Charles Darwin—Three Level Guide

Key Concepts

1. Darwin is a central figure in the history of biology because he was a careful observer of the natural world and synthesized his observations with other scientists' ideas to form his theory of evolution.

2. Individual characteristics may vary among members of a species and the selection of some individuals and elimination of others are the keys to changes in life forms on earth.

3. Scientific theories clarify and unify scientific knowledge.

Background

Wherever and whenever humans have lived near the sea, we have used the resources of the ocean and sought to understand these mighty bodies of water that so strongly affect our lives. It was only a matter of time, then, before scientists turned their attention to the marine environment. "Charles Darwin" is the first lesson describing modern scientific exploration of the oceans.

The voyage of Charles Darwin and the *Beagle* brought the attention of the scientific community to the sea and precipitated a series of exploration cruises that would continue to this day. This activity and "Explorers of the Ocean Depths- the Voyage of the Challenger" provide your students with a slice of oceanographic history. They describe the beginning of human efforts to know more about the sea for the sake of knowledge and not just for practical uses.

Materials

For each student:

- One copy of "Charles Darwin" Three-Level Guide
- One copy of the article: "Charles Darwin" by Loren C. Eiseley, "Scientific American" (Feb. 1956 Vol 194, No.2, pages 62-72 - or #108 Scientific American Offprints) "Scientific American" articles cannot be included in the CD ROM version of the FOR SEA Guide. Please check your local library.

Teaching Hints

Explain to students that the guide will take them through three levels of questioning, from a literal level, to inference, and then to analysis and synthesis. The idea is not to "get the answer right" per se, but more importantly, to use the questions as a guide to the major ideas in the article, and to try to incorporate those ideas into one's own knowledge base. It is important to emphasize to the students that their reasoning is much more important than their answer. In fact, in levels two and three, there may be no "right" or "wrong" answer!

Suggest that the students read the statements in the three-level guide before they read the article. (Some students may prefer to read the article first, then go back over it a second time with the three-level guide). The guide is intended to be a vehicle for helping students look for certain concepts in the article.

When students have finished, discuss the guide, referring to the article. You may wish to have students work in collaborative groups to compare their answers. The process of resolving differences of opinion can be very instructive.

It is sometimes helpful to have students note the page number and paragraph where they found evidence to support their answer. You may require the students to provide sound, complete explanations for the answers they chose!

For more information about Three-Level Guides, see Teacher Background, Lesson 2, "Meanwhile, in the Pacific," Part 2.

Key Words

characteristics - in this case, typical or distinctive qualities of an organism

evolution - a process of gradual, progressive change or development; specifically, change in the gene pool of a population from generation to generation by such processes as mutation, natural selection, and genetic drift

fossil - any remains, impression, or trace of a living thing of a former geologic age

inheritance - the collective genetic characteristics transmitted from parent to offspring

selection - any natural or artificial process that results in differential reproduction among members of a population so that the inheritable traits of only certain individuals are passed on, or are passed on in greater proportion, to succeeding generations

variation - a difference or deviation in structure or character from others of the same species or group

Answer Key

Charles Darwin - Three Level Guide

Level I

Directions: Read the statements carefully. Then as you read the selection, refer back to the statements in the guide and check those that you believe say what the author actually said or paraphrased in the selection. Indicate the page, paragraph and sentence on the statements checked for later reference. Also be ready to explain what is inaccurate about the statements that you do not check.

The Intellectual Setting

_____1. The notion of a continuity of events, of one animal changing by degrees into another, was accepted as common sense before Darwin.

__x__2. Darwin is accorded so important a place in biological history due to his supreme act of creative synthesis.

The Voyage

__x__1. Darwin sought to relate bones and fossils from past animals to animals of the present.

__x__2. Darwin observed that characteristics of vegetation and animal life tend to vary by slow degree.

_____3. Darwin's travels did not provide him with any information concerning the changing character of the earth or its age.

The Invalid and the Book

_____1. Upon his return, Darwin became a celebrity and gave many public lectures about the voyage.

__x__2. Darwin's seclusion resulted in the organization of an enormous battery of facts which documented the theory of evolution as it had never been documented before.

