. and Yates, F. 1938 (most recent edition 1963). *Statistical Tables for Biological, Agricultural and Medical Research*, Oliver and Boyd, Edinburgh.
- Bennett, J.H. Ed. 1971-1974. *Collected Papers of R.A.Fisher*, Vol.1-5, The University of Adelaide.

A P Gore, Department of Statistics, University of Pune, Pune 411 007, India

Algebra, Volume I: Groups

A Good Text Book on Group Theory for Post Graduates

K N Rajeswari

Algebra, Volume-I: Groups
I S Luthar and I B S Passi
Narosa Publishing House, New Dehli
ISBN-81-7319-077-1, 1996
pp.xxxvi + 242

The basic notions in various branches of modern algebra are analogous to those in group theory. So, it is important to make group theoretical concepts and ideas as clear as possible. This book is a successful attempt in this direction. The most concrete groups such as symmetric groups and matrix groups are used as main sources of examples. Various abstract concepts are explained through these examples, making it easy for the reader to grasp them. The exposition in the book is self-contained, in the sense that it includes proofs of several useful results which are often left as exercises to the readers or even overlooked in standard books on the subject. To mention a few such instances — results of section 6 on cardinal arithmetic in preliminaries, several explicit formulae concerning symmetric groups in chapter 2.

The exposition in the book is self-contained, in the sense that it includes proofs of several useful results which are often left as exercises to the readers or even overlooked in standard books on the subject.