ZABARGAD: THE ANCIENT PERIDOT ISLAND IN THE RED SEA

By Edward Gübelin

Reflecting on his 1980 visit to Zabargad, the author provides an update on this relatively unknown island and the beautiful peridots for which it has gained fame. He complements his discussion of the geology of Zabargad, the peridot occurrences, the mining techniques, and the characteristics of the gemstone with a look at the ancient history of the island and the etymological changes surrounding the stone's current name, peridot. ***Although somewhat low on the hardness scale, this magnificent gemstone has regained popular appreciation, and the crystals from Zabargad are still among the finest in the world.***

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Zabargad is the oldest and longest-known source of gem peridots (fig. 1); yet the island, just as much as the gemstone it hoarded, has slid repeatedly into oblivion, only to be rediscovered over and over again and forgotten once more. The author visited this tiny island in the Red Sea in March of 1980. Located about 60 miles southeast of the Râs Banâs peninsula, at 23° 36′ 16″ N and 36° 11′ 42″ E (fig. 2), it is situated 16 km north of the Tropic of Cancer. Zabargad is only 3.2 km long and 2.4 km wide, covering an area of 4.5 km². There is hardly any life on the island and no fresh water at all; one may justly describe it as a "desert island." In fact, apart from low-growing shrubs, several giant turtles, and a few birds such as wagtails, ospreys, and gulls, practically no flora or fauna exist on Zabargad. The highest ground is the so-called Peridot Hill (235 m above sea level), which together with some smaller hills (135 m above sea level) forms the most impressive sight that the island offers the approaching seafarer (fig. 3). Despite the lack of vegetation, the island is at its most beautiful when the yellow to dark brown tones of the various rocks and dump-heaps before the many pits brighten in the light of the morning sun. The adventurer with any imagination at all cannot avoid letting the pageant of history unfold (see box).

REGIONAL GEOLOGY

The occurrence of peridot on Zabargad is intimately related to the regional geology and the tectonic processes that on a larger scale were responsible for the formation of the Red Sea itself. As an extension of the East African Rift Valley and part of the global rift system, the Red Sea is a geologically young feature that evolved in the Tertiary period of geologic time, 65 to 13 million years ago.

The rocks seen on the island represent the results of magmatic activity with associated metamorphism of preexisting sediments and were all exposed through tec-

