

# So you are considering A level Biology?

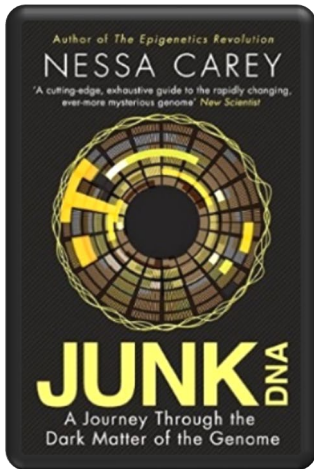
This pack contains a programme of activities and resources to prepare you to start A level in Biology in September. It is aimed to be used after you complete your GCSE throughout the remainder of the Summer term and over the Summer Holidays to ensure you are ready to start your course in September.



<https://www.distance-education-academy.com/wp-content/uploads/2013/06/biology-a-level-course.jpg>

## Book Recommendations

Kick back this summer with a good read. The books below are all popular science books and great for extending your understanding of Biology

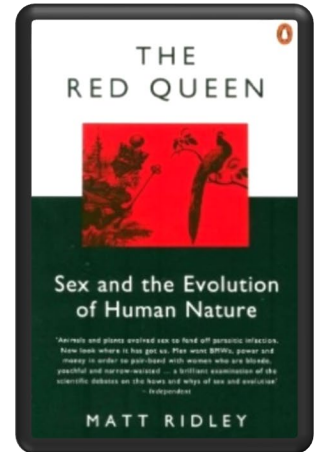


### Junk DNA

Our DNA is so much more complex than you probably realize, this book will really deepen your understanding of all the work you will do on Genetics. Available at [amazon.co.uk](http://amazon.co.uk)

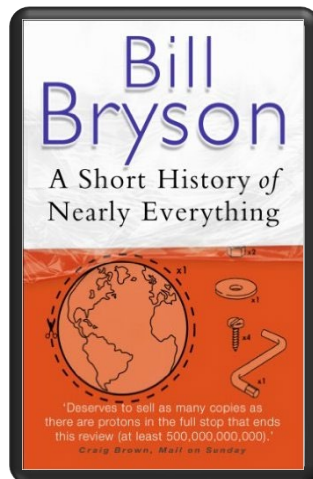
### The Red Queen

Its all about sex. Or sexual selection at least. This book will really help your understanding of evolution and particularly the fascinating role of sex in evolution. Available at [amazon.co.uk](http://amazon.co.uk)



### A Short History of Nearly Everything

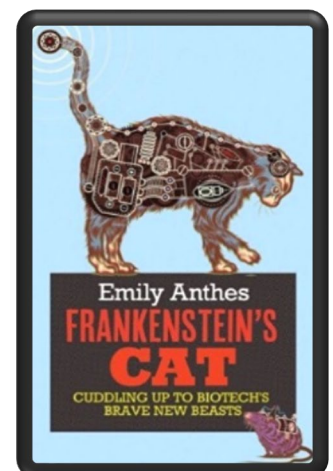
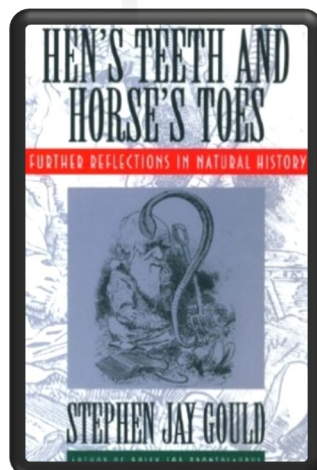
A whistle-stop tour through many aspects of history from the Big Bang to now. This is a really accessible read that will re-familiarise you with common concepts and introduce you to some of the more colourful characters from the history of science! Available at [amazon.co.uk](http://amazon.co.uk)



Studying Geography as well?

### Hen's teeth and horses toes

Stephen Jay Gould is a great Evolution writer and this book discusses lots of fascinating stories about Geology and evolution. Available at [amazon.co.uk](http://amazon.co.uk)



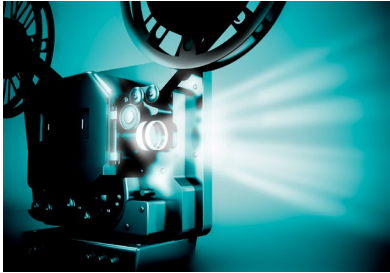
An easy read..

