

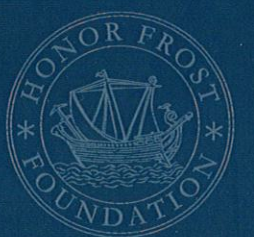


IN THE FOOTSTEPS OF HONOR FROST

The life and legacy of a pioneer in maritime archaeology



by
JACQUELYNNE BLUE



Honor Frost and the Pharos: the lighthouse of Alexandria

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In 1968 Honor Frost was engaged by UNESCO to carry out a survey of the underwater site of the monumental pharos of Alexandria. She was accompanied by the geologist Wladimir Nesteroff, Kamel Abul-Saadat, who had discovered the site, and architect Samir Amir, all of whom were divers. Bad weather conditions and poor visibility limited them to only six dives. Frost mapped the site with the limited means available to her, producing a remarkably precise plan. Her comments and descriptions of the site were published in 1975 in a short note titled 'Alexandria, the Pharos site'. In 1995 Frost brought the plans she had drawn back to Alexandria to help in the excavation of the lighthouse, which had started in 1994. These pages are intended to underline the fundamental contribution that Frost made to our knowledge of the site.

Keywords: Honor Frost, underwater archaeology, Egypt, Alexandria, lighthouse, Pharos, CEAlex (Centre d'Études Alexandrines).

The 'Under the Mediterranean' conference, held in Nicosia in 2017, marked not only the centenary of Honor Frost's birth, but also 40 years of our friendship, writes *Jean-Yves Empereur*. In the mid 1970s, as a young member of the French School in Athens, I first learned about underwater excavation on the wreck of Madrague de Giens, directed by André Tchernia and Patrice Pomey. There, I made Frost's acquaintance when she arrived for her annual visit (at the wheel of her car, nicknamed 'Turbo'), a stop *en route* to Marsala and her excavation of the Punic Ship wreck (see Pomey, Alagna, this volume). I took pleasure in seeing her thereafter from the first of the TROPIS meetings in Delphi organized by our friend Harry Tzalas (see Tzalas, this volume), and in London at her home in Welbeck Street.