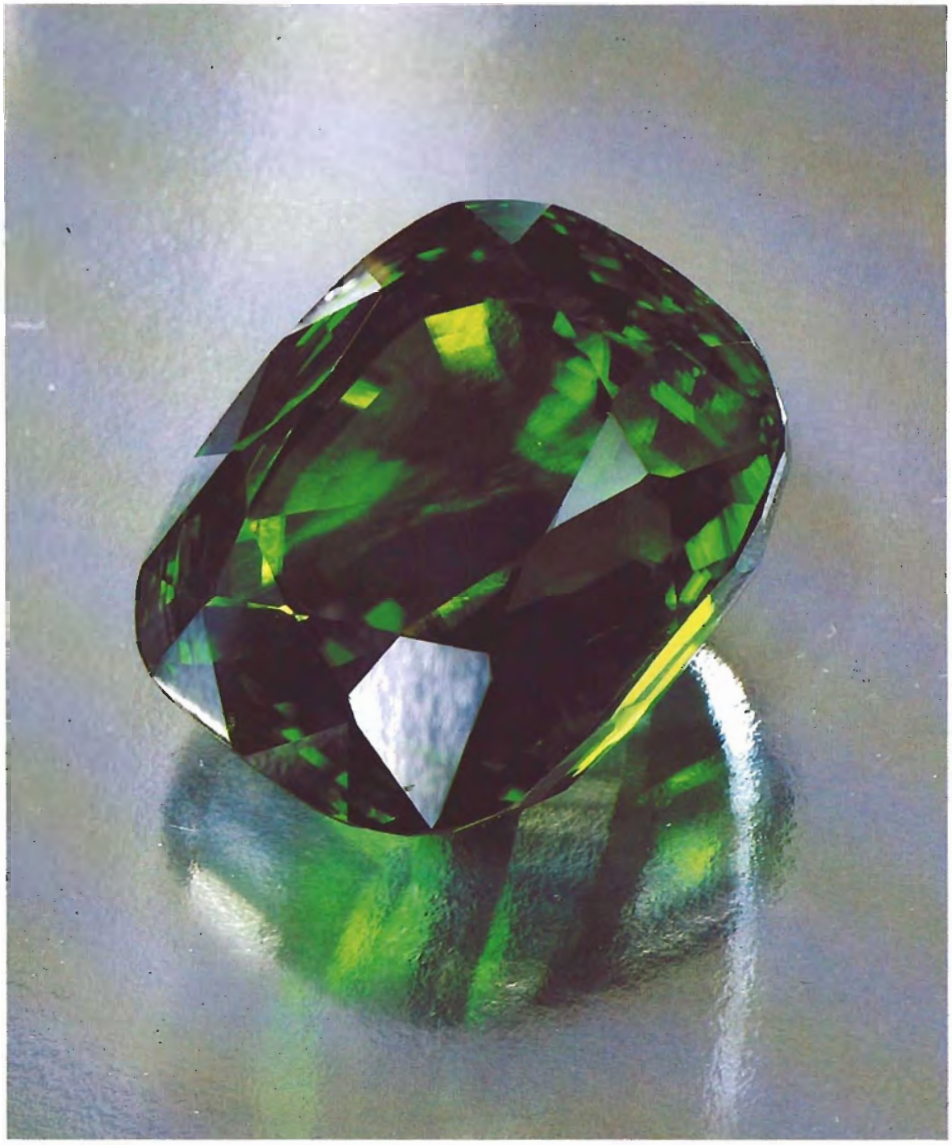

Figure 1. Faceted peridot from Zabargad, 284.85 carats (property of Messrs. A. Ruppenthal, Idar-Oberstein, Germany).

tonic uplift and erosion. Mafic igneous rocks (Badgley, 1965), which represent the bulk of the island, are of deep-seated origin. They are notable for their low silica content and consist primarily of lherzolites, characterized by abundant olivine, pyroxene, and amphibole. The metamorphic rocks, in turn, consist of serpentinites, granulites, schists, and slates. The alluvial sediments and an extensive gypsum deposit are of more recent origin.

The topography of the island reflects its tectonic history. The terrain is extremely irregular, the coastline consisting of fractured escarpment terraces. Numerous coral banks and reefs occur in the surrounding waters.

THE PERIDOT OCCURRENCES

No detailed documentation of the peridot occurrences on Zabargad has been made. An interesting review of available information is provided by Wilson (1976).

It seems likely that peridots were once found on several parts of the island—in fact, almost everywhere the peridotites outcrop. The finest and largest gem crystals, it is believed, occurred in such quantitites on the eastern slopes of Peridot Hill that mining was worthwhile. Here they appear to have been recovered in vein-like areas of the serpentinized peridotite. The tiny veins run in all directions so that in places they form

