

Guido Pontecorvo: An obituary*

On 24 September, the well-known geneticist Guido Pontecorvo, aged 91 years, died after a fall while walking in the Swiss Alps. Pontecorvo, known to his friends as Ponte, was one of a select group of geneticists who made their mark in the decade before the structure of DNA was discovered. Born into a prominent Jewish family in Pisa, Pontecorvo was the eldest of eight children. Among his brothers were the particle physicist Bruno and the film-maker Gino.

Pontecorvo studied at the University of Pisa, and worked in the Agricultural Research Institute at Florence. Then, in 1938, the rise of Hitler and the gathering clouds of war in mainland Europe forced Pontecorvo to emigrate to Edinburgh where he joined the American geneticist H. J. Muller. In the preceding years Muller had worked in the Soviet Union helping Vavilov develop genetics there but left after the rise of Lysenko. His life-long interest was in the nature of the genetic material, a problem that had begun to attract physicists and chemists. In Edinburgh, Muller had started a group which met regularly in the Institute of Animal Genetics to discuss gene structure and function. Among the younger members of this group were Pontecorvo and Charlotte Auerbach who discovered chemical mutagenesis. Ponte has described Muller's meetings as a gathering of refugees – 'Max Born, the theoretical physicist, a refugee from Hitler and Muller himself a refugee from Texas and Lysenko'. In 1941, Ponte became a lecturer in Zoology at Glasgow University, where he began his work on the fungus *Aspergillus nidulans*. Four years later he was made head of the newly created Genetics Department.

Among Pontecorvo's contributions to genetics, two in particular stand out. First, he discovered the parasexual cycle in fungi. In this process, haploid nuclei which contain half the normal amount of genetic material in vegetative cells fuse to become diploid. The consequences are similar to what happens in sexual reproduction, crossing over and

recombination of genes. Pontecorvo realized that this phenomenon could be used to figure out the arrangement of genes on chromosomes. He and his colleagues Alan Roper and Ted Forbes developed methods of genetic analysis that were forerunners of modern cell genetics. J. B. S. Haldane has called this an 'alternative to sex', which frees genetics from the constraints of biparental reproduction. Ponte turned to human genetics in the late 1950s. 'When I was appointed to my first tenured job,' Ponte recalled, 'I went to see the Dean of Medicine to ask what he wanted me to do'. The Dean's answer was shattering: 'Is there one thing in genetics



which is of any use to medicine?' This set Ponte thinking. Classical genetics, even if it were possible, would be too slow to be of any use, and some way of bypassing sexual reproduction would have to be found. Of course, that had been worked out fully in *Aspergillus*. But humans were a different matter. Nonetheless, Pontecorvo outlined his strategy before the CIBA Symposium in 1958, and set about the project in his own laboratory. Success was not easy. A crucial advance was the successful fusion of human cells with mouse cells, achieved by Mary Weiss and Howard Green. Also important were molecular techniques that allowed chromosomal

changes to be visualized and recombinant cells to be selected. In the end, the success of parasexual human genetics was spectacular. In 1984 Pontecorvo was able to say, 'human genetics, from being a Cinderella of genetics, has become its frontier'. He will be remembered as one of the founders of this field.

Pontecorvo's second important contribution is his work on the structure and organization of genes. The accepted picture of a gene in the 1920s and 1930s was that of a particulate indivisible entity like beads strung along a thread. Muller had questioned this view, and warned that different attributes of a gene may not reside in the same unitary element. Pontecorvo pursued this idea. He saw that the recombinant selection methods of microbial genetics were powerful enough to separate the elements of a gene by intragenic crossing over. In a paper published in 1952, Ponte pointed out that different operational definitions of a gene, function recombination or mutation, need not refer to the same entity. He carried out experiments with a number of genes in *Drosophila* and *Aspergillus* and came to the conclusion that intragenic recombination is a universal property of all genes and that the gene as a functional unit could be 'a segment of the chromosome stretched over a considerable length'.

The picture of a gene as an array of recombinable elements was vindicated when the structure of DNA was discovered by Watson and Crick in 1953 and the elegant work of Seymour Benzer on the *rII* gene of bacteriophage which followed. The linear structure of DNA was there for all to see, but Pontecorvo reminded his audience at the Cold Spring Harbor Symposium of 1956 that the boundaries between neighbouring genes may be gradual or overlapping, as Muller and Goldschmidt had suggested. This was borne out by the discovery of overlapping genes on the two strands of DNA.

Pontecorvo was a man for ideas. He believed that 'in no area of biology have ideas arisen so often in advance of times as in genetics or its offshoot, molecular biology' and this to him was the greatest

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fascination of the field. He was a staunch believer in working at the bench. In Glasgow, his professorial office was a small desk in a one-room laboratory. He took pride in the fact that the place was managed by a 'part-time secretary and a waste-paper basket'. When Michael Stoker invited him to join the Imperial Cancer Fund's Laboratory in London, he said, 'the answer is yes, provided the laboratory is small enough and there are no assistants'. Ponte moved there in 1968 and continued to work with members of ICRF well into the 1990s.

Pontecorvo received his share of honours and awards, too many for me to

recount here, but above all these was the respect and affection in which he was held by his friends and admirers all over the world. He was an Honorary Fellow of the Indian Academy of Science and came to Bangalore in 1982 as Raman Professor of the Academy where he also delivered the Gandhi memorial lecture.

At heart Pontecorvo was a radical and a non-conformist. He had no use for the pompous and the pretentious. At the same time he was warm and friendly, and a source of much sound advice and practical wisdom to inexperienced younger colleagues. While growing up in Italy, Pontecorvo belonged to a group

of avid mountaineers, which included his close friends the physicists Enrico Fermi, Emilio Serge and Franco Rasetti. His love for mountains and flowers remained a life-long passion. Pontecorvo spent the summers in the Alps and took every opportunity to explore high mountains in other countries. In the end, the Alps claimed him.

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MEETINGS/SYMPOSIA/SEMINARS

Short-term Course on the Global Positioning System & its Applications

Date: 9–19 May 2000
Place: Mumbai

A short-term training course, sponsored by the DST on the above topic will be conducted at IIT, Bombay. The objective of the course is to provide theoretical and practical background, including hands-on training, to a few prospective candidates on the use of the Global Positioning System for various applications, with emphasis on geodetic applications related to Earth Sciences, like Crustal Deformation Studies, Precise Positioning, etc.

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Workshop on Plume Tectonics

Date: 13–14 June 2000
Place: Hyderabad

A workshop is being organized by the DST at NGRI to assess various geo-data sets in light of plume tectonics and to develop a multidisciplinary approach on this aspect with special emphasis on the Indian plate.

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