

tpo_19_passage_2

In the late nineteenth century, ecology began to grow into an independent science from its roots in natural history and plant geography. The emphasis of this new "community ecology" was on the composition and structure of communities consisting of different species. In the early twentieth century, the American ecologist Frederic Clements pointed out that a succession of plant communities would develop after a disturbance such as a volcanic eruption, heavy flood, or forest fire. An abandoned field, for instance, will be invaded successively by herbaceous plants (plants with little or no woody tissue), shrubs, and trees, eventually becoming a forest. Light-loving species are always among the first invaders, while shade-tolerant species appear later in the succession. Clements and other early ecologists saw almost lawlike regularity in the order of succession, but that has not been substantiated. A general trend can be recognized, but the details are usually unpredictable. Succession is influenced by many factors: the nature of the soil, exposure to sun and wind, regularity of precipitation, chance colonizations, and many other random processes. The final stage of a succession, called the climax by Clements and early ecologists, is likewise not predictable or of uniform composition. There is usually a good deal of turnover in species composition, even in a mature community. The nature of the climax is influenced by the same factors that influenced succession. Nevertheless, mature natural environments are usually in equilibrium. They change relatively little through time unless the environment itself changes. For Clements, the climax was a "superorganism," an organic entity. Even some authors who accepted the climax concept rejected Clements' characterization of it as a superorganism, and it is indeed a misleading metaphor. An ant colony may be legitimately called a superorganism because its communication system is so highly organized that the colony always works as a whole and appropriately according to the circumstances. But there is no evidence for such an interacting communicative network in a climax plant formation. Many authors prefer the term "association" to the term "community" in order to stress the looseness of the interaction. Even less fortunate was the extension of this type of thinking to include animals as well as plants. This resulted in the "biome," a combination of coexisting flora and fauna. Though it is true that many animals are strictly associated with certain plants, it is misleading to speak of a "spruce-moose biome," for example, because there is no internal cohesion to their association as in an organism. The spruce community is not substantially affected by either the presence or absence of moose. Indeed, there are vast areas of spruce forest without moose. The opposition to the Clementsian concept of plant ecology was initiated by Herbert Gleason, soon joined by various other ecologists. Their major point was that the distribution of a given species was controlled by the habitat requirements of that species and that therefore the vegetation types were a simple consequence of the ecologies of individual plant species. With "climax," "biome," "superorganism," and various other technical terms for the association of animals and plants at a given locality being criticized, the term "ecosystem" was more and more widely adopted for the whole system of associated organisms together with the physical factors of their environment. Eventually, the energy-transforming role of such a system was emphasized. Ecosystems thus involve the circulation, transformation, and accumulation of energy and matter through the medium of living things and their activities. The ecologist is concerned primarily with the quantities of matter and energy that pass through a given ecosystem, and with the rates at which they do so. Although the ecosystem

concept was very popular in the 1950s and 1960s, it is no longer the dominant paradigm. Gleason's arguments against climax and biome are largely valid against ecosystems as well. Furthermore, the number of interactions is so great that they are difficult to analyze, even with the help of large computers. Finally, younger ecologists have found ecological problems involving behavior and life-history adaptations more attractive than measuring physical constants. Nevertheless, one still speaks of the ecosystem when referring to a local association of animals and plants, usually without paying much attention to the energy aspects.

question 1

According to paragraph 2, which of the following is a criticism of Clements' view of succession?

- A The principles of succession are more lawlike than Clements thought they were.
- B More evidence is needed to establish Clements' predictions about succession.
- C The details of succession are affected by random processes.
- D Many of the factors that determine which plants will grow in an environment, such as the nature of the soil and the exposure to sun, do not change at all.

question 2

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

- A confirmed
- B noticed
- C defined
- D publicized

question 3

According to paragraph 4, why do many authors prefer the term "association" to "community" when describing a climax plant formation?

- A Because the term "association" does not suggest the presence of a tight network involving interactive communication
- B Because the term "association" indicates that the grouping is not necessarily

beneficial to all members

C Because the term "community" indicates continuing dynamic development that a climax formation does not have

D Because the term "community" suggests an organization that has been designed for a specific purpose

question 4

In paragraph 5, the author challenges the idea of a "biome" by noting that

A there are usually no very strong connections among the plants and animals living in a place

B plants and animals respond in the same way to the same circumstances

C particular combinations of flora and fauna do not generally come about purely by chance

D some animals are dependent on specific kinds of plants for food

question 5

Why does the author make the statement, "Indeed, there are vast areas of spruce forest without moose" ?

A To highlight a fact whose significance the ecologist Herbert Gleason had missed

B To propose the idea that a spruce forest is by itself a superorganism

C To emphasize that moose are not limited to a single kind of environment

D To criticize the idea of a spruce-moose biome

question 6

According to paragraph 5, Gleason's opposition to the Clementsian views of plant ecology was based on the claim that plant species grow in places where

- A they can enter into mutually beneficial relationships with other species
- B conditions suit them, regardless of whether particular other species are present
- C habitats are available for a wide variety of plant and animal species
- D their requirements are met, and those of most other species are not

question 7

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 Unlike the terms "climax," "biome," and "superorganism," which refer to the particular association of plants and animals at a given location, the term "ecosystem" refers specifically to the physical factors within an environment.
- B The terms "climax," "biome," "superorganism," and "ecosystem" all refer to the system of plants and animals in an associated environment, but some are more controversial than others.
- C When the older terms of ecology became too technical, they were replaced by the more popular and more widely used term "ecosystem."
- D The term "ecosystem" gradually replaced discredited terms for the combination of a physical environment and the plants and animals living together in it.

question 8

According to paragraph 6, what did ecologists mainly study when the ecosystem concept was the dominant paradigm?

- A The physical factors present in different environments
- B The typical activities of animals and the effect of those activities on plants
- C The rates at which ecosystems changed from one kind to another
- D The flow of energy and matter through ecosystems

question 9

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

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concerned primarily with the quantities of matter and energy that pass through a given ecosystem, and with the rates at which they do so. Although the ecosystem concept was very popular in the 1950s and 1960s, it is no longer the dominant paradigm. [] Gleason's arguments against climax and biome are largely valid against ecosystems as well. [] Furthermore, the number of interactions is so great that they are difficult to analyze, even with the help of large computers. Finally, younger ecologists have found ecological problems involving behavior and life-history adaptations more attractive than measuring physical constants. [] Nevertheless, one still speaks of the ecosystem when referring to a local association of animals and plants, usually without paying much attention to the energy aspects. []

question 10

Directions: An introductory sentence for a brief summary of the passage is provided below. Complete the summary by selecting the THREE answer choices that express the most important ideas in the passage. Some sentences do not belong in the summary because they express ideas that are not presented in the passage or are minor ideas in the passage. This question is worth 2 points.

- A. Areas that are recovering from serious disturbances like volcanic eruptions and heavy floods provide special opportunities to observe the development of plant communities.
- B. According to the earliest theories of ecology, the development of plant communities proceeds in lawlike fashion and results in stable climax communities.
- C. Whether a given species will be found in a given ecosystem strongly depends on what other species it would interact with in that ecosystem.
- D. The idea of associations of plants and animals that function as "superorganisms" was later rejected by biologists who saw no strong evidence in support of that idea.
- E. Computer-aided studies of entire systems of associated organisms together with their environment provide a solid basis for current studies of specific ecological problems.
- F. The once popular idea of communities as integrated ecosystems has been largely rejected by modern ecologists, who are more interested in problems involving behavior and adaptations.