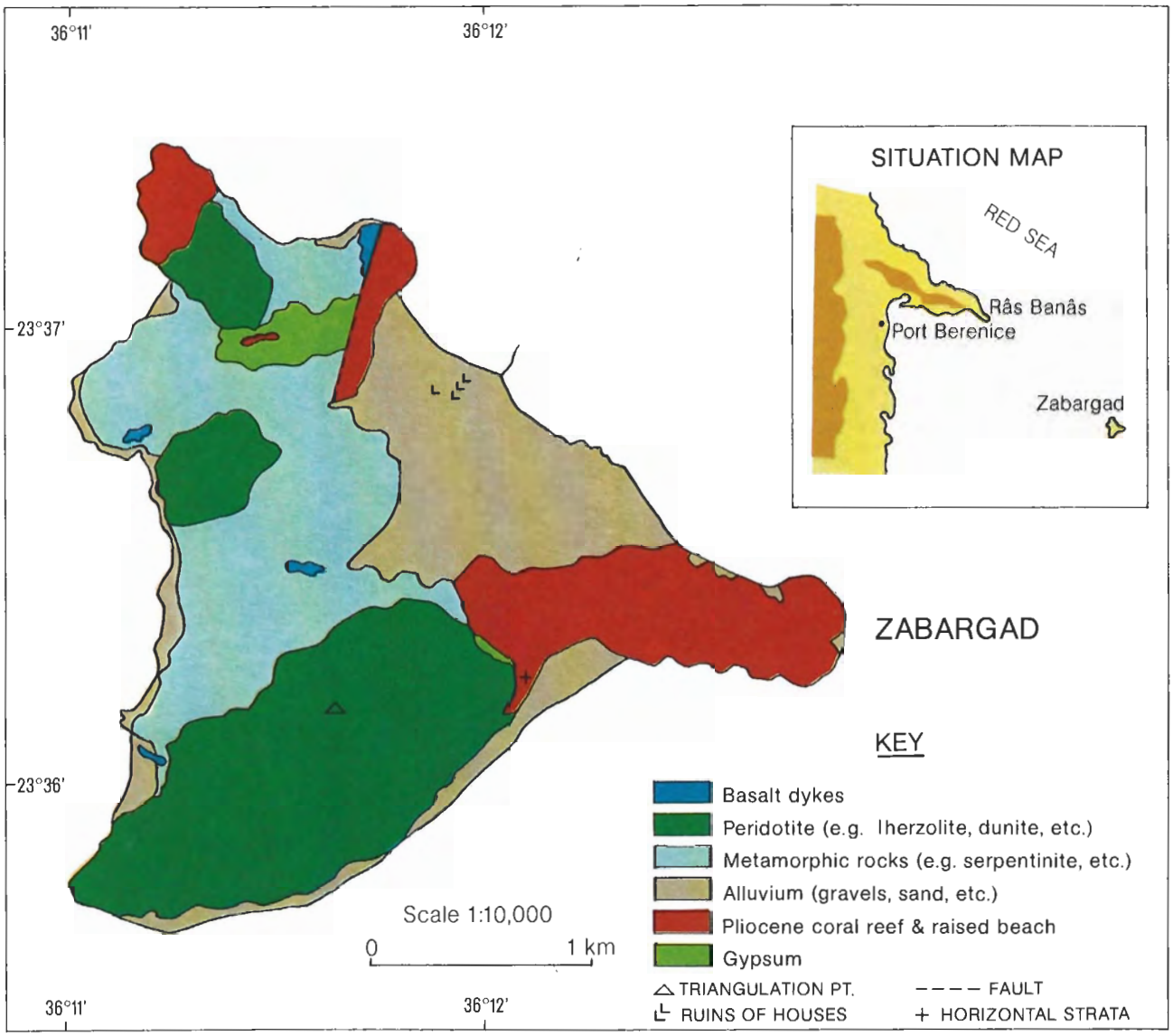

Figure 2. Geologic map of the island of Zabargad. Inset shows the relationship of the island to the Egyptian mainland.

an actual stockwork that occupies an oval region of considerable extent.

The peridot crystals must originally have followed and lined open cracks and fissures, inasmuch as they were probably formed on the walls of fractures. As a result of tectonic movements, they were later broken from their original sites and included among the rubble of the cracks. In this author's view, however, this theory is only valid if the transformation of the peridotite into serpentinite occurred metasomatically and before or during the formation of the peridot crystals; otherwise they too would have undergone serpentinization. Since the crystals are absolutely fresh and well preserved, or at the most very slightly etched, they must have developed at the same time or at a later stage. However, unless and until the island is investigated in its entirety mineralogically and petrographically, such ideas must remain speculations.

Shortly before the visit of the author and his companion, a joint American-Austrian expedition consisting of curators from the Vienna Museum of Natural History and the American Museum of Natural History in cooperation with the Egyptian Geological Survey, and with the help of the El Nasr Phosphate Company, spent several days on the island. It is to be hoped that new and valid knowledge can be expected from these investigators. At the old sieving places (fig.

Figure 3. View of Peridot Hill, the highest point on the island (235 m above sea level), as seen from the northeast. Note the dump-heaps at the foot of the hill.

Figure 4. Sieving place in the foreground and dump-heaps in the background on the eastern slope of Peridot Hill.