__x__3. From his studies, Darwin reached the conclusion that since variation in individual characteristics existed among the members of any species, selection of some individuals and elimination of others must be the key to organic changes.

__x__4. Thomas Malthus' work on the human population provided Darwin with the idea that the struggle for existence under changing environmental conditions was what induced alterations in the physical structure of organisms.

Procrastination

__x__1. Darwin planned to reveal his theory of evolution in a monumental book.

__x__2. Other authors published books dealing with creation.

__x__3. Alfred Russel Wallace sent Darwin a copy of his article explaining his theory of evolution.

_____4. Darwin gave up his idea and did not publish his theory.

Publication

_____1. To convince the public, Darwin wrote a second volume explaining all that could not be made clear in the abstract.

__x__2. The science world agreed with Huxley who said, “How extremely stupid not to have thought of that.”

__x__3. Darwin proved the reality of evolutionary change beyond any reasonable doubt and described in his writings about natural selection a principle capable of wide, if not universal, application.

A Small Place for Humans

_____1. In the “Origin of the Species,” Darwin went into great depth discussing the evolution of humans.

__x__2. In “The Descent of Man,” Darwin failed to distinguish consistently between biological inheritance and cultural influences upon the behavior and evolution of human beings.

_____3. Humans were not Darwin’s best subject.

The Islands

__x__1. Darwin needed evidence for the continuity of life. He found it in the oceanic islands.

__x__2. The island worlds that gave the information for Darwin’s theory are disappearing, many without ever having been seriously investigated.

Level II

Directions: The statement below may or may not be true. Check each statement you believe is a generalization the author himself draws based on the information he gives in the selection. Indicate the page, paragraph and sentence on the statements checked for later reference.

The Intellectual Setting

__x__1. As with many scientific discoveries, other investigators had set the stage for Darwin's theories.

_____2. Darwin's theory was bound to meet with world-wide approval because of the intellectual climate of the time.

The Voyage

__x__1. Darwin was a careful observer.

__x__2. Darwin was not aware at first of the extreme importance of his observations in the Galapagos

The Invalid and the Book

_____1. During his withdrawal from society, Darwin was able to create his theory based solely on his own work.

__x__2. Darwin's importance comes not from the fact that he discovered all of the elements necessary to form his theory, but rather from the fact that he recognized variation, inheritance of variation, selective breeding and the struggle for existence as related parts of one whole.