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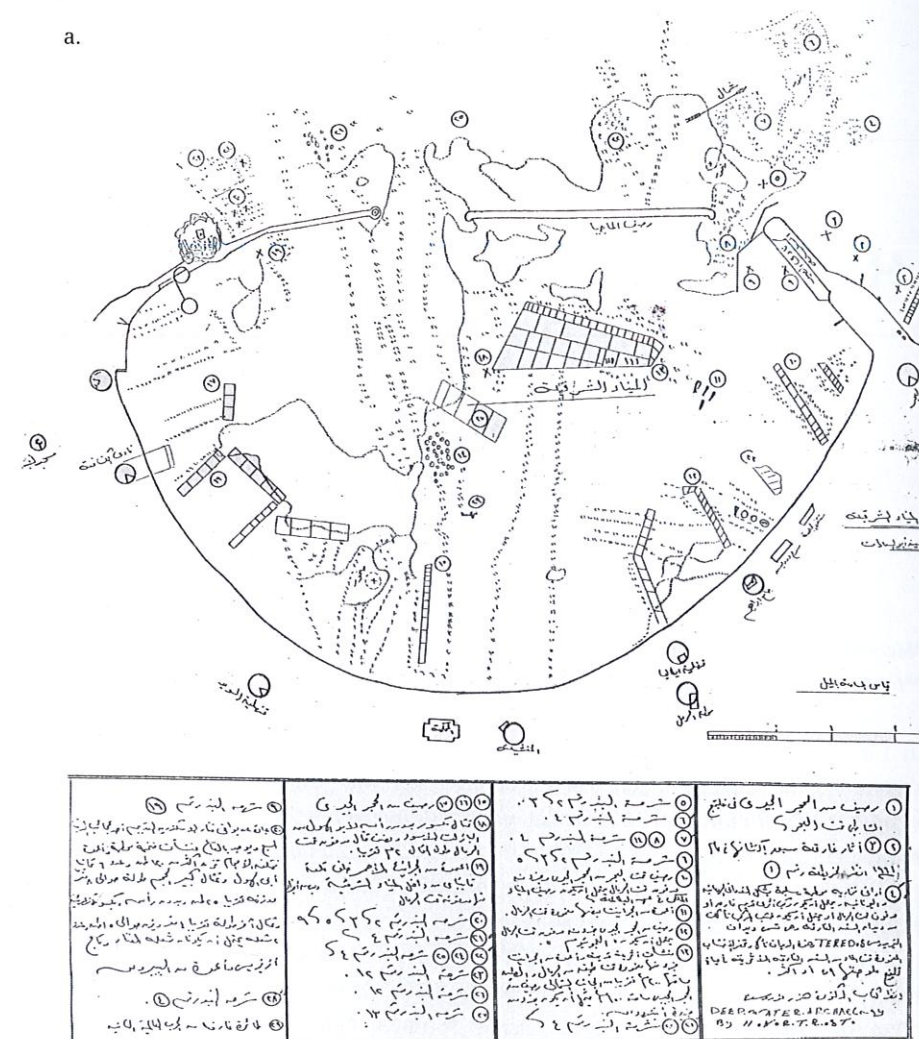
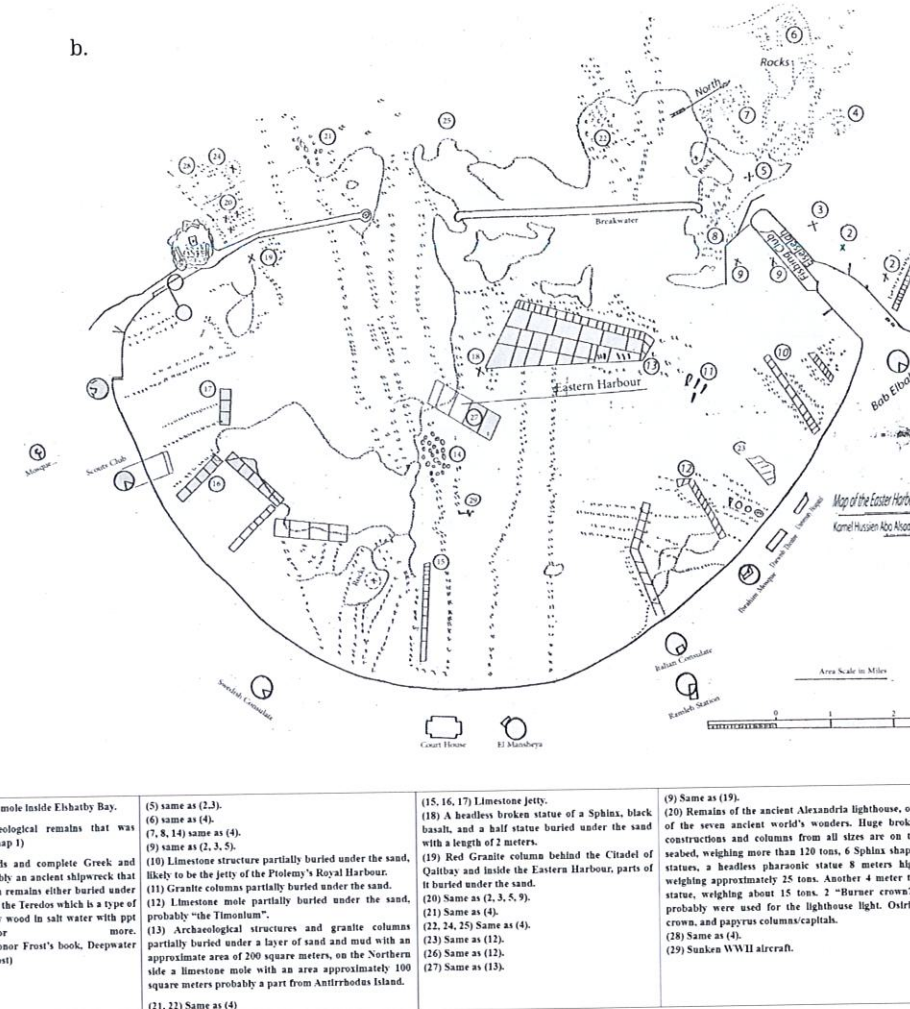


Figure 1. a) Original drawing by Kamel Abul-Saadat showing the location of his underwater archaeological discoveries at Alexandria, with Arabic annotations dated 1961 and later additions. At the bottom right is marked 'Deepwater Archaeology by Honor Frost'. This document was brought to the CEAlex by Honor Frost in 1995. (© Archives CEAlex/CNRS) b) (Opposite page) English translation of annotations by Ziad Morsy.

In 1968, Frost was engaged by UNESCO to carry out an assessment of a site at Alexandria, to examine the underwater ruins first signalled by the pioneer of Egyptian underwater archaeology, Kamel Abul-Saadat. Over the course of a series of dives, Frost made measured plans and published a description of the site in an *IJNA* note titled 'The Pharos site, Alexandria, Egypt' (Frost, 1975). When, in 1992, the Egyptian authorities asked me to undertake a rescue excavation at the foot of Qaitbay Fort in Alexandria, I naturally turned to Frost. She accepted my invitation and dived with our team in 1995: thanks to her prodigious memory, she was able to describe in detail the state of the site prior to the placement of a second series of modern



concrete blocks in 1980. She was kind enough to return to Alexandria several times, bringing with her unpublished notes and reports. In 1997, I entrusted architect and diver Isabelle Hairy with responsibility for creating a Graphical Information System for the Pharos site, a project that she now directs. In the following lines we will illustrate the essential contribution that Frost made to our knowledge of the underwater site of the Pharos of Alexandria.