### Frankenstein's cat

Discover how glow in the dark fish are made and more great Biotechnology breakthroughs. Available at [amazon.co.uk](http://amazon.co.uk)

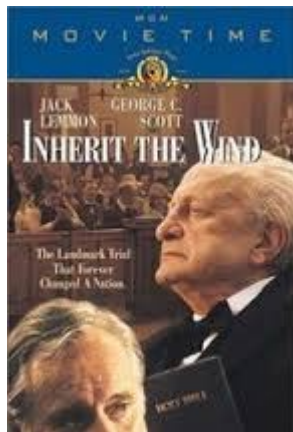
## Movie Recommendations

Everyone loves a good story and everyone loves some great science. Here are some of the picks of the best films based on real life scientists and discoveries. You won't find Jurassic Park on this list, we've looked back over the last 50 years to give you our top 5 films you might not have seen before. Great watching for a rainy day.



### Inherit The Wind (1960)

Great if you can find it. Based on a real life trial of a teacher accused of the crime of teaching Darwinian evolution in school in America. Does the debate rumble on today?



### Gorillas in the Mist (1988)

An absolute classic that retells the true story of the life and work of Dian Fossey and her work studying and protecting mountain gorillas from poachers and habitat loss. A tear jerker.



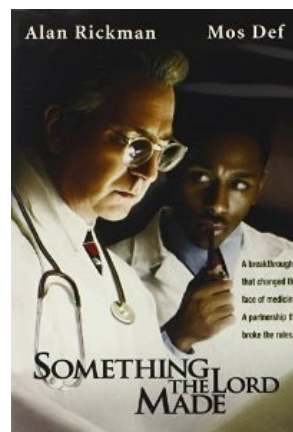
### Andromeda Strain (1971)

Science fiction by the great thriller writer Michael Crichton (he of Jurassic Park fame). Humans begin dying when an alien microbe arrives on Earth.



### Lorenzo's Oil (1992)

Based on a true story. A young child suffers from an autoimmune disease. The parents research and challenge doctors to develop a new cure for his disease.



### Something the Lord Made (2004)

Professor Snape (the late great Alan Rickman) in a very different role. The film tells the story of the scientists at the cutting edge of early heart surgery as well as issues surrounding racism at the time.

There are some great TV series and box sets available too, you might want to check out: Blue Planet, Planet Earth, The Ascent of Man, Catastrophe, Frozen Planet, Life Story, The Hunt and Monsoon.

## Movie Recommendations

If you have 30 minutes to spare, here are some great presentations (and free!) from world leading scientists and researchers on a variety of topics. They provide some interesting answers and ask some thought-provoking questions. Use the link or scan the QR code to view:

### **A New Superweapon in the Fight Against Cancer**

Available at :

[http://www.ted.com/talks/paula\\_hammond\\_a\\_new\\_superweapon\\_in\\_the\\_fight\\_against\\_cancer?language=en](http://www.ted.com/talks/paula_hammond_a_new_superweapon_in_the_fight_against_cancer?language=en)

Cancer is a very clever, adaptable disease. To defeat it, says medical researcher and educator Paula Hammond, we need a new and powerful mode of attack.



### **Why Bees are Disappearing**

Available at :

[http://www.ted.com/talks/marla\\_spivak\\_why\\_bees\\_are\\_disappearing?language=en](http://www.ted.com/talks/marla_spivak_why_bees_are_disappearing?language=en)

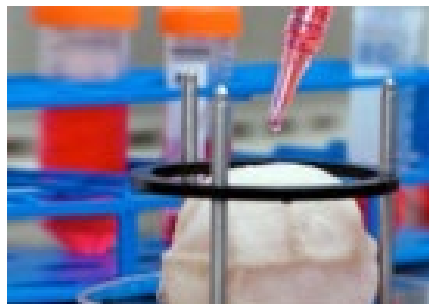
Honeybees have thrived for 50 million years, each colony 40 to 50,000 individuals coordinated in amazing harmony. So why, seven years ago, did colonies start dying en-masse?

### **Why Doctors Don't Know About the Drugs They Prescribe**

Available at :

[http://www.ted.com/talks/ben\\_goldacre\\_what\\_doctors\\_don\\_t\\_know\\_about\\_the\\_drugs\\_they\\_prescribe?language=en](http://www.ted.com/talks/ben_goldacre_what_doctors_don_t_know_about_the_drugs_they_prescribe?language=en)

When a new drug gets tested, the results of the trials should be published for the rest of the medical world — except much of the time, negative or inconclusive findings go unreported, leaving doctors and researchers in the dark.



