

Think Darwin, Think Evolution, Think Now

Teachers' notes

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Introduction

Think Darwin, Think Evolution, Think Now has been produced by SIBE (Scottish Initiative for Biotechnology Education) at The University of Edinburgh to celebrate the 200th birthday of Charles Darwin. The booklet has been designed for Scottish Higher and Advanced Higher students of biology and copies will be sent to every Secondary School in Scotland. The booklet has six chapters, each with text and an activity section at the end. Throughout the text you will find question boxes to initiate discussion and reflection and also key point boxes. The booklet links in with attainment targets on the Higher and Advanced Higher syllabuses and these links are shown in these teaching notes. We hope that the booklet will provide you with support in the teaching of evolutionary theory and its many connections throughout the field of biology. Enjoy!

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Ways in which the booklet could be used in the classroom

1. **To support the Higher and Advanced Higher Biology Curriculum by providing:**
 - Up to date and relevant reading material for topics.
 - A basis for discussion of topics.
 - A media resource (used alongside the podcasts available on the website) to introduce or reinforce a topic.
 - Extra examples.
 - Images.
 - Practical activities.

The Higher and Advanced Higher biology syllabuses state that the courses should provide opportunities for pupils to acquire: *positive attitudes such as being open-minded and being willing to recognise alternative points of view; having an interest in biology, in themselves and their environment; being aware that they can make decisions which affect the well-being of themselves, others, and the quality of their environment.* We hope the booklet will provide a resource to help achieve this.

2. **As an extension or enrichment resource**

- For students requiring additional reading material (for example, as an extension).
- As supplementary reading material during time gaps in practical sessions or when other work has been completed.

3. **As the basis for a school event in celebration of Darwin's bicentenary**

4. **For cross-curricular work**

For developing cross curricular work in line with Curriculum for Excellence. The booklet could be used lower down the school for cross-curricular activities. For example:

- Geography and biology (climate change).
- RME and biology (moral decisions).
- Art and biology (use of images to initiate art work, or artwork to initiate biological discussion).
- History and biology (the life of Charles Darwin / Victorian Britain).

5. **As career material**

The interviews with scientists could be used as a basis for discussion about career paths for those that study biology.

Curriculum links

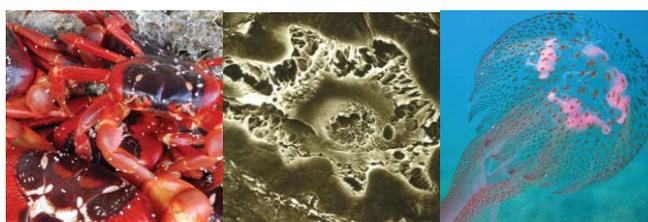
See attached tables

Further information

Please contact us with any questions or feedback – we will be pleased to hear from you and are here to help!

Email: SIBE@ed.ac.uk **Telephone:** 0131 650 7123

Web: <http://www.biology.ed.ac.uk/public/sibe/projects/HappyBirthdayDarwin.htm>



	<p>v. The high-speed evolution of organisms such as antibiotic resistant bacteria and the melanic peppered moth.</p> <p>vi. The conservation of species through wildlife reserves, captive breeding and cell banks. Maintenance of genetic diversity.</p>	<p>Chapter 5: p.78 Superbugs.</p> <p>Chapter 4: Discusses alien species which have implications for the conservation of native species and of genetic diversity. Specifically p. 70-73 The interview with Helen Senn looks at genetic diversity in Scottish wild deer populations.</p>
	<p><u>2. Artificial selection.</u></p> <p>i. The evolution of a wide variety of crops and domesticated animals through selective breeding and hybridisation as undertaken by humans.</p> <p>ii. The contribution of genetic engineering to the development of new varieties.</p>	<p>Chapter 3: The entire chapter provides an overview of the whole topic of artificial selection. The interview with Steve Bishop gives an up to date account of the use of genetic engineering in animal and crop species.</p>
<p>Regulation3: Control and</p>	<p>c) Population dynamics</p> <p>iii. Monitoring populations. The need to monitor wild populations. Candidates should be aware that populations of animals and plants may be monitored to provide essential data for a wide variety of purposes to include:</p> <ul style="list-style-type: none"> • the control of pest species • the protection and conservation of endangered species. 	<p>See the references above about formation of populations and species in chapter 2.</p> <p>Chapter 4 (whole chapter including activity) An up to date look at pest (alien) species. The interview in chapter 4 with Helen Senn provides an example of the monitoring of wild deer populations with the aim of monitoring genetic diversity.</p> <p>Chapter 6: (whole chapter including activity) Discusses the effect of climate change on biodiversity and highlights the need for the need to monitor populations in the face of environmental change.</p>

Unit	SQA Advanced Higher Biology Course specification	Relevant material in 'Think Darwin, Think Evolution, Think Now'
Cell and molecular biology	<p>d) Applications of DNA technology</p> <p>i The Human Genome Project. Analysing the genomes of other species. Comparison of human genome with other species reveals remarkable similarities.</p> <p>iv Agriculture. Transgenic plants.</p>	<p>Chapter 2: p.17-18 Comparative genome analysis provides evidence for the relatedness of species and descent from a common ancestor.</p> <p>Chapter 3: p.43-48 The use of genetic technologies to produce animals and plants with favoured characteristics.</p>
Environmental biology	<p>b) Interactions in ecosystems</p> <p><u>1. Biotic interactions</u></p> <p>iii Competition.</p> <p><u>3. The costs, benefits and consequences of interactions</u></p> <p>ii Interactions with the environment.</p>	<p>Chapter 4: (including activity). Discusses the inter-species interactions when an alien species enters an ecosystem and the consequences.</p> <p>Chapter 6: (including activity) Impact of changing conditions on ecosystems.</p> <p>Chapter 6 p.97 Responses of organisms to changes in environmental conditions.</p>

	<p>c) Human impact on the environment Changes to ecosystems i Changes in complexity.</p> <p>iii Effects of increased energy production.</p>	<p>Chapter 4: (whole chapter including activity) Discusses the role of humans in the transportation of non-native species and the impact these species have on the environment.</p> <p>Chapter 6: (whole chapter and activity) The effect of carbon dioxide from the burning of fossil fuels by humans has led to the current climate change issues and the impact this is having on the environment is discussed.</p>
Biotechnology	<p>b) Applications of biotechnological processes <u>2. Food industry</u></p>	<p>Chapter 3: p.43 p.48 and Interview with Steve Bishop. Discusses and presents questions about the use of genetic technologies and the ethical and moral questions that arise from the use of these technologies.</p>
Animal Behaviour	<p><u>3. Social behaviour</u> ii Selfish and altruistic behaviour. The concept of the 'selfish' gene. Kin selection. Altruism.</p>	<p>Chapter 2: Provides an overview of evolution of characteristics through natural selection. Chapter 2: p.23 An example of kin selection.</p>