Edmund Brisco Ford (1902–1988)

EDMUND Brisco ("Henry") Ford FRS died in Oxford, where he had worked all his life, on 22 January, aged 86. He had been Professor of Ecological Genetics at the University and was a Fellow of All Souls College, where he had served two terms as Senior Dean.

He had two outstanding achievements. First, he founded ecological genetics, demonstrating that the brilliant statistical methods and theoretical predictions of Fisher and Haldane could be used and tested in nature as well as in the laboratory, and the Lepidoptera constituted his main experimental material. Second was his concepton of balanced polymorphism applied to the study of evolution in the wild. On both topics, which were interrelated, he wrote with marvellous clarity and was the supreme example of the benefits to a scientist of a classical education.

As a boy, Henry and his father, H.D. Ford, observed each season a colony of the Marsh Fritillary butterfly in Cumberland in the north of England. The numbers fluctuated greatly and during periods of rapid increase there was an extraordinary outburst of variability in pattern. When the population decreased again the common form was recognizably distinct from that which had prevailed before the period of abundance. An opportunity for evolution had occurred and the insect had made use of it.

A similar principle was used later in detailed studies on the frequency of the heterozygote *medionigra* of the Scarlet Tiger moth, *Panaxia dominula*, and on spot number in the Meadow Brown butterfly, *Maniola jurtina*. By this time Henry had devised elaborate techniques of mark-release-recapture, which enabled his team to estimate changes in frequency of particular forms, and of the genes controlling them, and to assess migration.

Ford was the first to predict that the polymorphic human blood-group systems would influence susceptibility to disease. The associations of cancer of the stomach and group A, and of duodenal ulcer and group O, bore this out. In the sickle-cell haemoglobinopathy the advantage of the heterozygote was excellently demonstrated as it protected children against malaria.

In his later years Ford became interested in the genetics of the Gypsy moth, *Lymantria dispar*. Using the heteropyknotic body technique, he and C.A. Clarke showed that Goldschmidt was wrong in thinking that unusual ratios in race crosses of the moth were the result of complete sex reversal. In fact the all-male broods were fully fertile and simply the result of the Haldane effect.

Henry had a gift for picking good research workers and then giving them their heads. H.B.D. Kettlewell throve on the Peppered moth and industrial melanism; Arthur Cain excelled on the snail *Cepaea nemoralis*, demonstrating that natural selection by predators acted on a colour polymorphism; and Philip Sheppard concentrated on the evolution of mimicry, particularly in the Swallowtail butterfly *Papilio dardanus*, on which Ford's monograph was the Bible. But there was more to come: Sheppard applied Ford's suggestion about the human blood groups to the Rh (rhesus) system, and with researchers at the Department of Medicine at Liverpool University found a method of preventing Rh haemolytic disease of the newborn. It was for this type of work that the Nuffield Foundation, of which Henry was a trustee, set up the Unit of Medical Genetics there, and it was a nice quirk that in the Rh polymorphism the heterozygote does not obey the rules, for it is always at a disadvantage.

Henry's interests were very wide; he was an expert on archaeology and heraldry and with J.S. Haywood he wrote *Church Treasures in the Oxford District*. On genetics and ecology his many books are classics: *Mendelism and Evolution*; *The Study of Heredity*; *Genetics for Medical Students*; *Butterflies*; *Moths*; *Ecological Genetics*; *Genetic Polymorphism*; *Genetics and Adaptation*; *Understanding Genetics* and *Taking Genetics into the Countryside. Butterflies*, to his astonishment, was a best-seller.

Oxford has produced many eccentrics, but few in the same class as Henry. Though a very faithful and generous friend of people he liked, he froze those of whom he disapproved, and his attitude to women (he was unmarried) was well exemplified at one of his lectures when only female students turned up: "Since there is no one here, there will be no lecture". We shall never see his like again. **Cyril Clarke**

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100 years ago

MR. SHELFORD BIDWELL is continuing his admirable researches on the changes produced by magnetism in the lineal dimensions of the different magnetic metals. He finds that iron, which first expands with the magnetizing force, soon reaches a maximum point, whence it retracts until it attains its original length; but, on still further increasing the magnetizing force, it contracts until it apparantly reaches a minimum point, beyond which his means have not enabled him to proceed. His apparatus was so sensitive that he could read a variation of one hundred-thousandths of a millimetre.

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Daedalus

Vehicular spectroscopy

MOTOR vehicles are notoriously unreliable. They all need regular servicing, and some countries impose an annual roadworthiness test for every vehicle. So Daedalus is seeking improved diagnostic methods. Every solid object has a huge set of mechanical resonances, amounting to a detailed 'signature' of its total structure. DREADCO's engineers are coupling an experimental car to an electromechanical frequency-generator, and sweeping this through a wide range of frequencies from sub-audio to ultrasonic. The vibrational amplitude and phase excited at many points of the vehicle are recorded by piezoelectric transducers. The whole test takes only a few minutes.

The resulting mechanical spectrum is then compared by computer to the one established for a perfect car of that make and model. Mass-production is so consistent that even small deviations from the standard will indicate some sort of anomaly, though detailed knowledge will be needed to distinguish between some harmless dimensional variation and a dangerous deficiency. Each part of the spectrum will tell its own story. The lower frequencies will be dominated by whole-body torsions and panel resonances, thus revealing the condition of the bodywork. A rusty area at a vibrational antinode, for example, would raise the relevant frequency; at a node it would lower it. The higher frequencies will give information about the more massive and rigid components, for example, the engine block and drive train. The amplitudes of some frequencies will be sensitive to mechanical damping, as contributed by shock-absorbers, underseal and so on. Overtones at any frequency will crucially reveal non-linearities, caused by the rattling of loose bolts, the opening and closing of tiny cracks, or the slapping of worn bearings. Comparisons with spectra recorded at previous services would show up such deteriorations even more sharply.

Thus all exploratory grubbing-about will be mercifully ended, and mechanics will spend all their time rectifying faults that are clearly indicated. So accurate is frequency-measurement that nothing can be overlooked; once the spectrum agrees with specification, the proud owner will be able to drive away in a 'spectroscopically pure' car. But, says Daedalus, modern instrumental methods permit still greater elegance. Continuous-wave spectroscopy could with advantage be replaced by fast-Fourier techniques. In this method of instant diagnosis, the wired-up vehicle will simply be given a single heavy blow, and the full vibrational spectrum will be reconstructed from the dying echoes by Fourier transformation. David Jones