tpo_30_passage_1

A heated debate has enlivened recent studies of evolution. Darwin's original thesis, and the viewpoint supported by evolutionary gradualists, is that species change continuously but slowly and in small increments. Such changes are all but invisible over the short time scale of modern observations, and, it is argued, they are usually obscured by innumerable gaps in the imperfect fossil record. Gradualism, with its stress on the slow pace of change, is a comforting position, repeated over and over again in generations of textbooks. By the early twentieth century, the question about the rate of evolution had been answered in favor of gradualism to most biologists' satisfaction. Sometimes a closed question must be reopened as new evidence or new arguments based on old evidence come to light. In 1972 paleontologists Stephen Jay Gould and Niles Eldredge challenged conventional wisdom with an opposing viewpoint, the punctuated equilibrium hypothesis, which posits that species give rise to new species in relatively sudden bursts, without a lengthy transition period. These episodes of rapid evolution are separated by relatively long static spans during which a species may hardly change at all. The punctuated equilibrium hypothesis attempts to explain a curious feature of the fossil record-one that has been familiar to paleontologists for more than a century but has usually been ignored. Many species appear to remain unchanged in the fossil record for millions of years-a situation that seems to be at odds with Darwin's model of continuous change. Intermediate fossil forms, predicted by gradualism, are typically lacking. In most localities a given species of clam or coral persists essentially unchanged throughout a thick formation of rock, only to be replaced suddenly by a new and different species. The evolution of North American horses, which was once presented as a classic textbook example of gradual evolution, is now providing equally compelling evidence for punctuated equilibrium. A convincing 50-million-year sequence of modern horse ancestors-each slightly larger, with more complex teeth, a longer face, and a more prominent central toe-seemed to provide strong support for Darwin's contention that species evolve gradually. But close examination of those fossil deposits now reveals a somewhat different story. Horses evolved in discrete steps, each of which persisted almost unchanged for millions of years and was eventually replaced by a distinctive newer model. The four-toed Eohippus preceded the three-toed Miohippus, for example, but North American fossil evidence suggests a jerky, uneven transition between the two. If evolution had been a continuous, gradual process, one might expect that almost every fossil specimen would be slightly different from every other. If it seems difficult to conceive how major changes could occur rapidly, consider this: an alteration of a single gene in flies is enough to turn a normal fly with a single pair of wings into one that has two pairs of wings. The question about the rate of evolution must now be turned around: does evolution ever proceed gradually, or does it always occur in short bursts? Detailed field studies of thick rock formations containing fossils provide the best potential tests of the competing theories. Occasionally, a sequence of fossil-rich layers of rock permits a comprehensive look at one type of organism over a long period of time. For example, Peter Sheldon's studies of trilobites, a now extinct marine animal with a segmented body, offer a detailed glimpse into three million years of evolution in one marine environment. In that study, each of eight different trilobite species was observed to undergo a gradual change in the number of segments-typically an increase of one or two segments over the whole time interval. No significant discontinuities were observed, leading Sheldon to conclude that environmental conditions were quite stable

during the period he examined. Similar exhaustive studies are required for many different kinds of organisms from many different periods. Most researchers expect to find that both modes of transition from one species to another are at work in evolution. Slow, continuous change may be the norm during periods of environmental stability, while rapid evolution of new species occurs during periods of environmental stress. But a lot more studies like Sheldon's are needed before we can say for sure.

question 1

The word "innumerable" in the passage is closest in meaning to

A countless

B occasional

C large

D repeated

question 2

According to paragraph 1, all of the following are true EXCEPT:

A Darwin saw evolutionary change as happening slowly and gradually.

B Gaps in the fossil record were used to explain why it is difficult to see continuous small changes in the evolution of species.

C Darwin's evolutionary thesis was rejected because small changes could not be observed in the evolutionary record.

D By the early twentieth century, most biologists believed that gradualism explained evolutionary change.

question 3

Which of the sentences below best expresses the essential information in the highlighted sentence in the passage? Incorrect choices change the meaning in important ways or leave out essential information.

A The punctuated equilibrium hypothesis challenged gradualism, which holds that species evolve in relatively sudden bursts of brief duration.

B The punctuated equilibrium hypothesis developed by Stephen Jay Gould and

Niles Eldredge was challenged in 1972.

C In 1972 Stephen Jay Gould and Niles Eldredge challenged gradualism by positing that change from one species to another cannot occur without a lengthy transition period.

