Chance, Risk & Health
Brink of a New Era

Voice-over
Car manufacture is just one of the current applications for the ideas that Fisher developed at Rothamsted. As technology advances engineers are developing new engine designs which have to take into account an increasing number of factors.

Dean Rose, Ford Motor Company
The first thing we're trying to do is produce engines which are environmentally friendly, and there's a drive at the moment for having green engines which are very efficient; the other side of the scale we're really trying to balance that with customer requirements. They're very specific about having engines which have a low fuel consumption, they're energy-efficient, and can produce as much power as possible, so it's really trying to get the balance between those major aspects of optimisation.

Voice-over
Fisher's methods for designing experiments are at the heart of the complex work of the development team, using pioneering techniques made possible only by the latest computer software.

Dean Rose, Ford Motor Company
There's no way we could do this work without computers. The number of factors which we're varying are absolutely astronomical and using traditional techniques it would take something like ninety years just to visit all of the operation points.

Voice-over
It now takes only two weeks to perform the same kind of experiment. Practical tests are used merely to verify and adjust the computer generated data, creating a virtual model of the engine's performance.

Dean Rose, Ford Motor Company
Now this is really useful for us because we can then ask the model what the engine is doing, rather than go down to the cell and retest point after point after point.

Voice-over
Computer technology means that Fisher's principles can be easily combined with other concepts of statistics. New software packages can apply the theory of maximum likelihood at the click of a mouse.

Dean Rose, Ford Motor Company
From my perspective it's really useful because coming from an engineering background I've had to pick up a lot of these statistics and the software enables someone with a fairly basic understanding of statistics to really get down to some quite state-of-the-art techniques.

Voice-over
While Fisher's contribution to the theory of statistics may ebb and flow with the tide of ideas there are reasons why his reputation has since been tarnished.

Stephen Senn, University College, London
Fisher was not perfect. He had a spectacular mistake regarding smoking and that was he decided to be clever rather than wise. When Bradford Hill and Richard Doll produced the first evidence linking lung cancer to smoking, Fisher countered that it could in fact be due to genetics.

Alan Grafen, University of Oxford
What he said was, we shouldn't pretend there's certainty when there isn't, and we shouldn't be causing mass scares to the population when actually there was room for doubt about whether or not smoking caused lung cancer. It was a very reasonable position; it was perhaps unfortunate he was funded by the tobacco companies at the time.

Voice-over
Fisher's reputation has also suffered because of his strong convictions about the practical applications of human genetics, known then as eugenics.

Clip: *Heredity in Man* (1937) Julian Huxley
"Eugenics seems to apply the known laws of heredity so as to prevent the degeneration of the race and improve its inborn qualities. Not all mental deficiency is hereditary, but heredity accounts for more of the mild-feeble-minded types, but it would have been better by far for them, and for the rest of the community, if they had never been born."

Voice-over
Though shocking now, the principles of eugenics were widely accepted at the time.

Alan Grafen, University of Oxford
Fisher had a great sense of some social responsibility. One of his earliest papers is a rather pious one called, *Some Hopes of a Eugenist*, and he thought that we ought to use genetics in lots of ways, including improving the human condition.

Joan Fisher Box
He brought home all sorts of tests for the family. Intelligence tests were being developed, he was very enthusiastic about the blood group work, eye colours, hair colours, he brought professors of ophthalmology to sort out our genetic traits as far as any genetic traits could be discriminated at the time.

Stephen Senn, University College, London
Fisher wrote a number of articles in which he described what sort of political measures could be taken to improve the eugenic stock of Great Britain, for example, providing child allowances so that the right sort of person would, in fact, have children to encourage not just the working classes, but also the middle classes to have large families.

Voice-over
Whatever we think about Fisher's views on eugenics some aspects of his hopes for the future are remarkably close to our own. After a lifetime of measuring the unmeasurable, it's only now that his vision is able to become a reality.

Alan Grafen, University of Oxford
Just as nowadays with the Genome Project there's the idea that we are on the brink of a new era in which we'll be able to use genetics to improve the human condition. Fisher believed that then.

Anthony Edwards
He was the first person to suggest, when he was Professor of Genetics in London, that if only we could develop a linkage map of man, it might be useful for disease prognosis, and in that sense he and his colleagues at University College in the 1930's are the parents of the Human Genome Project.

Voice-over
Fisher died in 1962, but he had foreseen the far-reaching potential of combining statistics and genetics in the search for certainty. It's this creative synthesis which proved most fruitful during his time at Rothamsted that carries on today.

Richard Durbin, Sanger Centre
I feel tremendously privileged to be involved in sequencing the Human Genome, and I think everyone who works as part of the project feels the same way. Just as Rothamsted was at the cutting edge of collecting genetic data in the 1920's and 1930's, the Sanger Centre is the cutting edge of collecting genetic data now, in the new Millennium. We know we are producing something that is going to be a foundation for biological science from now on for the next thousand years, and five thousand years.

Voice-over
From a deep understanding of who we are, to the way we live our lives, statistics has a crucial role in our future, thanks in large part to the work of R.A. Fisher.

Stephen Senn, University College, London
Fisher could hardly have dreamt how his ideas would be used today.

Alan Grafen, University of Oxford
His influence is so pervasive that everything you do in statistics, and everything you do in evolution biology, can really be said to be Fisherian.

Joan Fisher Box
He was a genius of course. He followed his own bent.