### **Growing New Organs**

Available at :

[http://www.ted.com/talks/anthony\\_atalla\\_growing\\_organs\\_engineering\\_tissue?language=en](http://www.ted.com/talks/anthony_atalla_growing_organs_engineering_tissue?language=en)

Anthony Atalla's state-of-the-art lab grows human organs — from muscles to blood vessels to bladders, and more.

## Research activities

The Big Picture is an excellent publication from the Wellcome Trust. Along with the magazine, the company produces posters, videos and other resources aimed at students studying for GCSEs and A level.

For each of the following topics, you are going to use the resources to produce one page of Cornell style notes.

Use the links of scan the QR code to take you to the resources.

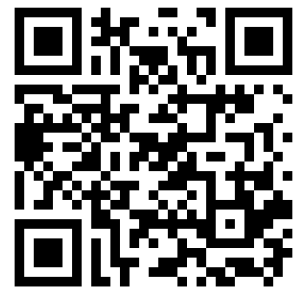
# BigPicture



### Topic 1: The Cell

Available at: <http://bigpictureeducation.com/cell>

The cell is the building block of life. Each of us starts from a single cell, a zygote, and grows into a complex organism made of trillions of cells. In this issue, we explore what we know – and what we don't yet know – about the cells that are the basis of us all and how they reproduce, grow, move, communicate and die.



### Topic 2: The Immune System

Available at:

<http://bigpictureeducation.com/immune>

The immune system is what keeps us healthy in spite of the many organisms and substances that can do us harm. In this issue, explore how our bodies are designed to prevent potentially harmful objects from getting inside, and what happens when bacteria, viruses, fungi or other foreign organisms or substances breach these barriers.



### Topic 3: Exercise, Energy and Movement

Available at:

<http://bigpictureeducation.com/exercise-energy-and-movement>

All living things move. Whether it's a plant growing towards the sun, bacteria swimming away from a toxin or you walking home, anything alive must move to survive. For humans though, movement is more than just survival – we move for fun, to compete and to be healthy. In this issue we look at the biological systems that keep us moving and consider some of the psychological, social and ethical aspects of exercise and sport.



#### Topic 4: Populations

Available at:

<http://bigpictureeducation.com/populations>

What's the first thing that pops into your mind when you read the word population? Most likely it's the ever-increasing human population on earth. You're a member of that population, which is the term for all the members of a single species living together in the same location. The term population isn't just used to describe humans; it includes other animals, plants and microbes too. In this issue, we learn more about how populations grow, change and move, and why understanding them is so important.



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#### Topic 4: Populations

Available at: <http://bigpictureeducation.com/health-and-climate-change>

The Earth's climate is changing. In fact, it has always been changing. What is different now is the speed of change and the main cause of change – human activities. This issue asks: What are the biggest threats to human health? Who will suffer as the climate changes? What can be done to minimise harm? And how do we cope with uncertainty?



## Pre-Knowledge Topics

A level Biology will use your knowledge from GCSE and build on this to help you understand new and more demanding ideas. Complete the following tasks to make sure your knowledge is up to date and you are ready to start studying:

### DNA and the Genetic Code

In living organisms nucleic acids (DNA and RNA have important roles and functions related to their properties. The sequence of bases in the DNA molecule determines the structure of proteins, including enzymes.

The double helix and its four bases store the information that is passed from generation to generation. The sequence of the base pairs adenine, thymine, cytosine and guanine tell ribosomes in the cytoplasm how to construct amino acids into polypeptides and produce every characteristic we see. DNA can mutate leading to diseases including cancer and sometimes anomalies in the genetic code are passed from parents to babies in disease such as cystic fibrosis, or can be developed in unborn foetuses such as Downs Syndrome.

Read the information on these websites (you could make more Cornell notes if you wish):

<http://www.bbc.co.uk/education/guides/z36mmp3/revision>

<http://www.s-cool.co.uk/a-level/biology/dna-and-genetic-code>

And take a look at these videos:

<http://ed.ted.com/lessons/the-twisting-tale-of-dna-judith-hauck>

<http://ed.ted.com/lessons/where-do-genes-come-from-carl-zimmer>

### **Task:**

**Produce a wall display to put up in your classroom in September. You might make a poster or do this using PowerPoint or similar Your display should use images, keywords and simple explanations to:**

Define gene, chromosome, DNA and base pair

Describe the structure and function of DNA and RNA

Explain how DNA is copied in the body

Outline some of the problems that occur with DNA replication and what the consequences of this might be.