Procrastination

__x__1. Darwin spent much time formulating theories about various phenomena.

__x__2. Darwin was afraid to publish his book.

__x__3. Wallace's letter forced Darwin to act.

Publication

_____1. Darwin's theories apply to all animals with the exception of humans.

__x__2. Scientific theories should clarify and simplify our knowledge.

A Small Place for Humans

_____1. Even Darwin's fellow scientists thought he was a bit crazy.

__x__2. Darwin preferred that his human subjects be dead.

The Islands

_____1. The destruction of island habitats is of little significance to humans.

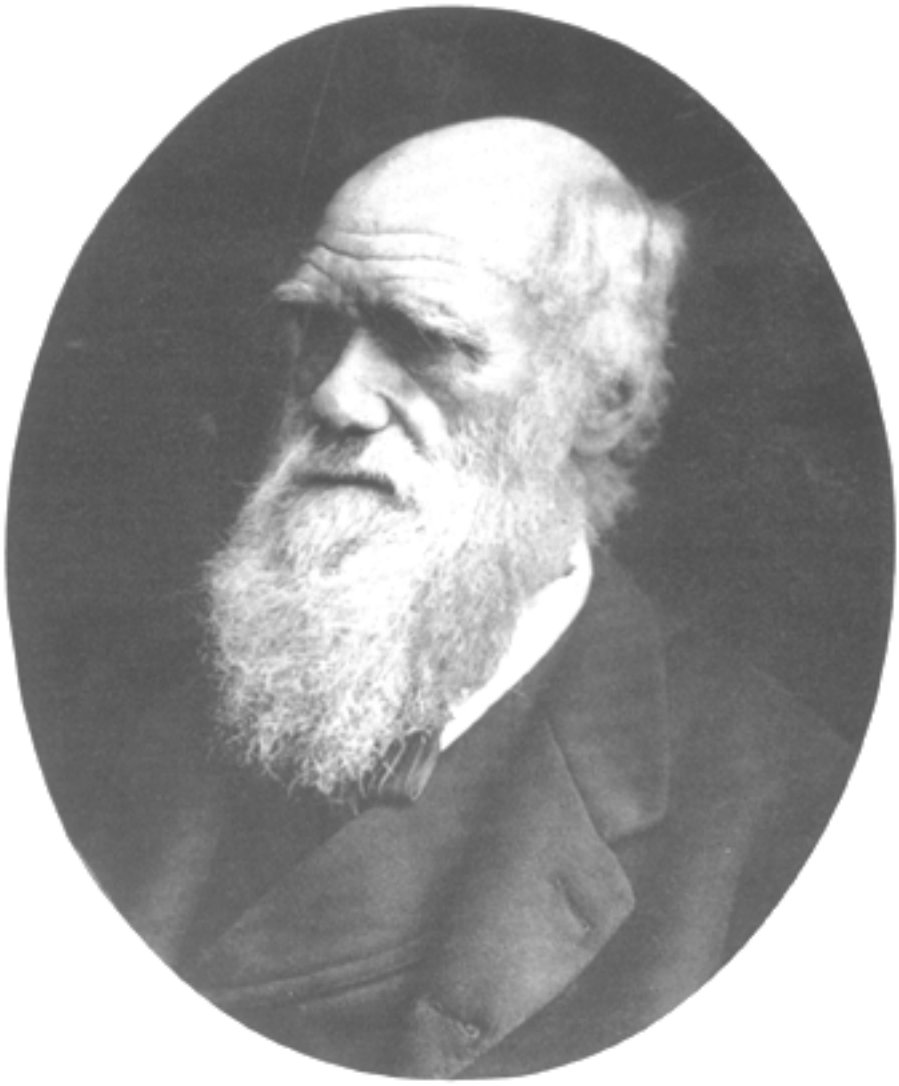
__x__2. Darwin looked on the unknown as a challenge.

Level III

Directions: Read each statement below, relating the details and author's interpretations drawn from the selection to ideas and experiences you've had in reference to this topic. In column A, check the statements which Darwin would have agreed with. In column B, check the statements you agree with.

A	B	
___	___	1. All plants and animals were created in the same form in which we see them today.
X	__	2. The principles of natural selection and evolutionary change can help humans to "create" new breeds of livestock and other kinds of animals and plants.
__	__	3. The animals and plants we see about us today will remain unchanged for the rest of time.
__	__	4. Humans are the one animal that has not changed and will not change in the future.
X	__	5. Scientific investigation provides facts that will lead every investigator to the same conclusions.

Charles Darwin—Three Level Guide



Humans have long studied the sea, hoping to learn how to navigate the currents and harvest the bounty of the oceans. In the nineteenth century, scientists began to study the sea to satisfy their curiosity. The article "Charles Darwin" describes one of the most influential modern scientists and the work he did as a naturalist traveling the seas. Though he was not strictly an oceanographer or marine biologist, Darwin's ideas form a framework within which modern marine scientists work.

Level I

Directions: Read the statements carefully. Then as you read the selection, refer back to the statements in the guide and check those that you believe say what the author actually said or paraphrased in the selection. Indicate the page, paragraph and sentence on the statements checked for later reference. Also, be ready to explain what is inaccurate about the statements that you do not check.

The Intellectual Setting

_____1. The notion of a continuity of events, of one animal changing by degrees into another was accepted as common sense before Darwin.

_____2. Darwin is accorded so important a place in biological history due to his supreme act of creative synthesis.

The Voyage

_____1. Darwin sought to relate bones and fossils from past animals to animals of the present.

_____2. Darwin observed that characteristics of vegetation and animal life tend to vary by slow degree.

_____3. Darwin's travels do not provide him with any information concerning the changing character of the earth or its age.