D The punctuated equilibrium hypothesis, in opposition to gradualism, holds that transitions from one species to another occur in comparatively sudden bursts.

question 4

According to paragraphs 1 and 2, the punctuated equilibrium hypothesis and the gradualism hypothesis differed about

A whether the fossil record is complete

B whether all species undergo change

C whether evolution proceeds at a constant rate

D how many new species occur over long periods of time

question 5

According to paragraph 3, the lack of intermediate fossils in the fossil record of some species

A has been extensively studied by paleontologists for over a century

B contradicts the idea that most species have remained unchanged for millions of years

C challenges the view that evolutionary change is gradual

D is most common in the fossil records of clam and coral species

question 6

Paragraph 4 mentions that North American horses have changed in all of the following ways EXCEPT in

A the number of toes they have

B the length of their faces

C their overall size

D the number of years they live

question 7

According to paragraph 7, Peter Sheldon’ s studies demonstrated which of the following about trilobites?

A They underwent gradual change over a long time period.

B They experienced a number of discontinuous transitions during their history.

C They remained unchanged during a long period of environmental stability.

D They evolved in ways that cannot be accounted for by either of the two competing theories.

question 8

The main purpose of paragraph 7 is to

A describe one test of the competing theories

B provide an example of punctuated equilibrium

C describe how segmented animals evidence both competing theories

D explain why trilobites became extinct

question 9

Look at the four squares [ ] that indicate where the following sentence could be added to the passage.

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change continuously but slowly and in small increments. Such changes are all but invisible over the short time scale of modern observations, and, it is argued, they are usually obscured by innumerable gaps in the imperfect fossil record. Gradualism, with its stress on the slow pace of change, is a comforting position, repeated over and over again in generations of textbooks. By the early twentieth century, the question about the rate of evolution had been answered in favor of gradualism to most biologists' satisfaction. Sometimes a closed question must be reopened as new evidence or new arguments based on old evidence come to light. In 1972 paleontologists Stephen Jay Gould and Niles Eldredge challenged conventional wisdom with an opposing viewpoint, the punctuated equilibrium hypothesis, which posits that species give rise to new species in relatively sudden bursts, without a lengthy transition period. These episodes of rapid evolution are separated by relatively long static spans during which a species may hardly change at all. The punctuated equilibrium hypothesis attempts to explain a curious feature of the fossil record-one that has been familiar to paleontologists for more than a century but has usually been ignored. Many species appear to remain unchanged in the fossil record for millions of years-a situation that seems to be at odds with Darwin's model of continuous change. Intermediate fossil forms, predicted by gradualism, are typically lacking. In most localities a given species of clam or coral persists essentially unchanged throughout a thick formation of rock, only to be replaced suddenly by a new and different species. The evolution of North American horses, which was once presented as a classic textbook example of gradual evolution, is now providing equally compelling evidence for punctuated equilibrium. A convincing 50-million-year sequence of modern horse ancestors-each slightly larger, with more complex teeth, a longer face, and a more prominent central toe-seemed to provide strong support for Darwin's contention that species evolve gradually. But close examination of those fossil deposits now reveals a somewhat different story. Horses evolved in discrete steps, each of which persisted almost unchanged for millions of years and was eventually replaced by a distinctive newer model. The four-toed Eohippus preceded the three-toed Miohippus, for example, but North American fossil evidence suggests a jerky, uneven transition between the two. If evolution had been a continuous, gradual process, one might expect that almost every fossil specimen would be slightly different from every other. If it seems difficult to conceive how major changes could occur rapidly, consider this: an alteration of a single gene in flies is enough to turn a normal fly with a single pair of wings into one that has two pairs of wings. The question about the rate of evolution must now be turned around: does evolution ever proceed gradually, or does it always occur in short bursts? Detailed field studies of thick rock formations containing fossils provide the best potential tests of the competing theories. Occasionally, a sequence of fossil-rich layers of rock permits a comprehensive look at one type of organism over a long period of time. For example, Peter Sheldon's studies of trilobites, a now extinct marine animal with a segmented body, offer a detailed glimpse into three million years of evolution in one marine environment. In that study, each of eight different trilobite species was observed to undergo a gradual change in the number of segments-typically an increase of one or two segments over the whole time interval. No significant discontinuities were observed, leading Sheldon to conclude that environmental conditions were quite stable during the period he examined. [] Similar exhaustive studies are required for many different kinds of organisms from many different periods. [] Most researchers expect to find that both modes of transition from one species to another are at work in evolution. [] Slow, continuous change may be the norm during periods of environmental stability, while rapid evolution of new species

occurs during periods of environmental stress. [] But a lot more studies like Sheldon's are needed before we can say for sure.

question 10

Directions: Select from the seven phrases below the phrases that correctly characterize punctuated equilibrium and the phrases that correctly characterize gradualism. Two of the phrases will NOT be used. This question is worth 3 points.

A. States that new species emerge from existing species during relatively brief periods of time

B. Was first formulated by Charles Darwin

C. Explains why North American horses have become smaller over time

D. States that new species evolve slowly and continuously from existing species

E. Explains the lack of intermediate fossil forms in the fossil record of many species

F. States that a species will not change unless its environment changes

G. Is associated with periods of environmental stability