A predecessor, Kamel Abul-Saadat

A native Alexandrian, Kamel Abul-Saadat (1933-1984) discovered the underwater site at Qaitbay in 1961. He was an amateur diver who, with no institutional support, made many truly remarkable discoveries at Alexandria, which earned him the title of 'founder

of underwater archaeology in Egypt'.¹ He recorded his observations on three maps drawn up over the years with a series of updates (often misdated) which he never published: they were held for some time in the archives of the Greco-Roman Museum of Alexandria (which has been closed for renovation since 2005) and are now conserved by the Underwater Archaeology Unit of the Egyptian Ministry of Antiquities. Two of these plans have been recently published (Seif el-Din, 2014: figs 1-2), alongside a French translation of the Arabic legends. The third, the most complete, is presented here (Fig. 1). Kamel Abul-Saadat marked a series of submerged archaeological sites on this plan – the site at the foot of the Qaitbay Fort, and at least three others in the Eastern Port, as well as the sites of Silsileh and Chatby to the east of the port (Halim, 2000; Seif el-Din 2014: 102-103).

At the underwater site at the foot of the Qaitbay Fort, the diver noted the presence of two large statues, an immense sphinx, sarcophagi, and granite and marble columns (Morcos, 2000: pl. 4), all scattered among an impressive number of ancient stone blocks distributed over a wide area, which he believed belonged to the Pharos of Alexandria. Following this initial survey, in 1962 the Egyptian National Marines raised one of the colossal statues made of pink Assouan granite from the sea. It is a female statue, now exhibited in the Maritime Museum of Alexandria (Laqany, 1966: 28). As for its paired male statue, it was raised by the Centre d'Études Alexandrines (CEAlex) in 1995.

Frost's visit to Alexandria, 1968

Working conditions

In 1968, Frost and Wladimir Nesteroff were asked by UNESCO to survey the site (Fig. 2).² Nesteroff is rarely mentioned in scientific literature, and even less in archaeological circles. He was a geomorphologist and Director of Research at the Centre National de la Recherche Scientifique (CNRS). He had accompanied Jacques-Yves Cousteau in his expeditions around the world aboard *Calypso* and, as a pioneer in radiocarbon dating beach-rock, published several scientific reports in the 1960s.³

In fact, no record of Nesteroff's part in the project has been found to explain how he and Frost organized their work together, but he probably dived on his own in search of clues that might explain why the site was submerged in antiquity.

The season in October and November was not optimal for underwater survey; Frost wrote of her six dives that 'photographic coverage was doomed in the choppy, cloudy, autumn sea' (Frost, 1975: 127), elsewhere noting that the site is particularly exposed to the north-west wind that stirs up the town's sewage. During her fieldwork the water was

1 Kamel Abul-Saadat was regularly cited during the 'Alexandria International Conference on Maritime and Underwater Archaeology' which was held in Alexandria, 31 October-2 November 2016, to celebrate the 20th anniversary of the Egyptian Underwater Archaeology Department. His work has also been the subject of a study by Halim (2000, see also Morcos, 2000; Abd el-Maguid, 2000: fig. 3; Abd el-Maguid, 2001; Khalil and Abd el-Maguid, 2002: fig. 3.1.2; Darwisch and Abd el-Maguid, 2002: fig. 2; El Sayed, 2013).

2 Wladimir Nesteroff (with a 'W') not Vladimir, as his name is erroneously spelt by Frost in her article and reports, and all recent literature.

3 An internet search reveals several underwater geological studies in Nesteroff's name (for example Nesteroff, 1972).



Figure 2. Honor Frost at Qaitbay Fort in 1968. (courtesy St Millière, © Archives Gédéon).

clear on only one day which, in our experience, signifies there was a southerly wind, which is rare in the region.

The discoveries

Frost writes at the beginning of her *IJNA* note that she had sought out the statue first seen by Abul-Saadat in 1961 and lifted by the Egyptian navy in 1962; she includes a photograph of it lying on the ground in the Serapion Gardens (Frost, 1975: 126, fig. 1), with what appears to be a pharaoh's crown (a second crown was lifted from the seafloor by CEAlex in 1995). She continues that Abul-Saadat also found 'the remains of submerged buildings that may represent the lost Palace of Alexander and the Ptolemy (supposedly the final resting place of a glass sarcophagus containing the body of Alexander the Great)'! (Frost, 1975: 126-127).