### Evolution

Transfer of genetic information from one generation to the next can ensure continuity of species or lead to variation within a species and possible formation of new species. Reproductive isolation can lead to accumulation of different genetic information in populations potentially leading to formation of new species (speciation). Sequencing projects have read the genomes of organisms ranging from microbes and plants to humans. This allows the sequences of the proteins that derive from the genetic code to be predicted. Gene technologies allow study and alteration of gene function in order to better understand organism function and to design new industrial and medical processes.

Read the information on these websites (you could make more Cornell notes if you wish):

<http://www.bbc.co.uk/education/guides/z237hyc/revision/4>

<http://www.s-cool.co.uk/a-level/biology/evolution>

And take a look at these videos:

<http://ed.ted.com/lessons/how-to-sequence-the-human-genome-mark-j-kiel>

<http://ed.ted.com/lessons/the-race-to-sequence-the-human-genome-tien-nguyen>

### **Task:**

**Produce a one page revision guide for an AS Biology student that recaps the key words and concepts in this topic. Your revision guide should:**

Describe speciation

Explain what a genome is

Give examples of how this information has already been used to develop new treatments and technologies.

## **Biodiversity**

The variety of life, both past and present, is extensive, but the biochemical basis of life is similar for all living things. Biodiversity refers to the variety and complexity of life and may be considered at different levels. Biodiversity can be measured, for example within a habitat or at the genetic level. Classification is a means of organising the variety of life based on relationships between organisms and is built around the concept of species. Originally classification systems were based on observable features but more recent approaches draw on a wider range of evidence to clarify relationships between organisms. Adaptations of organisms to their environments can be behavioural, physiological and anatomical. Adaptation and selection are major factors in evolution and make a significant contribution to the diversity of living organisms.

Read the information on these websites (you could make more Cornell notes if you wish):

<http://www.s-cool.co.uk/a-level/biology/ecological-concepts>

<http://www.s-cool.co.uk/a-level/biology/classification>

And take a look at these videos:

<http://ed.ted.com/lessons/why-is-biodiversity-so-important-kim-preshoff>

<http://ed.ted.com/lessons/can-wildlife-adapt-to-climate-change-erin-eastwood>

### **Task:**

**Write a persuasive letter to an MP, organisation or pressure group promoting conservation to maintain biodiversity.**

Your letter should:

Define what is meant by species and classification

Describe how species are classified

Explain one way scientists can collect data about a habitat, giving an example

Explain adaptation and how habitat change may pose a threat to niche species

## **Exchange and Transport**

Organisms need to exchange substances selectively with their environment and this takes place at exchange surfaces. Factors such as size or metabolic rate affect the requirements of organisms and this gives rise to adaptations such as specialised exchange surfaces and mass transport systems. Substances are exchanged by passive or active transport across exchange surfaces. The structure of the plasma membrane enables control of the passage of substances into and out of cells

Read the information on these websites (you could make more Cornell notes if you wish):

<http://www.s-cool.co.uk/a-level/biology/gas-exchange>

<http://www.s-cool.co.uk/a-level/biology/nutrition-and-digestion/revise-it/human-digestive-system>

And take a look at these videos:

<http://ed.ted.com/lessons/insights-into-cell-membranes-via-dish-detergent-ethan-perlstein>

<http://ed.ted.com/lessons/what-do-the-lungs-do-emma-bryce>

### **Task:**

**Create a poster or display to go in your classroom in September. Your poster should either: compare exchange surfaces in mammals and fish or compare exchange surfaces in the lungs and the intestines. You could use a Venn diagram to do this.** Your poster should:

Describe diffusion, osmosis and active transport

Explain why oxygen and glucose need to be absorbed and waste products removed

Compare and contrast your chosen focus.



