

WHERE DOES THE EVIDENCE LEAD?

DVD Teachers' manual



Teaching scientific controversy over the origin of life and its diversity

Introduction

Pupils should be taught...

how scientific controversies can arise from different ways of interpreting empirical evidence (for example, Darwin's theory of evolution).

The National Curriculum for Key Stage 4 Science
(Sc1: Scientific enquiry)

All young people should develop the scientific literacy that they need to play a full part – as active and informed citizens – in a modern democratic society where science and technology play a key role in shaping our lives.

An essential part of this is for pupils to understand the nature and causes of scientific controversy. A good example of this, specified by the National Curriculum, is Darwin's theory of evolution.

However, few schools currently teach the modern scientific controversy over Darwinism, and the only alternative theories mentioned by popular textbooks are either outdated or not scientific.

The theory of Darwinian Evolution states that life and its diversity are the result of blind and purposeless processes. A growing number of scientists now question this, suggesting instead that the natural world has been designed by an intelligence.

The theory of Intelligent Design is the current number one alternative to Darwinism as a scientific theory of origins. Last year, Lord Filkin, Parliamentary Under-Secretary of State for the Department for Education and Skills, named Intelligent Design as a theory that can be discussed in schools for pupils to consider and evaluate against the evidence (Hansard, 21 Feb 2005).

This DVD is a six-part documentary that provides science teachers with a resource to teach this controversy over origins. The first part outlines the basics of Darwin's theory, covering topics mentioned by GCSE Biology Specifications. The following parts explore the scientific evidence for Intelligent Design theory, using microscopic photography and state-of-the-art computer animation of cellular processes such as DNA transcription and translation.

Interviews with key scientists who question Darwinism help pupils to understand how scientists work and develop scientific ideas. The DVD shows how scientific controversies arise from different ways of interpreting empirical evidence. It helps pupils see the need to draw conclusions using observation and evidence rather than preconception or prejudice.

This video is most suitable for pupils at Key Stage 4 or above, and contains material relevant to GCSE and A-Level syllabuses, particularly in Biology. An outline of learning outcomes from each section is shown below.

Each of the six parts is approximately 10 minutes in length. In a class where Darwinian evolution has already been taught thoroughly and time is limited, pupils might learn most from viewing parts 2, 5 and 6 in sequence.

Further resources can be found at:

www.truthinscience.org.uk

Learning outcomes

Part 1 Life: The Big Questions

- Understand Darwin's theory of natural selection, and its historical background in the voyage of the Beagle and the publication of *The Origin of Species*
- Understand that variation in beak shape and size of Galapagos finches provides evidence for evolution
- Know that domestic breeding is similar to natural selection
- Understand that Darwin provided the first plausible theory to explain the appearance of design in the natural world without an intelligent designer
- Recognise that Darwinism is assumed to be true by most scientists
- Recognise that a growing number of scientists question the true extent of the creative power of natural selection

Part 2 What Darwin Didn't Know

- Understand that in Darwin's lifetime scientists did not appreciate the complexity of living cells
- Know that since the 1950s our knowledge of cells has exploded, and that they contain a huge variety of miniature machines
- Recognise that the bacterial flagellum is driven by a highly efficient miniature motor, with a complex structure
- Understand that Darwin's theory relies on accumulating complexity by slight, successive, advantageous variations

- Know that Dr Michael Behe is an example of a scientist who questions whether Darwin's theory can account for the complexity of the cell
- Understand the process which Behe went through as a scientist in changing his ideas

Part 3 Molecules and Mousetraps

- Understand the concept of "irreducible complexity" – that some machines are made up of many parts, all of which are necessary for function
- Recognise the bacterial flagellum as an example of an irreducibly complex system
- Understand that irreducibly complex structures cannot evolve by slight, successive, advantageous variations, because at certain points in their evolution they will lose function altogether
- Understand that Darwinian scientists dispute this, and that the theory of co-option (borrowing parts from other machines) is a possible solution to the problem of irreducible complexity
- Recognise that the needle-nose cellular pump has some similarities to the bacterial flagellum, but that it only contains 10 of the 40 protein components of the flagellum
- Recognise that the process by which cells assemble the flagellum is precise and complex, and has not been explained in Darwinian terms

Part 4 How Did Life Begin?

- Understand that Darwin concentrated on how new forms and structures arise in living organisms, and only briefly described how life might have originated in the first place

- Recognise Oparin's theory of chemical evolution
- Understand that proteins are a major component of all cells and carry out many essential processes
- Understand that proteins are made up of precise sequences of amino acids, and this determines a complex 3D structure which is essential to their function
- Recognise that a protein sequence is analogous to a sentence
- Understand that the chance of a simple protein of 100 amino acids forming in a chemical soup is vanishingly small
- Know that the simplest cell contains 600 different proteins of over 100 amino acids in length
- Recognise that mainstream scientists no longer believe that chance alone could have caused the formation of the first functional protein

Part 5 The Language Of Life

- Know that when mainstream scientists rejected the idea that chance alone caused the formation of the first protein, it was suggested that the properties of amino acids might make the process inevitable
- Know that Dr Dean Kenyon is a scientist who suggested this in a book "Biochemical Predestination"
- Know that after 5 years he began to doubt the theory
- Understand that Kenyon could not explain how proteins could replicate without DNA, nor the origins of DNA
- Understand the basic structure of the DNA molecule
- Understand how proteins are produced from DNA by a process of transcription, translation and folding

- Understand how over the course of many years Kenyon realised that the only way to explain the origin of life and the cell is by involving design from an intelligent source

Part 6 The Design Inference

- Know that all scientists agree that there is an appearance of design in the world, but many attribute this to evolution
- Consider how we all regularly make inferences to intelligent design in detecting man-made objects
- Understand that we recognise design in objects if they are complex and fit a recognisable (specified) pattern
- Know that Dr William Dembski provided a mathematical framework for detecting design
- Understand that information is both complex and specified
- Know that DNA stores more information and transmits it more efficiently than anything else in the known universe
- Understand that there is no known natural process to explain the origin of information
- Recognise that the inference of design makes sense of the world as a rational and comprehensible product of an intelligent mind

The 65 minute film *Unlocking the Mystery of Life* contains the same material as the six part series *Where Does the Evidence Lead?* Pupils watching this film will cover all the learning outcomes outlined in this booklet.

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First Printed in August 2006

Published by: Truth in Science Limited, PO Box 640,
Newcastle upon Tyne, NE27 9AB

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Registered Company Number: 5378298

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