In the second part of her report for UNESCO, Frost details 'Recommendations' for the personnel and equipment required to carry out an excavation campaign that she foresaw between August and October. Other than her insistence on the necessity of stopping the pollution of the site with sewage (for which no solution has yet been found...), she gives a detailed list of possible participants, including her friends Abul-Saadat and the architect Amir Amir; she furnishes the names of French and Cypriot companies that would be able to lift the heaviest blocks, and provides a detailed budget – in the French francs of the time – for an underwater excavation and for lifting the blocks necessary to continue work in the following years (Frost, nd). This unpublished report, as well as her hand-drawn plan of the underwater site (Fig. 3) was sent to UNESCO. A copy can be found in the Honor Frost archive (MS 439 HFA/1/3/3) now housed at Southampton University Special Collections, and another was given to us by Frost in 1995.

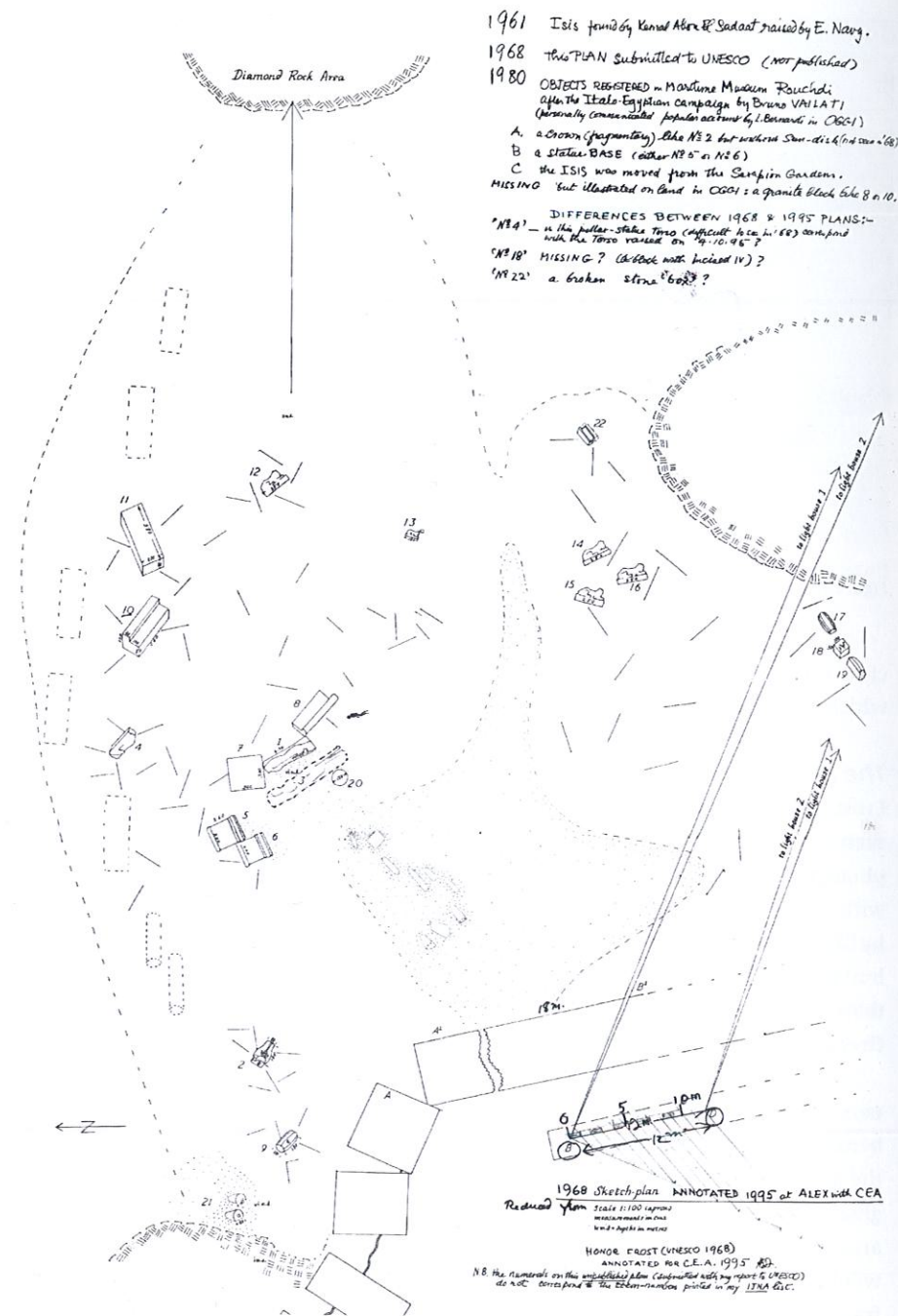


Figure 3. Frost's plan drawn in 1968 and given to the CEALex, on which she added annotations in 1980 following Bruno Vailati's mission, and in 1995 while revisiting the site (H. Frost, © Archives CEALex/CNRS).

