Songs in the key of life

J. S. Jones

Exons, Introns, and Talking Genes: The Science Behind the Human Genome Project. By Christopher Wills. *Basic Books*: 1991. Pp. 288. \$23 (United States), \$30 (Canada), £23.

The Lottery of Life: The New Genetics of the Future of Mankind. By Philippe Frossard. *Bantam*: 1991. Pp. 252. £14.99.

The Human Blueprint: The Race to Unlock the Secrets of Our Genetic Script. By Robert Shapiro. *St Martin's*: 1991. Pp. 432. \$24.95.

THE world's most boring book will be the complete sequence of the human genome: three-thousand-million letters long, with no discernible plot, thousands of repeats of the same sentence, page after page of meaningless rambling, and the occasional nugget of sense — usually signifying nothing in particular. The manuscript should be finished by the year 2005, and the first copy will cost a great deal — about the same, in fact, as a Trident nuclear submarine. All of us who have to explain to students just how long the genetic message is are forced to fall back on analogies: the genome is like so many copies of the *Encyclopaedia Britannica*, the *Oxford English Dictionary* or the Manhattan telephone book. Soon there will be another standard of comparison: putting all the popular works about the human genome project next to each other should, before long, form a shelf of volumes about the same length as the genetic message itself.

These three books are among the first of what will no doubt be an enormous *oeuvre*. Each is good in its own way, and each is impressively up to date (which means that each will soon be comprehensively out of date). They differ in emphasis, as do the expectations of those involved in sequencing. Wills is best: he gives a full, clear and attractively written account of the medical and ethical implications of the human genome project. Frossard (who works for a biotechnology company) is much concerned with its commercial implications, whereas Shapiro — a proponent of the 'little did he realize' school of historical writing — ranges widely through the past, present and future of genetics. Each has plenty of local colour, with interviews with many of those eminent in the field in their native habitats, although English readers may be baffled as to which moors Shapiro saw from Fred Sanger's laboratory in Cambridge.

There is a certain relentless optimism in all three. Each author assumes that it may one day be possible to cure genetic disease, ignoring much of the history of modern medicine, which has been far more successful at alleviating symptoms than producing cures. Wills, in particular, holds out high hopes for genetics: his

introductory chapter is a vivid account of how technology may soon help the brain-damaged child of a crack addict by persuading neurons to de-differentiate and regenerate themselves with the help of nerve growth factors — paying special

attention, of course, to those that increase IQ. Given that the United States, where this exciting future is promised, has a pattern of childhood mortality more characteristic of developing countries, one may wonder whether it would be more efficient to spend the money on improving a society that produces addicted children in the first place.

There is some interesting politics of science here too. The arguments among the government agencies involved in funding are spelt out in detail, together with some of the notably sordid commercial involvement. Frossard describes how Genentech offered stock to the chairman of the committee supervising a clinical trial, while his own company pursued the gene responsible for Alzheimer's disease largely because "the management was very greedy at the time". Although some fortunes were made — Robert Swanson and Herbert Boyer, who set up Genentech with \$1,000 capital in 1978, were each worth \$66 million by 1980 — biotechnology produced more South Sea Bubbles than Southern blots, with more than four-hundred companies founded in the United States, only a few of which

ever did anything useful.

The new genetics will produce plenty of ethical and legal problems. There are already quarrels about patenting segments of the human genome, about who owns the frozen embryos when a marriage breaks up, and about whether physicians are liable to pay damages to the parents for failing to predict the birth of an abnormal child. Whether the problems quite justify some of the more outrageous statements made by molecular geneticists is not clear. Irwin Chargaff, one of the founders of the subject, described the patenting of human genes as "a molecular Auschwitz, in which genes are extracted rather than gold teeth", while Watson himself (the one who appeared Before Crick) is quoted by Shapiro as threatening to aim nuclear missiles at Tokyo because the Japanese will not pay their fair share for sequencing the human genome.

The human genome project is a classic case of goal-directed research of the kind that put men on the Moon. Thirty years later, the general perception of the Apollo project is — so what? Genome research seems safe from such retrospective damnation. After all, it has already found the gene that makes me male, and is well on the way to finding the one that makes us all grow old and even, if you believe the optimists, to alleviating the symptoms of decay with a judicious dose of genetically engineered growth hormone.

The plan to sequence the human genome has been relentlessly hyped. There are some absurd predictions of what it can do. Those of Frossard, Shapiro and Wills are no exception. Once we have sequenced ourselves, we will know, apparently, which wine to buy, whether to learn a musical instrument and even whom to sleep with. The gene sequencers are pursuing the ultimate reductionist programme: to understand the message, we just have to put all the letters in order. There is an opposing view which suggests that, having sequenced the genome, we may be in the position of a nonmusician faced with the score of Wagner's *Ring* cycle: many pieces of information, apparently making no sense at all, but in fact containing an amazing tale — if only we knew what it meant. None of these books tells us this, but each of them is worth reading for what it says about the first bars of the first act of HUGO, the human genetic opera. □

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■ *The Human Genome Project: Cracking the Genetic Code of Life* by Thomas F. Lee has just been published by Plenum, \$24.50.