



## **Chance, Risk & Health**

*The Quest for Certainty*

### **Voice-over**

Despite these pioneering achievements, Fisher's work is not widely known beyond the scientific community. His perspective and insight are difficult to grasp or to explain simply, familiar obstacles for anyone who tries – the theory of maximum likelihood, for instance.

### **Alan Grafen**

If you want to draw inferences in the presence of uncertainty the first leap you have to make is to create certainty in your imagination, but not to create one certainty, you create lots of different certainties, and that's not as easy as it sounds. You have to say, well, if this were the case everything would be certain, or if that were the case everything would be certain, or the other were the case everything would be certain, an drawing up that list of possible certainties is the first stage in drawing inferences in the presence of uncertainty. The next stage is to take each possible certainty and to ask what would happen if that were true; and the next one what would happen if that were true; and the next one what would happen if that were true? And then you look at what really happened and you look back and say, well, if this were true, how likely is it that we'd see what we see now; if the middle thing was true, how likely is it that we'd see what we see now; and if the last thing was true, how likely is it that we'd see what we see now? And maximum likelihood is saying, well, which of those possible certainties makes it most likely we'd see what we saw?

### **Voice-over**

Fisher's effortless grasp of abstract ideas is reflected in his writing.

### **Anthony Edwards**

Fisher's writing is extraordinarily tense and close, partly because he would formulate his ideas in his mind, and very often dictate everything that he was to publish. His mentor, Leonard Darwin, who was Charles Darwin's fourth son, once wrote to him, "One idea per sentence is a good idea, I think. You have to think hard whilst you're reading".

### **Alan Grafen**

In this, his most famous book, *The Genetical Theory of Natural Selection*, Fisher says in the preface, "No efforts of mine could avail to make the book easy reading". We understand it better now than when he wrote it, and as biologists learn more they'll understand the book better still.

### **Voice-over**

If Fisher's giant steps of thought were ahead of his time, they were not always welcomed by his contemporaries.

### **Joan Fisher Box, R.A. Fisher's Daughter**

New ideas that are unexpected, they're difficult to assimilate, they're difficult to act on, and people get quite indignant and angry about them.

### **Alan Grafen**

You can only tell people things one step away from what they know already, and if you try to go two or three steps, you'll lose them and they get cross.

### **Anthony Edwards**

He thought so clearly himself that he had great difficulty in appreciating the lack of clarity, or as he once put it, "the dense fog in the minds of the young men around me". The rest of us suffered.

**Voice-over**

But it wasn't just his students who struggled. The intellectual giants of the day couldn't always keep up with him either.

**Michael Healy, Rothamsted, 1947-1965**

Poor Pearson who like pages and pages of algebra found that Fisher was coming along and proving his results and saying 'it is obvious that', which is enough to make anybody cross.

**Alan Grafen**

The trouble is – he was usually right – but he wasn't always so good at explaining why he was right, and people misunderstood him, he didn't always take it in good part.

**Joan Fisher Box**

He did not tolerate fools gladly, and he could be quite rude, but that is human.

**Voice-over**

The inner world of his intuition and intellect seemed at odds with the world outside. Despite his best efforts, he wasn't always good at explaining himself.

**A.W.F. Edwards, University of Cambridge**

He had this amazing analytical ability to complete long mathematical arguments in his mind without putting anything down on paper, and frequently he would produce an argument which was correct mathematically, and then not be able immediately to reconstruct how he'd arrived at that point.

**Stephen Senn, University College, London**

Fisher had brilliant insight on many matters and he often chose to explain things in an intuitive way which used a minimal amount of mathematics, and he hoped in this way that his ideas would become comprehensible to a less specialist audience, but the net result often was that the mathematicians didn't understand him either.

**Anthony Edwards**

Thinking about it in later years I had the sense that he was probably rather lonely.

**Voice-over**

While Fisher's perspective on the world may have left him out of kilter with his time the legacy of his ideas has been phenomenal; perhaps even he couldn't have dreamt of its scope.

**Alan Grafen, University of Oxford**

The value of abstraction in solving problems as Fisher did is that you begin locally with a particular problem you want to solve, but by thinking about it in a very abstract way is like a sending in to the stratosphere so that you can then solve all kinds of other problems all over the world with just the same solution as you've just achieved.