Comparison of 1968 and CEALex plans					
Frost 1968			CEALex		
N°	Dimensions (cm)	Description of blocks	N°	Dimensions (cm)	Description of blocks
1	470	Colossal Statue	1001	450*100*100	Colossal statue in pink granite
2	180*100	Hathoric crown	1017	190*105*96	Hathoric crown in pink granite
3	?	Colossal Statue	1077/1861	647*150*110	Female colossal statue in pink granite
4	?	Reworked Sphinx	1064	240*110*95	Reworked sphinx in pink granite
5	260*200	Statue base	1062	260*240*240	Statue base in pink granite
6	250	Statue base	1024	260*246*246	Statue base in pink granite
7	300*300	Square block	1035	320*295*80	Pink granite slab
8	?	Architrave	1003	595*210*140	Pink granite lintel from a monumental doorway
9	180*100*40	Fragment of papyriform column	1254	182*103*42	Fragment of a 'fût fasciculé (4 tiges)' in pink granite with a Ramses II cartouche
10	440*180*120	Corniche	1028	436*210*140	Pink granite abutment from a monumental doorway
11	520*277*80	Long building block	1025	535*275*90	Slab of granite rose
12	250	Sphinx in grey Assouan stone	1011	200*130*60	Sphinx in grey granodiorite
13	120	Sphinx with head broken off at the neck	1671/1672	120*60*60	Sphinx body in yellow quartzite with head broken off at the neck
14	250	Sphinx	2499	130*120*80	Fragment of a sphinx in grey granitoid
15	250	Sphinx	2002	245*100*67	Fragment of a sphinx in greywacke
16	250	Sphinx	2003	180*120*70	Fragment of a sphinx of Sésostris III in yellow quartz
17	?	Fragment of papyriform column	2176	213*84	Fragment of papyriform column inscribed with the name of Ramesses II in pink granite
18	100*100*50	Granite block inscribed with a Roman figure IV	?	-	-
19	?	Fragment of papyriform column	2180	315*102	Fragment of papyriform column in pink granite with a cross decoration
20	150	Column base?	5177	35*142	Pink granite column base
21	80	Column or fragment	?	-	-
22	150	Fragment of granite sarcophagus	2405	135*109*25	Fragment of pink granite sarcophagus

Table 1. Comparison between architectural stone blocks and statuary recorded by Honor Frost in 1968 and those planned by the CEALex.

Frost's plan

Only when Frost's plan, made more than 50 years previously, was superimposed on the plan made by the Centre d'Études Alexandrines from 2012 onwards could the great precision of her work be appreciated (Figs 4-5), especially considering the short time she had on site, and the diverse methods used for measuring both distances and angles, writes *Isabelle Hairy*. The plan provides reliable information about the changes that have occurred in the state of the site since 1968. Nearly all the blocks seen in 1968 can still be identified in the locations indicated, which suggests the site has remained relatively stable over the past 50 years (see Table 1). Only one block has moved significantly: the Hathoric crown moved by 15 m to the north-east between 1968 and 1995, the date at which it was recorded prior to lifting. The reasons for the relocation of this 5-ton block are difficult to discern: we could suggest either the storms that lash the Alexandrine coast each winter – the most violent of which cause a devastating swell capable of moving weights up to 6 tons – or the disorder created by the sinking of concrete blocks for the modern sea wall installed in 1980. But the most likely, and the most coherent given that no other blocks from the zone recorded by Frost in 1968 have moved, is that it was intentionally moved by the divers of the Egyptian navy in 1962 when the colossal statue of Isis, to which it belongs, was lifted, supposing that this second crown was originally located close to the statue and hindered its retrieval. This second crown was raised by CEALex in 1995 and is now exhibited in the Open Air Museum at Kôm el-Dick archaeological site; while the crown lifted by the army in 1962 lies on the ground in the Maritime Museum, as seen by Frost.

Once the stone blocks marked on Frost's plan had been identified, the most recognizable were used as fixed points to position the plan on the CEALex map. This revealed a discrepancy between the orientation of the western section and the eastern section of Frost's map. Her field notes helped to resolve the situation. The western zone was first area to attract the attention of the divers on 28 October 1968, and it was there they worked with the greatest precision. More precisely, it was the area in which the two big pedestals and the male colossus were found, near to where the female statue had been raised by the Egyptian navy, as well as the lintel of a monumental door. This assemblage of blocks was recorded very precisely using two theodolites between 6 and 8 November 1968. This part of the 1968 plan was thus fixed. The eastern part was drawn up separately, then attached to this part. Frost's fieldnotes revealed that the blocks in the eastern area were mapped based on measurements taken directly by the divers, rather than using the theodolites. The divers used the first group of blocks to measure in (while swimming) and orientate (using a compass) the blocks to the east. Moreover, it appears that these were not immediately transferred to the main map, as the orientation recorded under water was mistakenly inversed.