## **Cells**

The cell is a unifying concept in biology, you will come across it many times during your two years of A level study. Prokaryotic and eukaryotic cells can be distinguished on the basis of their structure and ultrastructure. In complex multicellular organisms cells are organised into tissues, tissues into organs and organs into systems. During the cell cycle genetic information is copied and passed to daughter cells. Daughter cells formed during mitosis have identical copies of genes while cells formed during meiosis are not genetically identical

Read the information on these websites (you could make more Cornell notes if you wish):

<http://www.s-cool.co.uk/a-level/biology/cells-and-organelles>

<http://www.bbc.co.uk/education/guides/zvjyicdm/revision>

And take a look at these videos:

<https://www.youtube.com/watch?v=gcTuQpuJyD8>

<https://www.youtube.com/watch?v=L0k-enzoeOM>

<https://www.youtube.com/watch?v=qCLmR9-YY7o>

### **Task:**

**Produce a one page revision guide to share with your class in September summarising one of the following topics: Cells and Cell Ultrastructure, Prokaryotes and Eukaryotes, or Mitosis and Meiosis.**

Whichever topic you choose, your revision guide should include:

Key words and definitions

Clearly labelled diagrams

Short explanations of key ideas or processes.

## **Biological Molecules**

Biological molecules are often polymers and are based on a small number of chemical elements. In living organisms carbohydrates, proteins, lipids, inorganic ions and water all have important roles and functions related to their properties. DNA determines the structure of proteins, including enzymes. Enzymes catalyse the reactions that determine structures and functions from cellular to whole-organism level. Enzymes are proteins with a mechanism of action and other properties determined by their tertiary structure. ATP provides the immediate source of energy for biological processes.

Read the information on these websites (you could make more Cornell notes if you wish):

<http://www.s-cool.co.uk/a-level/biology/biological-molecules-and-enzymes>

<http://www.bbc.co.uk/education/guides/zb739j6/revision>

And take a look at these videos:

<https://www.youtube.com/watch?v=H8WJ2KENIK0>

<http://ed.ted.com/lessons/activation-energy-kickstarting-chemical-reactions-vance-kite>

### **Task:**

**Krabbe disease occurs when a person doesn't have a certain enzyme in their body. The disease effects the nervous system. Write a letter to a GP or a sufferer to explain what an enzyme is.**

Your poster should:

Describe the structure of an enzyme

Explain what enzymes do inside the body

## **Ecosystems**

Ecosystems range in size from the very large to the very small. Biomass transfers through ecosystems and the efficiency of transfer through different trophic levels can be measured. Microorganisms play a key role in recycling chemical elements. Ecosystems are dynamic systems, usually moving from colonisation to climax communities in a process known as succession. The dynamic equilibrium of populations is affected by a range of factors. Humans are part of the ecological balance and their activities affect it both directly and indirectly. Effective management of the conflict between human needs and conservation help to maintain sustainability of resources.

Read the information on these websites (you could make more Cornell notes if you wish):

<http://www.bbc.co.uk/education/guides/z7vqtfr/revision>

<http://www.s-cool.co.uk/a-level/biology/ecological-concepts>

And take a look at these videos:

<https://www.youtube.com/watch?v=jZKIHe2LDP8>

<https://www.youtube.com/watch?v=E8dkWQVFAoA>

### **Task:**

**Produce a newspaper or magazine article about one ecosystem (e.g. the arctic, the Sahara, the rainforest, or something closer to home like your local woodland, nature reserve or shore line).**

**Your article should include:**

Key words and definitions

Pictures or diagrams of your chosen ecosystem.

A description of the changes that have occurred in this ecosystem

An explanation of the threats and future changes that may further alter this ecosystem.

## **Control Systems**

Homeostasis is the maintenance of a constant internal environment. Negative feedback helps maintain an optimal internal state in the context of a dynamic equilibrium. Positive feedback also occurs. Stimuli, both internal and external, are detected leading to responses. The genome is regulated by a number of factors. Coordination may be chemical or electrical in nature

Read the information on these websites (you could make more Cornell notes if you wish):

<http://www.s-cool.co.uk/a-level/biology/homeostasis>

<http://www.bbc.co.uk/education/topics/z8kxpv4>

And take a look at these videos:

<https://www.youtube.com/watch?v=x4PPZCLnVkA>

<https://www.youtube.com/watch?v=x4PPZCLnVkA>

### **Task:**

**Produce a poster to display in your classroom in September summarising one of the following topics: Temperature Control, Water and the Kidneys, Glucose, or The Liver.**

Whichever topic you choose, your poster or display should include:

Key words and definitions

Clearly labelled diagrams

Short explanations of key ideas or processes.

### **Energy for Biological Processes**

In cellular respiration, glycolysis takes place in the cytoplasm and the remaining steps in the mitochondria. ATP synthesis is associated with the electron transfer chain in the membranes of mitochondria and chloroplasts in photosynthesis energy is transferred to ATP in the light- dependent stage and the ATP is utilised during synthesis in the light-independent stage.

