

## The Geologic History of the Mediterranean

In 1970 geologists Kenneth J. Hsu and William B.F. Ryan were collecting research data while aboard the oceanographic research vessel Glomar Challenger. An objective of this particular cruise was to investigate the floor of the Mediterranean and to resolve questions about its geologic history. One question was related to evidence that the invertebrate fauna (animals without spines) of the Mediterranean had changed abruptly about 6 million years ago. Most of the older organisms were nearly wiped out, although a few hardy species survived. A few managed to migrate into the Atlantic. Somewhat later, the migrants returned, bringing new species with them. Why did the near extinction and migrations occur?

■ Another task for the Glomar Challenger's scientists was to try to determine the origin of the domelike masses buried deep beneath the Mediterranean seafloor. ■ These structures had been detected years earlier by echo-sounding instruments, but they had never been penetrated in the course of drilling. ■ Were they salt domes such as are common along the United States Gulf Coast, and if so, why should there have been so much solid crystalline salt beneath the floor of the Mediterranean? ■

With question such as these clearly before them, the scientists aboard the Glomar Challenger processed to the Mediterranean to search for the answers. On August 23, 1970, they recovered a sample. The sample consisted of pebbles of hardened sediment that had once been soft, deep-sea mud, as well as granules of gypsum and fragments of volcanic rock. Not a single pebble was found that might have indicated that the pebbles came from the nearby continent. In the days following, samples of solid gypsum were repeatedly brought on deck as drilling operations penetrated the seafloor. Furthermore, the gypsum was found to possess peculiarities of composition and structure that suggested it had formed on desert flats. Sediment above and below the gypsum layer contained tiny marine fossils, indicating open-ocean conditions. As they drilled into the central and deepest part of the Mediterranean basin, the scientists took solid, shiny, crystalline salt from the core barrel. Interbedded with the salt were thin layers of what appeared to be windblown silt.

The time had come to formulate a hypothesis. The investigators theorized that about 20 million years ago, the Mediterranean was a broad seaway linked to the Atlantic by two narrow straits. Crustal movements closed the straits, and the landlocked Mediterranean began to evaporate. Increasing salinity caused by the evaporation resulted in the extermination of scores of invertebrate species. Only a few organisms especially tolerant of very salty conditions remained. As evaporation continued, the remaining brine (salt water) became so dense that the calcium sulfate of the hard layer was precipitated. In the central deeper part of the basin, the last of the brine evaporated to precipitate more soluble sodium chloride (salt). Later, under the weight of overlying sediments, this salt flowed plastically upward to form salt domes. Before this happened, however, the Mediterranean was a vast desert 3,000 meters deep. Then, about 5.5 million years ago came the deluge. **As a result of crustal adjustments and faulting, the Strait of Gibraltar, where the Mediterranean now connects to the Atlantic, opened, and water cascaded spectacularly back into the Mediterranean.** Turbulent waters tore into the hardened salt flats, broke them up, and ground them into the pebbles observed in the first sample taken by the Challenger. As the basin was refilled, normal marine organisms returned. Soon layer of oceanic ooze began to accumulate above the old hard layer.

The salt and gypsum\*, the faunal changes, and the unusual gravel provided abundant evidence that the Mediterranean was once a desert.

1. The word “objective” in the passage is closest in meaning to
  - (A) achievement
  - (B) requirement
  - (C) purpose
  - (D) feature
2. Which of the following is NOT mentioned in paragraph 1 as a change that occurred in the fauna of the Mediterranean?
  - (A) Most invertebrate species disappeared during a wave of extinctions.
  - (B) A few hardy species wiped out many of the Mediterranean’s invertebrates.
  - (C) Some invertebrates migrated to Atlantic Ocean.
  - (D) New species of fauna populated the Mediterranean when the old migrants returned.
3. What does the author imply by saying “Not a single pebble was found that might have indicated that the pebbles came from the nearby continent.”?
  - (A) The most obvious explanation for the origin of the pebbles was not supported by the evidence.
  - (B) The geologists did not find as many pebbles as they expected.
  - (C) The geologists were looking for a particular kind of pebble.
  - (D) The different pebbles could not have come from only one source.
4. Which of the following can be inferred from paragraph 3 about the solid gypsum layer?
  - (A) It did not contain any marine fossil.
  - (B) It had formed in open-ocean conditions.
  - (C) It had once been soft, deep-sea mud.
  - (D) It contained sediment from nearby deserts.
5. Select the TWO answer choice from paragraph 3 that identify materials discovered in the deepest part of the Mediterranean basin. To receive credit you must select TWO answers.
  - (A) Volcanic rock fragments
  - (B) Thin silt layers
  - (C) Soft, deep-sea mud
  - (D) Crystalline salt
6. What is the main purpose of paragraph 3?
  - (A) To describe the physical evidence collected by Hsu and Ryan
  - (B) To explain why some of the questions posed earlier in the passage could not be answered by the findings of the Glomar Challenger
  - (C) To evaluate techniques used by Hsu and Ryan to explore the sea floor
  - (D) To describe the most difficult problems faced by the Glomar Challenger expedition
7. According to paragraph 4, which of the following was responsible for the evaporation of the Mediterranean’s waters?
  - (A) The movements of Earth’s crust
  - (B) The accumulation of sediment layers
  - (C) Changes in the water level of the Atlantic Ocean
  - (D) Changes in Earth’s temperature
8. The phrase “scores of” in the passage is closest in meaning to
  - (A) members
  - (B) large numbers
  - (C) populations
  - (D) different types
9. According to paragraph 4, what caused most invertebrate species in the Mediterranean to become extinct?
  - (A) The evaporation of chemicals necessary for their survival
  - (B) Crustal movements that connected the Mediterranean to the saltier Atlantic
  - (C) The migration of new species through the narrow straits
  - (D) Their inability to tolerate the increasing salt content of the Mediterranean

10. 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 strait of Gibraltar reopened when the Mediterranean and the Atlantic became connected and the cascades of water from one sea to the other caused crustal adjustments and faulting.
- (B) The Mediterranean was dramatically refilled by water from the Atlantic when crustal adjustments and faulting opened the Strait of Gibraltar, the place where the two seas are joined.
- (C) The cascades of water from the Atlantic to the Mediterranean were not as spectacular as the crustal adjustments and faulting that occurred when the Strait of Gibraltar was connected to those seas.
- (D) As a result of crustal adjustments and faulting and the creation of the Strait of Gibraltar, the Atlantic and Mediterranean were connected and became a single sea with spectacular cascades of water between them.