4), in the prematurely abandoned sieve-heaps, and among the waste of the mines, the author and his companion found over a hundred fresh, transparent, well-preserved, in part broken but certainly cutable peridot crystals pale yellowish green to deep olive green in color. Conspicuous samples of the macroscopic paragenesis of these peridot crystals were green garnierite and fresh whitish to weathered grey cancrinite. The peridot crystals, pseudohexagonal after b(010) in form, were between 5 and 15 mm along the a-axis. Formerly, however, one could find peridot crystals up to 10 cm long, although those 2–4 cm in length were much more abundant. The Geological Museum in London owns a splendid step-cut peridot of 146 ct., while the largest known cut peridot weighs 310 ct. and is exhibited at the Smithsonian Institution in Washington, DC. Both of these magnificent samples came originally from the island of Zabargad.

MINING

The original mining methods consisted of primitive manual digging, whereby each individual vein was excavated (fig. 5). The miners worked

Figure 5. Low tunnel dug into metamorphic rock to reach the deeper mafic rock (note the white bands of magnesite).

FROM "TOPAZOS" TO PERIDOT: ZABARGAD AND ITS GEM SHARE A PLACE IN HISTORY, LANGUAGE, AND LORE

Topazios is the name used by Greek author Alexander Polyhistor to refer to an island on which gemstones are found whose color "resembles that of fresh oil." The great naturalist of ancient times, Pliny the Elder (23–79 A.D.), mentions the island "Topazios" in his work *Naturalis Historia.* He refers specifically to King Juba II of Mauretania (25 B.C.–23 A.D.) who reportedly states in his writings that this legendary island in the Red Sea was first explored during the reign of Queen Berenice (340–279 B.C.). Pliny also refers to another report that pirates driven by adverse winds landed on an island in the Red Sea called Chytis or Cytis. Being in a famished condition, they sought herbs and roots in the ground and thereby found the first "topazos." Other names attributed to the island in ancient times include Island of Death (Nekron) and Ophiodes ("snake island," reported by Agatharchides of Knidos, 181–146 B.C.). Not until the time of the Crusades did this mystery-bound scrap of land receive the name by which it is still mistakenly known in the West, St. John's Island, and finally, Zabargad.

For Pliny the Elder, *topazos* was a jewel that mainly occurs in green but may also be yellow. Probably there is some confusion here with chrysolite, "chrysolithos," which was also known in ancient times (Ezekiel 10, 9). During the period, *chrysos* meant golden, that is, yellow. Not until much later did the word experience an etymological change as the prefix *chryso-* entered common usage to describe a green stone (see chrysoberyl, chrysoprase, chrysopal, chrysocolla, chrysolite, etc.).

When in the early 18th century the name *topaz* was finally affixed to the fluorine-bearing aluminum silicate that currently holds this title, a new name was needed for the green gemstone from Zabargad. In 1790, the sometime mineralogist A. G. Werner named the mineral olivine because of its typical olive-green color. In the same year, he published a description of chrysolite in *Bergmanns Journal* 3, stating that it was a mineral in its own right. A few years later, M. H. Klaproth was able to prove that olivine and chrysolite belong to the same family of minerals. Although *chrysolite* was used by German and American mineralogists for over 100 years, this term has left general usage and is no longer accepted in English nomenclature for the gemstone. The English adopted Werner's name *olivine,* while the French gave preference to the new name *peridot,* which is derived from the Arabian word *faridat,* meaning gem. The latter is generally used today to refer to the gemstone, whereas the true name of the mineral is olivine (see Ball, 1950, Lüschen, 1979, and Mitchel, 1979, for further information on the various names).

Archaeological excavations in Alexandria have apparently unearthed valuable peridots. Faceted samples, which could only have come from Zabargad, have also been discovered in ancient Greece. In all probability, the fabulous stone that once adorned King Ezekiel from Tyrus (about 586 B.C.; Ezekiel 28, 13) was a peridot from Zabargad. Where so much treasure and beauty were to be found, the authorities kept a wary eye. Diodorus Siculus writes in the first century before Christ: "The Egyptians kept the island under constant watch, and anyone who tried to approach the treasure island without permission—let alone to attempt to land and steal the peridots—was threatened with death." Thus, this island in the Red Sea became one of the most closely guarded regions of the ancient world, and its treasure was held secret for centuries, virtually hidden from the Western world from biblical times until the onset of the baroque period in the 17th century.