In the eastern area the divers defined a first group made up of two sphinxes. The sphinxes were added to the main 1968 map to the southeast of the main group, while they were mapped in 2006 by CEALex to the northeast. Using sphinx N.13 (on Frost's map) as a fixed point and comparing the position of fragments No. 1671 and No. 1672 (CEALex) – as the sphinx was already in two parts in 1968, head and body lying side-by-side – it was possible to reposition this part of Frost's plan. This realignment is confirmed by the position of the second sphinx mapped by Frost (Fig. 4).

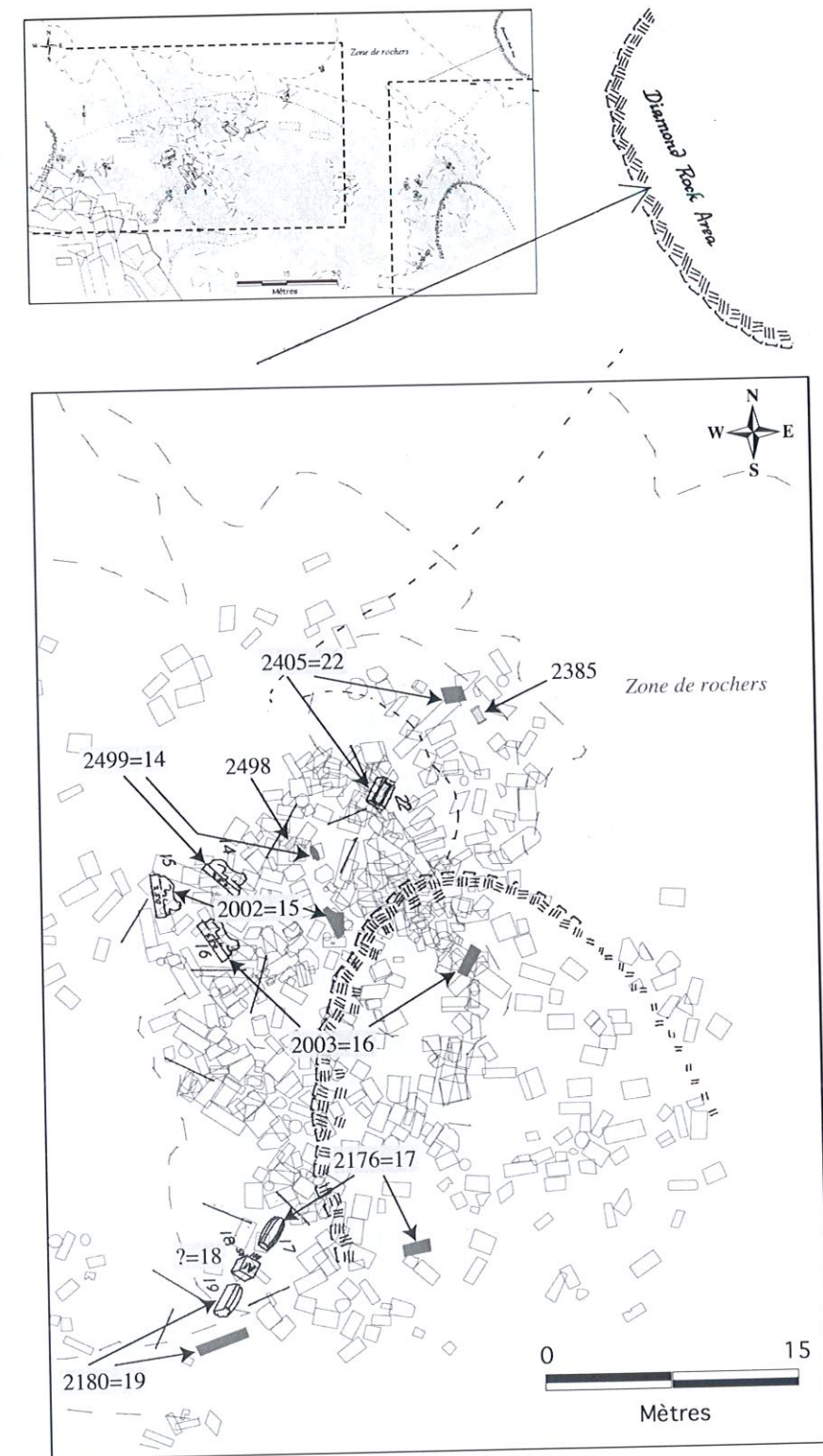


Figure 4. Frost's plan of 1968 superimposed on the CEALex, zone west. (I. Hairy, © Archives CEALex/CNRS).