Read the information on these websites (you could make more Cornell notes if you wish):

<http://www.bbc.co.uk/education/guides/zcxrd2p/revision>

<http://www.s-cool.co.uk/a-level/biology/respiration>

And take a look at these videos:

[https://www.youtube.com/watch?v=00jbG\\_cfGuQ](https://www.youtube.com/watch?v=00jbG_cfGuQ)

<https://www.youtube.com/watch?v=2f7YwCtHcgk>

#### **Task:**

**Produce an A3 annotated information poster that illustrates the process of cellular respiration and summarises the key points.**

Your poster should include:

Both text and images

Be visually stimulating

Key words and definitions

Clearly labelled diagrams

Short explanations of key ideas or processes.

### **Scientific and Investigative Skills**

As part of your A level you will complete a practical assessment. This will require you to carry out a series of practical activities as well as planning how to do them, analysing the results and evaluating the methods. This will require you to: use appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and pH), use appropriate instrumentation to record quantitative measurements, such as a colorimeter or photometer, use laboratory glassware apparatus for a variety of experimental techniques to include serial dilutions, use of light microscope at high power and low power, including use of a graticule, produce scientific drawing from observation with annotations, use qualitative reagents to identify biological molecules, separate biological compounds using thin layer/paper chromatography or electrophoresis, safely and ethically use organisms, use microbiological aseptic techniques, including the use of agar plates and broth, safely use instruments for dissection of an animal organ, or plant organ, use sampling techniques in fieldwork.

#### **Task:**

**Produce a glossary for the following key words:**

accuracy, anomaly, calibration, causal link, chance, confounding variable, control experiment, control group, control variable, correlation, dependent variable, errors, evidence, fair test, hypothesis, independent, null hypothesis, precision, probability, protocol, random distribution, random error, raw data, reliability, systematic error, true value, validity, zero error,

## Ideas for Day Trips

If you are on holiday in the UK, or on a staycation at home, why not plan a day trip to one of these :

