

# A look at what's in the genes

## NON-FICTION

THE GENOME GENERATION. By Elizabeth Finkel  
Melbourne University Press. 274pp. \$32.95.

Reviewer: FRANK O'SHEA

In 2001, after a massive worldwide undertaking costing almost \$4 billion, scientists read the entire human genome. All three billion letters of it, give or take a few million: GTT, AGT, GCT, TCA, CTC . . . Today, in a mockery of Moore's rule for the reduction of costs in technology, there are companies which will do the same job for a few thousand dollars; give it another few years and every child could have its genome read for \$100, possibly covered by Medicare.

This leads to the uncomfortable feeling that since many of our abilities, traits and illnesses are genetic in nature, reading our genome would be spelling out our future like a weather forecast. You have a 60 per cent chance of diabetes, a 32 per cent chance of bipolar disorder, less than 0.01 per cent chance of Huntington's disease, an 84 per cent chance of heart disease . . . and a life expectancy of 48 years. To know your genome is to know your destiny.

That was the scenario imagined with varying measures of alarm or glee by novelists, insurance companies and those who felt that science had gone too far (this time). In fact, as this book points out, the situation is not nearly as clear-cut as it might appear. It turns out that while some character traits or medical conditions are determined by a small number of genes, the great majority are due to a combination of genes colluding.

For example, in a huge worldwide hunt for the genes that determine height, the best that geneticists could do was to identify between 10 and 13.5 per cent of those genes; the remainder are scattered throughout the three billion other letters of the genome. There is a theory that such traits are determined by a number of large collections of such genes (nuggets) rather than by scattered individuals (gold dust), but in either case, we are no nearer to being able to predict future basketball players or lineout jumpers.

The author has an intriguing chapter on a cautious

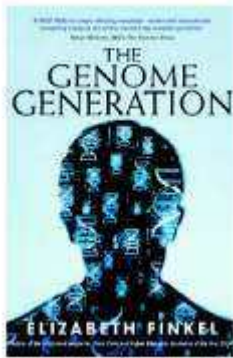
modern revival of Lamarckism. Lamarck believed that some aspects of the way we use our bodies are passed on to our children. Writers like Shaw and Koestler felt that this view of humanity was more attractive than the nihilism of Darwin. In the heyday of Stalinism, Russian science also promulgated it as a science that was more amenable to their world view that people could progress by personal effort rather than by inherited privilege.

However, one of the basic tenets of genetics is that the germ cells (ovum and sperm) are shielded from any changes that arise in the body owing to external factors. You may build up a resistance to tuberculosis, for example, but you cannot pass it on to your offspring; to claim otherwise is to risk the same derision as creationists or doctrinaire Stalinists.

But now we are not so sure, and there are experiments suggesting that Lamarck may not have been as wrong as was thought. Water fleas exposed to predators grow protective head shields and give birth to offspring born with these shields (the change is lost after a few generations). Pregnant mice fed folate give birth to healthier babies whose offspring are also healthier. There are even results in human populations which suggest similar effects, if not with quite as much clarity.

The author devotes a chapter to HIV and the successes that have come in dealing with it through understanding its genetic makeup and the mechanisms it uses to enter the body. The problem is particularly acute in southern Africa. Twenty years ago, Botswana was one of the most successful countries in that continent with average life expectancy of 65 years. Ten years later that figure had fallen to about 50 and there were United Nations forecasts that it would soon fall below 40; that it has not done so is partly down to work on HIV supported by bodies such as the Bill Gates Foundation.

Where HIV infection affects typically less than 1 per cent of the population in other countries – including the



notoriously poor and unstable countries of sub-Saharan Africa – it is 23 per cent in South Africa, Botswana and Lesotho; moreover, it affects women more than men and is primarily associated with heterosexual contact. Research suggests that those geographical areas may have been struck with a particularly virulent strain of the virus or, more disturbingly, that there is something in the genetic makeup of the population that

makes them particularly susceptible to it.

The chapter titled "Feeding Nine Billion" recounts the efforts being made by geneticists to improve the yields of rice and wheat. Much of that work is based at the CSIRO Plant Phenomics Centre here in Canberra under Bob Furbank.

The final chapter looks at attempts to understand evolution. Prior to the genomics era, it was assumed that the first creatures to climb out of the primordial mud had a very simple set of genes. It turns out that this is not the case: we have about the same number of genes as the roundworm and only about one-third more than the humble fruit fly. In fact, recent research at James Cook University in Townsville shows that the most primitive animals – sponges and coral, for example – have as many genes as humans and in some cases, more sophisticated tools with which to operate on them. "In future, any bizarre finding in my lab will always be treated with respect, even though it does not make much sense," one geneticist is quoted as saying.

The book contains a number of endorsements from prominent scientists, including Nobel Prize winner Peter Doherty, and for once their encomiums are thoroughly deserved. It is a fascinating look into genetics, a book that can be read with equal benefit by the general reader or the expert in the field. With 50 pages of references, some as recent as 2011, there is plenty of material for further investigation. Written in a breezy and engaging style, this is science writing of the highest order.

• Frank O'Shea is a retired teacher.