The Invalid and the Book

_____1. Upon his return, Darwin became a celebrity and gave many public lectures about the voyage.

_____2. Darwin's seclusion resulted in the organization of an enormous battery of facts which documented the theory of evolution as it had never been documented before.

_____3. From his studies, Darwin reached the conclusion that since variation in individual characteristics existed among the members of any species, selection of some individuals and elimination of others must be the key to organic changes.

_____4. Thomas Malthus' work on the human population provided Darwin with the idea that the struggle for existence under changing environmental conditions was what induced alterations in the physical structure of organisms.

Procrastination

_____1. Darwin planned to reveal his theory of evolution in a monumental book.

_____2. Other authors published books dealing with creation.

_____3. Alfred Russell Wallace sent Darwin a copy of his article explaining his theory of evolution.

_____4. Darwin gave up his idea and did not publish his theory.

Publication

_____1. To convince the public, Darwin wrote a second volume explaining all that could not be made clear in the abstract.

_____2. The science world agreed with Huxley who said, "How extremely stupid not to have thought of that'"

_____3. Darwin proved the reality of evolutionary change beyond any reasonable doubt, and demonstrated, in natural selection, a principle capable of wide, if not universal, application.

A Small Place for Humans

_____1. In the "Origin of the Species," Darwin went into great depth discussing the evolution of humans.

_____2. In "The Descent of Man," Darwin failed to distinguish consistently between biological inheritance and cultural influences upon the behavior and evolution of human beings.

_____3. Humans were not Darwin's best subject.

The Islands

_____1. Darwin needed evidence for the continuity of life. He found it in the oceanic islands.

_____2. The island worlds that gave the information for Darwin's theory are disappearing, many without ever having been seriously investigated.

Level II

Directions: The statement below may or may not be true. Check each statement you believe is a generalization the author himself draws based on the information he gives in the selection. Indicate the page, paragraph and sentence on the statements checked for later reference.

The Intellectual Setting

_____1. As with many scientific discoveries, other investigators had set the stage for Darwin's theories.

_____2. Darwin's theory was bound to meet with world-wide approval because of the intellectual climate of the time.

The Voyage

_____1. Darwin was a careful observer.

_____2. Darwin was not aware at first of the extreme importance of his observations in the Galapagos.

The Invalid and the Book

_____1. During his withdrawal from society, Darwin was able to create his theory based solely on his own work.

_____2. Darwin's importance comes not from the fact that he discovered all of the elements necessary to form his theory, but rather from the fact that he recognized variation, inheritance of variation, selective breeding and the struggle for existence as related parts of one whole.

Procrastination

_____1. Darwin spent much time formulating theories about various phenomena.

_____2. Darwin was afraid to publish his book.

_____3. Wallace's letter forced Darwin to act.

Publication

_____1. Darwin's theories apply to all animals with the exception of humans.

_____2. Scientific theories should clarify and simplify our knowledge.

A Place for Humans

_____1. Even Darwin's fellow scientists thought he was a bit crazy.

_____2. Darwin preferred to have his human subjects dead.

The Islands

_____1. The destruction of island habitats is of little significance to humans.

_____2. Darwin looked on the unknown as a challenge.

Level III

Directions: Read each statement below, relating the details and author's interpretations drawn from the selection to ideas and experiences you've had in reference to this topic. In column A, check the statements which Darwin would have agreed with. In column B, check the statements you agree with.

A	B	
_____	_____	1. All plants and animals were created in the same form in which we see them today.
_____	_____	2. The principles of natural selection and evolutionary change can help humans to "create" new breeds of livestock and other kinds of animals and plants.
_____	_____	3. The animals and plants we see about us today will remain unchanged for the rest of time.
_____	_____	4. Humans are the one animal that has not changed and will not change in the future.
_____	_____	5. Scientific investigation provides facts that will lead every investigator to the same conclusions.