Comparison of 1968 and CEALex plans				
Frost		CEALex		
N°	Description of blocks	N°	Dimensions (cm)	Description of blocks
-	Base	2385	125*70*65	Pink granite statue base
-	Sphinx	2498	113*70*38	Yellow quartzite sphinx
A	Long building block	1010	518*209*140	Pink granite abutment from a monumental doorway
B	Long building block	1009	648*214*140	Pink granite abutment from a monumental doorway
C	Long building block	1026	475*279*91	Large slab of pink granite
D	Long building block	1029	472*210*120	Big block of pink granite
E	Long building block	1048	390*210*140	Pink granite abutment from a monumental doorway

Table 2. Comparison between architectural stone blocks and statuary recorded by Honor Frost in 1968 and those mapped by the CEALex.

Work carried out during the dives from 28 October to 7 November, 1968, provided the outline of the site as it still remains, particularly the part of zone two situated below the eastern platform. A fragment of a basin, the base of the statue (not recorded on the plan), as well as four sphinxes, and two papyriform columns were found there. The configuration provided by Frost's team matched exactly in terms of the distribution, the number of elements, and the orientation of the group in relation to the zone marked 'Diamond Rock Area' on Frost's plan. It reconfirms the realignment carried out by the CEALex team, although the block with an inscribed Roman numeral recorded by Frost (1975: 130: fig. 4) was never relocated. Table 2 shows how the blocks recorded by CEALex correspond to those noted in Frost's fieldnotes as located to the north-east and south-west of the sarcophagus fragment. These, although not noted on the 1968 plan, again validate the realignment proposed. On Frost's plan (Fig. 3) there are seven blocks drawn with dotted lines that are not numbered. They are aligned east to west above the main group and marked 'long building blocks/longs blocs de maçonnerie' some of which could also be matched to elements recorded by CEALex (see Table 2).

The extent of the site as well as its irregular geometry, linked to the natural relief and the accumulation of ancient blocks (in several layers in some places) encouraged a programme of photogrammetric recording to create a digital model of the site's surface. This innovative programme started in 2014 with the support of the Honor Frost Foundation. This means of data acquisition was implemented across the whole site. The method was inspired by aerial photogrammetry using a drone; one difference being that the longitudinal and lateral overlaps between photographs were 70-80 %, which is greater than that classically used in aerial data acquisition. This level of overlap reduces false readings by increasing the number of images combined and cross-matched. Each diver-photographer swam transects, which were maintained by fixing their trajectories visually using the local topography of the seafloor including a multiplicity of ancient blocks and the slope of the fort, and ranging rods were placed every 4 m in the zone covered. The zone was also delimited



Figure 5. Plan drawn from a photomosaic laid over the GIS map of the site of the Pharos. (I. Hairy, © Archives CEALex/CNRS).

