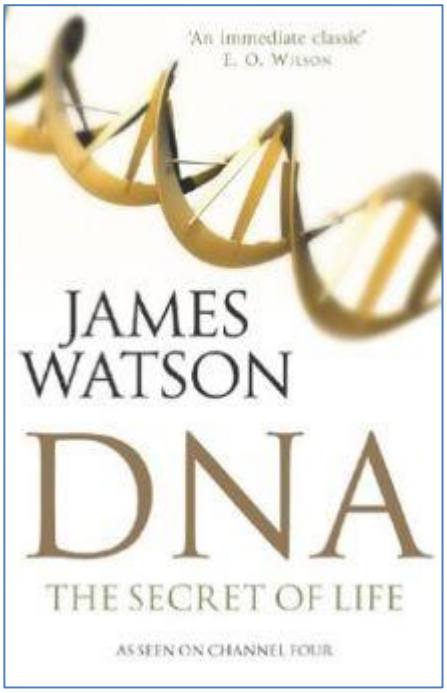
DNA The Secret of Life, James D Watson with Andrew Berry, Arrow Books, London, 2004

New edition update*: A revised and updated version of this book was published in 2018. Continuing the strengths of the 2004 edition it has been revised to include gene editing and epigenetics and new chapters on personal genomics (chapter 8) and a new final chapter on cancer research. The 2004 edition still retains relevance and should be now available at bargain basement prices!!*



This is an ideal book for school students (and their teachers). James Watson is a talented scientific communicator and writes in a way that makes the science readily accessible to school students and the interested lay person. Although written with a ghost writer (Andrew Berry) and with the assistance of others it retains Watson's clarity of style and purpose. It was first published in 2003 as part of the celebrations to mark the 50th anniversary of the publication of Watson and Crick's 1953 paper on the structure of DNA. There is an associated series of five one hour TV programmes originally shown on Channel 4, some of which can be sourced on YouTube. An internet search may well also produce a pdf copy of this book.

Watson sets out to recount the progress made in our understanding of DNA in the last fifty years. In doing so he not only reveals the insights gained into fundamental biological processes but also the impact it has had on medicine, agriculture, economic activity and the law. As he says "DNA is no longer a matter of interest only to white-coated scientists; it affects us all". The book is written in chronological order starting in chapter 1 with a history of genetics. This should help students see the often difficult to conceptualise link between the appearance and behaviour of chromosomes and the structure and replication of DNA. Chapter 2 is an account of the discovery of the structure of DNA - in many ways a summary of his book *The Double Helix*. It describes the available evidence that was available on DNA, attributing the scientists who discovered it and shows how he and Crick used all the available evidence to come up with the double helix structure of DNA. Chapter 3 is about 'cracking the code' of DNA and the DNA → RNA → protein 'central dogma' of protein synthesis. Chapter 4 is about the molecular technology of manipulating and transforming DNA; the ability to cut, copy and paste DNA sequences and the development of methods of sequencing DNA that led to the discovery of protein coding sequences (exons) interspersed with non coding sequences (introns) of genes.

The remainder of the book deals with real life applications of this DNA science. Chapter 5 deals with the production of human proteins (e.g. insulin) in genetically transformed cells to be used as pharmaceuticals in medical treatments. This leads to a discussion of the ins and outs of patenting biological processes and products and the impact that has on research to develop new medical treatments. Chapter 6 considers the use of GM technology to introduce genes to food crops that improve nutritional quality, pest resistance and herbicide resistance along with their safety and environmental impact. In chapter 7, genome sequencing focuses on the human genome project and the role genetic and physical mapping played in establishing a framework of genes for different sequencers to work on. This is then compared to Venter's 'whole genome shotgun' approach. The advantages of PCR over DNA cloning methods for amplifying sequences are also compared. Chapter 8 looks at the wide variation and repeated sequences of the non protein coding sequences of the genome compared to the highly conserved protein coding genes. The contribution of gene regulation to evolution through regulatory proteins switching genes on and off, alternative splicing and post translation modification are all considered as well as the role of mobile elements or' jumping genes'. Chapter 9 shows how evolution (and in particular human evolution) can be tracked through DNA and protein sequencing. The 'molecular clock' can be used to determine the date of common ancestors and the specific gene mutations and 'bottlenecks' that can result in rapid evolutionary change. Chapter 10 describes a variety of instances of the use of counting the number of 'short tandem repeats' (STRs) on multiple regions of DNA amplified by PCR from a number of chromosomes to provide a 'genetic fingerprint'. Chapter 11 deals with the research to locate the genes responsible for a number of conditions such as Huntington, Duchenne muscular dystrophy, cystic fibrosis and the BRAC 1 and 2 genes for breast cancer. It describes the use of human pedigrees and linkage mapping using RFLIP markers to locate these genes to specific regions of a chromosome. Chapter 12 deals with the treatment and prevention of the genetic disorders mentioned in chapter 11 as well as phenylketonuria (PKU), Down syndrome, fragile X, sickle cell anaemia and Tay-Sachs. Treatment methods, the risks and ethics of genetic testing and the potential of gene therapy and stem cell treatment are all discussed. Finally Watson deals with Nature vs. Nurture. Here he challenges 'liberal orthodoxy' as being intolerant of genetic research that investigates differences between human groups that potentially could be misused to support racist or discriminatory views – an approach that has caused Watson himself considerable personal criticism.

Overall this book matches up well with the ground covered in both Higher Biology and Higher Human Biology. Because of its chronological approach it also makes it a useful refresher for teachers moving from teaching the previous Higher courses to the revised CfE versions. It makes evident where the previous courses stopped in terms of what is known about DNA and the progress that had to be made (and perhaps still has to be made) in bringing these courses up to date.