Figure 6. Peridot crystal on its original matrix, self-collected by the author. The crystal is approximately 1.2 cm × 1.1 cm.

downwards until the vein, usually at a shallow depth, became sterile or contracted. However, the peridots were not found where they had crystallized. They were always loosely attached to the walls of the veinlets and could easily be removed from their position. Wilson (1976) noted that he knew of no peridot crystal that he could in good conscience claim was found directly grown on its mother-rock. However, the author of this present article was so lucky as to find a piece of matrix about the size of a child's fist with a fully grown, well-developed peridot crystal attached (fig. 6).

During the years before World War I, from about 1906 onwards, the island of Zabargad was generally known as *the* source of peridot, and mining rights were monopolized by the Khedive, the Turkish viceroy in Egypt. Within a four-year period, more than $2 million in peridot (present day value) was found and sent to France for cutting. The chief problem on the island then, as now, was the lack of fresh drinking water for the miners. The mining company overcame this difficulty by erecting a large gasoline-powered water condenser (of which a few rusty parts are still lying around today). In 1922 the Egyptian government gave the mining rights to the Red Sea Mining Company. In the years that followed, until the outbreak of World War II, this company brought out a considerable amount of peridot. In 1958, the deposits were nationalized by Egyptian President G. A. Nasser.

DESCRIPTION AND PROPERTIES

Gem peridot lies compositionally between the end members forsterite (Mg_2SiO_4) and fayalite (Fe_2SiO_4) of the olivine isomorphous series $(Mg, Fe)_2[SiO_4]$, in which the two divalent cations Mg and Fe can replace each other diadochally. The peridots from Zabargad contain 8%–10% FeO (FeO + MgO amount to approximately 64%; Wilson, 1976). The crystals are elongated along the a-axis so that the brachy pinacoid b(010), which is markedly striated vertically to the c-axis, forms the largest face. The gradations in color of this summer-green gemstone (the birthstone for August), as well as the variations in its other physical properties, are caused by the iron content (see Troeger, 1956, p. 54) and other components. The color tones of the finest qualities correspond with the DIN color chart 6164, page 24, colors 24:6:2; 24:6:3 to 24:6:4 of the color norms $X_c34.2$; $Y_c43.7$; $Z_c10.2$ or $X_c23.0$; $Y_c29.4$; $Z_c6.9$ or $X_c15.2$; $Y_c19.5$, and $Z_c4.6$. Refractive indices vary little, from 1.650 to 1.654 for $n\alpha$ and between 1.686 and 1.690 for $n\gamma$, with a constant value for $n\beta$ only a little below the middle of the two extreme readings. The high birefringence remains constant at 0.036, as does the density (3.34) which is only 0.01 above that of pure methylene iodide, in which liquid peridot remains suspended or sinks slowly. Pleochroism is weak but perceptible as pale green along α, green along β,

and light green along γ. The absorption spectrum reveals the iron content by means of three characteristically placed bands in the blue to blue-green region at 453, 473, and 493 nm.

Diagnostically important are the rounded plate-like and wafer-thin healing seams or residual drops, in the approximate center of which a black grain of chromite is situated. Their appearance may be likened to that of a water-lily leaf, and they are consequently termed "lily pads."

CONCLUSION

Since mining on Zabargad has failed to remain lucrative, other sources have filled the demand for peridot. Relatively great numbers of large, attractive peridots from Kyaukpon, above Mogok in Burma are still reaching the market. Today's second largest supplier of cutable gem peridots is near San Carlos, in Arizona, followed up by a deposit at Söndmöre in Norway, which produces peridots that are slightly lighter in color and very brilliant when faceted. In addition, some small fragments of peridot are said to come from Hawaii.

Despite its somewhat low hardness of 6½–7 (lying just below the critical border of gemstone hardness, 7), this magnificent gemstone with its agreeable sparkle and its glimmer like damp moss in the evening sunlight, has today once more gained appreciation and popularity.

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