Glasgow Science  
Centre - Glasgow

Dundee Science  
Centre - Dundee

The Lakeland Wildlife  
Oasis - Milnthorpe

Scottish Seabird centre –  
North Berwick

W5 - Belfast

Life – Newcastle-  
upon-Tyne

Anglesey Sea Zoo -  
Anglesey

Cambridge Science  
Centre - Cambridge

Think-tank -  
Birmingham

Herriman  
Museum and  
Gardens -  
London

National Museum -  
Cardiff

Centre of the Cell -  
London

The Eden Project -  
Cornwall

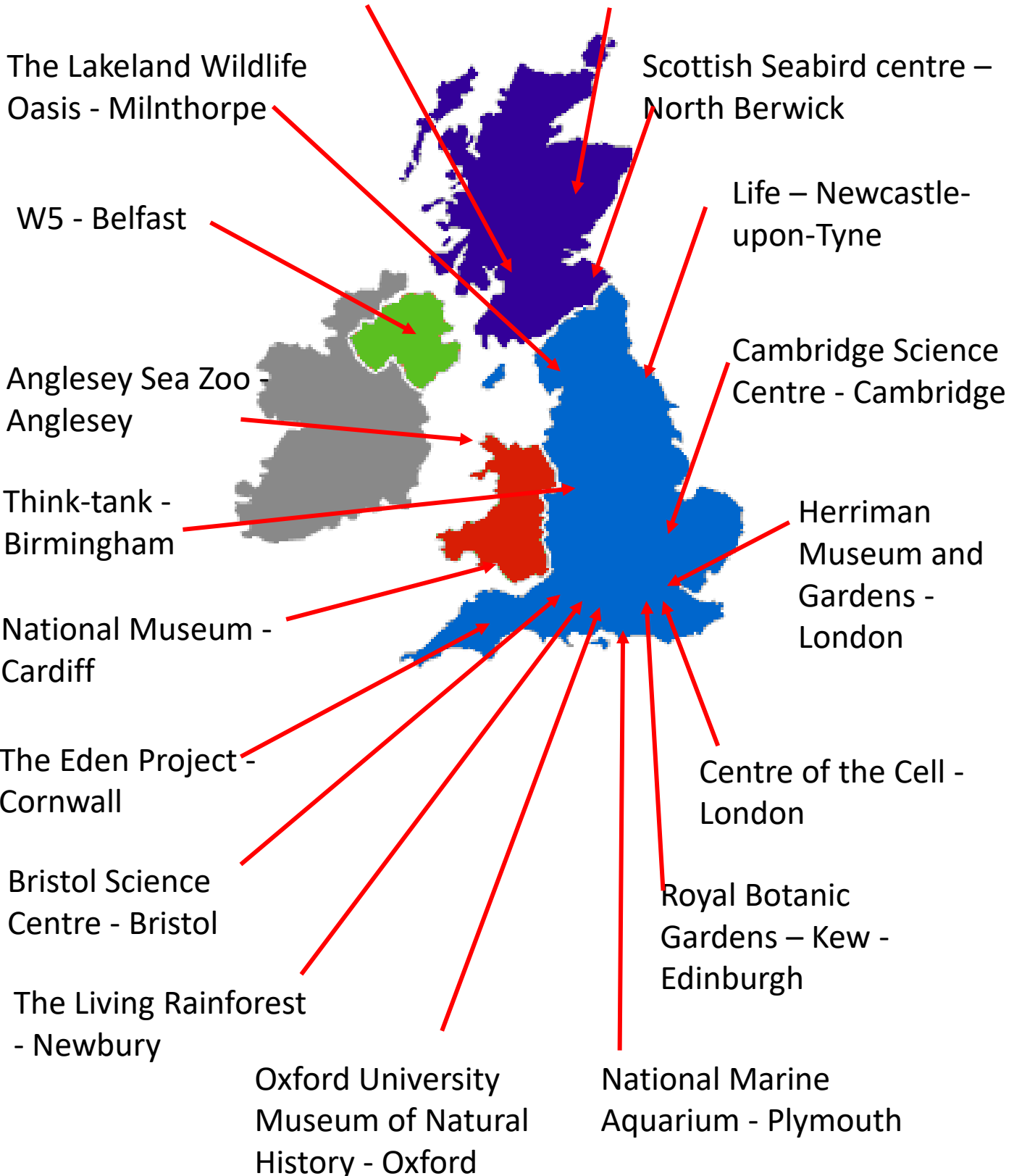
Bristol Science  
Centre - Bristol

Royal Botanic  
Gardens – Kew -  
Edinburgh

The Living Rainforest  
- Newbury

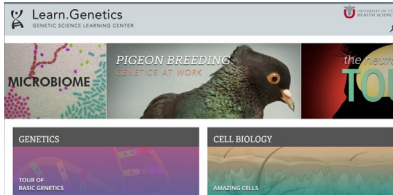
Oxford University  
Museum of Natural  
History - Oxford

National Marine  
Aquarium - Plymouth



## Science websites

These websites all offer an amazing collection of resources that you should use again and again through out your course.



Probably the best website on Biology....

Learn Genetics from Utah University has so much that is pitched at an appropriate level for you and has lots of interactive resources to explore, everything from why some people can taste bitter berries to how we clone mice or make glow in the dark jelly fish.

<http://learn.genetics.utah.edu/>

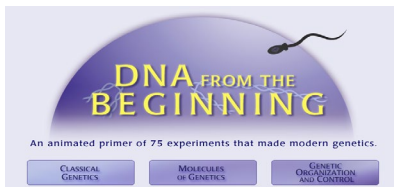


In the summer you will most likely start to learn about Biodiversity and Evolution. Many Zoos have great websites, especially London Zoo. Read about some of the case studies on conservation, such as the Giant Pangolin, the only mammal with scales. <https://www.zsl.org/conservation>



At GCSE you learnt how genetic diseases are inherited. In this virtual fly lab you get to breed fruit flies to investigate how different features are passed on.

<http://sciencecourseware.org/vcise/drosophila/>



DNA from the beginning is full of interactive animations that tell the story of DNA from its discovery through to advanced year 13 concepts.

One to book mark!  
<http://www.dnaftb.org/>



Ok, so not a website, but a video you definitely want to watch. One of the first topics you will learn about is the amazing structure of the cell. This BBC film shows the fascinating workings of a cell... a touch more detailed than the "fried egg" model you might have seen.

[http://www.dailymotion.com/video/xzh0kb\\_the-hidden-life-of-the-cell\\_shortfilms](http://www.dailymotion.com/video/xzh0kb_the-hidden-life-of-the-cell_shortfilms)

If this link expires – google "BBC hidden life of the cell"