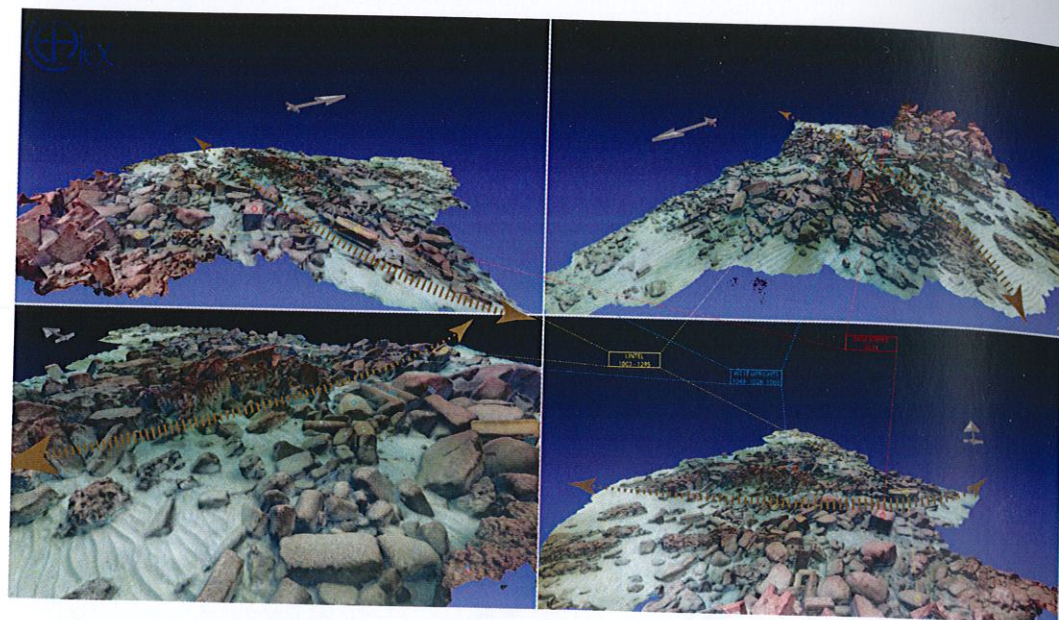


Figure 6. Extract of the high-definition photomosaic plan (Mohamed Abdelaziz, Mohamed El-Sayed, I. Hairy © Archives CEALex/CNRS).

by measuring tapes. The main difficulty encountered during photogrammetric data acquisition was the abrupt and major changes in elevation of the seafloor (plus or minus 5 m). In order to georeference the digital model, fixed points marked with pegs, or Ground Control Points, were placed underwater in the area covered by the photographer. These points were then mapped using a theodolite linked to a total station by the CEALex team. The photographs were then georeferenced within Photoscan. Since 2013, 28 weeks have been dedicated to the photographic survey with 50,152 photographs used in the creation of the 3D model of the seafloor, covering 8200 m² of the 13000 m² site formed by the ancient stone blocks (Fig. 5)

After five years of data acquisition nearly two-thirds of the surface covered by blocks had been recorded. The plans and models produced provide a new perspective of the site and exemplify the revolution in methods used to record large underwater sites. The photomosaic created from the 3D textured model provides a global view of the layout of the blocks in their natural environment. It provides a view of the site even the diver does not have, as the virtual visitor is not troubled by the vagaries of weather and visibility. Immense detail is captured in the seafloor model; the viewer is fully immersed (Fig. 6). These recording techniques open a new route to studying the site, which remains to be fully explored.

Future perspective and archive

These pages were intended to explain the decisive contribution made by Frost to our understanding of the underwater site of the Pharos of Alexandria, writes Jean-Yves Empeur. With very limited means and in difficult weather conditions, she was able to greatly improve on the maps made by Kamel Abul-Saadat and produce a levelled



Figure 7. a) Alexandria. Honor Frost preparing to dive with J.Y. Empeur on the Pharos site (1995); b) Honor Frost beside the colossal statue of Ptolemy I as Pharaoh (1995). (courtesy St Millière, © Archives Gédéon).

plan indicating the precise position of statues and blocks that were relocated during the excavations carried out in 1992.

A second stage in recounting Frost's work on the Pharos of Alexandria site will be possible when her archives are sorted and classified. The notes and sketches that she made during her visits to Alexandria and her unpublished report made to UNESCO, dated 2 November 1968 (not seen), will no doubt throw more light on the state of the

site as she saw it in 1968. The archives including her reports and correspondence will enable us to better understand both the scientific and the personal relationships that Frost had with the team of divers with whom she collaborated during this project: Nesteroff, the geomorphologist whose part in the project is so little known; Abul-Saadat, the founder of underwater archaeology in Alexandria, who Frost thanked for his help, notably during diving, and for Hala Halim's study, which she mentioned in the friendly letters she sent him, and which are now kept by his family; and Bruno Vailati, an Italian born in Alexandria and another colourful character. Vailati was part of the Resistance during the Second World War, and was a childhood friend of Abul-Saadat, providing him with diving equipment when it was so difficult to come by in Egypt. Vailati played an important role in the development of scientific diving in Italy and made numerous underwater films including one on the Pharos of his home town. Frost was also in contact with him, as shown by her second report to UNESCO (Frost, nd).

Frost continued to update her original plan made in 1968, adding to it up to 1995, as shown by her annotations in the map legends (Fig. 3). In 1995, when she revisited Alexandria, Frost was extremely pleased to find that her plans, although drawn in 1968 using basic equipment and methods, fitted well with the new plan made with modern equipment for the 1994 lighthouse excavations. For our part, we appreciated her extraordinary ability to recall the site as if the quarter of a century that separated her visits had taken no toll on her memory. No doubt, Frost would have been pleased to contribute to the discovery of new technologies, notably the use of photogrammetry to produce 3D georeferenced plans of extraordinary precision that render time-consuming and less-precise hand-drawings obsolete. For the lighthouse underwater archaeological site, which had been so disturbed by seismic activity, subsidence, and violent storms, as well as human actions – notably by placing modern concrete blocks to protect the Mamluk fort of Qaitbay – there is no doubt that Frost's actions were decisive and that we owe much to her for our better understanding of the site (Fig. 7).

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