11. The word “Turbulent” in the passage is closest in meaning to

- (A) Fresh
- (B) Deep
- (C) Violent
- (D) Temperate

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

Thus, scientists had information about the shape of the domes but not about their chemical composition and origin.

Where would the sentence best fit?

13. 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.

An expedition to the Mediterranean answered some long-standing questions about the ocean's history.

Answer choices

- (A) The Glomar Challenger expedition investigated changes in invertebrate fauna and some unusual geologic features.
- (B) Researchers collected fossils to determine which new species migrated from the Atlantic with older species.
- (C) Scientists aboard the Glomar Challenger were the first to discover the existence of domelike masses underneath the seafloor.
- (D) Samples recovered from the expedition revealed important differences in chemical composition and fossil distribution among the sediment layers.
- (E) Evidence collected by the Glomar Challenger supports geologists' beliefs that the Mediterranean had evaporated and become a desert, before it refilled with water.
- (F) Mediterranean salt domes formed after crustal movements opened the straits between the Mediterranean and the Atlantic, and the Mediterranean refilled with water.



### 参考答案与解析

1. 选 **C**。objective 目标，目的，purpose 正确。
2. 选 **B**。EXCEPT 题，排除法。A 中的 invertebrate 做关键词定位至第三句，但这句只说 change，下一句才对应 A 答案，所以 A 对，不选；注意原文说大部分 wiped out，一部分 hardy 的留下了，而 B 说 hardy 的把大部分轰出去了，错，所以选 B；C 的 Atlantic 对应倒数第二句，对，不选；D 的 old migrants 对应最后一句，对，不选。
3. 选 **A**。先把修辞点所在的句子读清楚，说没有 pebble 能证明是形成在 nearby continent 的，注意这道题如果往前看的话是找不到答案的，即使是看完中心句也没用，所以索性往后看。后面 furthermore 那句说这些 pebble 是形成在沙漠的，也就是说之前认为的很明显的证据是不对的，A 对；剩下的选项都没说。
4. 选 **A**。以 gypsum layer 做关键词定位至倒数第二句，说 gypsum layer 之上和之下的 sediment 都包含 marine fossils，之间的 gypsum layer 应该是不包含的，否则就没法分层了。原文倒数第三句明确说 gypsum 形成在 desert flats，所以 B 的 open-ocean 就不对；虽然说了 desert，但 nearby 这个信息是没法推得的，所以 D 不对；C 没说。
5. 选 **BD**。以 Mediterranean basin 做关键词定位至最后一句，说科学家从盆地底拿到了 salt 和 windblown silt，所以 B 和 D 正确。
6. 选 **A**。看第一句，说为了解决这些问题，科学家们开船到地中海，接着就花大量笔墨说他们采到各种各样的 sample，所以答案是 A。原文没说问题不能解决的原因，B 错；技术的事儿只是带过，并没有详细描述，C 错；D 说航行中遇到的问题完全没提。
7. 选 **A**。以 evaporation 做关键词定位至第三句，但第三句已经开始说 evaporation 引起的结果了，跟问题无关，而第二句说 crustal movement 关闭了海峡，然后海水开始蒸发，所以答案是 A。
8. 选 **B**。scores of 指的是大量，跟 score 的原意无关，所以 B 正确。
9. 选 **D**。以 invertebrate species 做关键词定位至第四句，是 increasing salinity 增加的盐度导致的。
10. 选 **B**。原句的结构是由于 crustal adjustment 和 faulting，导致海峡 open 和水流。A 因果弄反，错；C 的 as spectacular as 将两者进行比较，而这是原文没有的，所以错；D 把原文中属于结果的海峡打开搬到了原因部分，改变了原文结构，错。
11. 选 **C**。turbulent 动荡的，狂暴的，骚动的，所以 violent 正确。原句说什么样的水撕开了硬化的盐田，将它们弄碎并且形成小卵石，说明水的冲击力很大，无论是 A 新鲜水 B 深水还是 D 缓流的水都达不到这种效果。
12. 选 **C**。四个过渡点，thus 说明正确插入点之前的句子和待插入句子之间存在因果关系：shape、dome 还有 chemical composition and origin。dome 和 chemical composition and origin 与原文的 salt domes 和 crystalline salt 重合，断定 C 或者 D 是正确答案；C 点之前说这些 dome 已经用回声测过了，所以应该知道形状，thus 表明的因果关系成立，所以 C 对 D 错。
13. 选 **ADE**。A 选项对应第一段第三句和第二段的第一句，正确；B 选项原文没说，不选；C 选项与第二段第一句相反，这句话说科学家的目的是为了确定那些 domelike masse 的来源，也就是说以前已经发现了，所以他们不是第一个，错；D 选项对应整个第三段，正确；E 选项对应整个第四段，说地中海曾经干涸，后来又被填满，正确；F 选项与第四段倒数第六句说反，不选。