LIBYAN SILICA GLASS

Libyan Desert, The Great Sand Sea
Western Desert, Egypt

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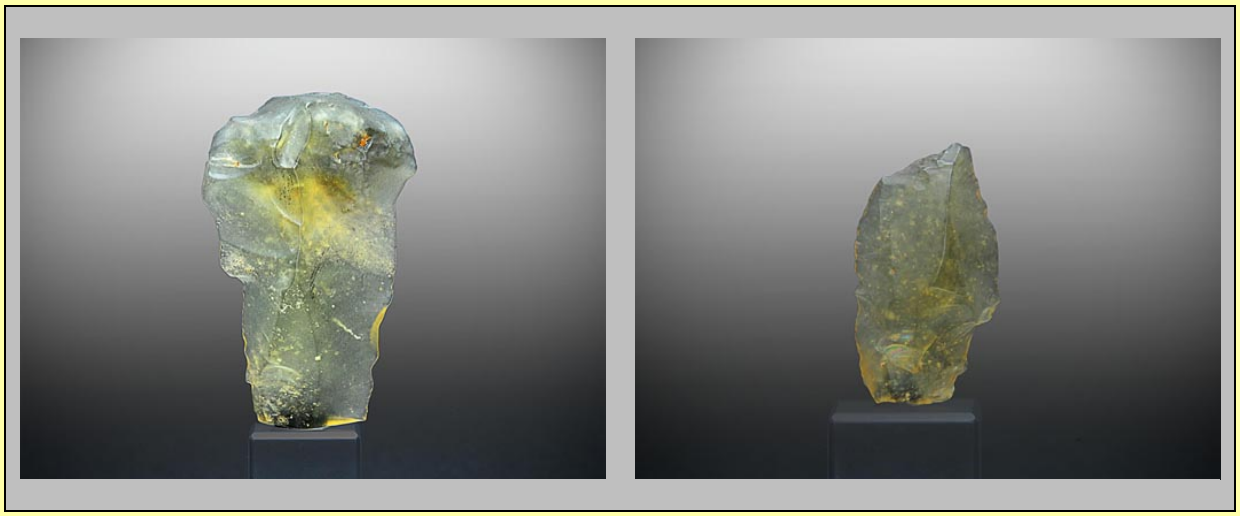
Libyan Silica Glass can be found at the Silica Glass Area in the Great Sand Sea (Western Desert, Egypt) near the Libyan border. The area is very difficult to access as it is situated between high elongated parallel dunes north of the Gilf Kebir Plateau. These dunes reach heights of 100 meters and the sand extends more than 72.00 km^2.

The glass is spread over a surface area of more than 6.500 km^2.This remarkable material was already known in ancient times (10,000 years ago). Many prehistoric tools made from this material can be found (with a little bit of luck) on the slopes of the dunes.

The Libyan Silica Glass was already known in ancient times (10,000 years ago). Many prehistoric tools made from this material can be found on the slopes of the dunes and near the borders of an ancient lake. The two beautiful examples were found in November 2009 near the lake. These tools are quite small and very fragile (glass). The dimensions for the left are 55 mm x 35 mm x 10 mm. The right hand example is a little smaller.



The drying up of the lake is probably the reason for the prehistoric people to abandon the area. When this happened is not known and the existence of the glass became forgotten until the 19th century.

The French Consul Fresnel recorded the glass back in 1848 in his 'Bulletin de l'Institut de Géographie de Paris'.

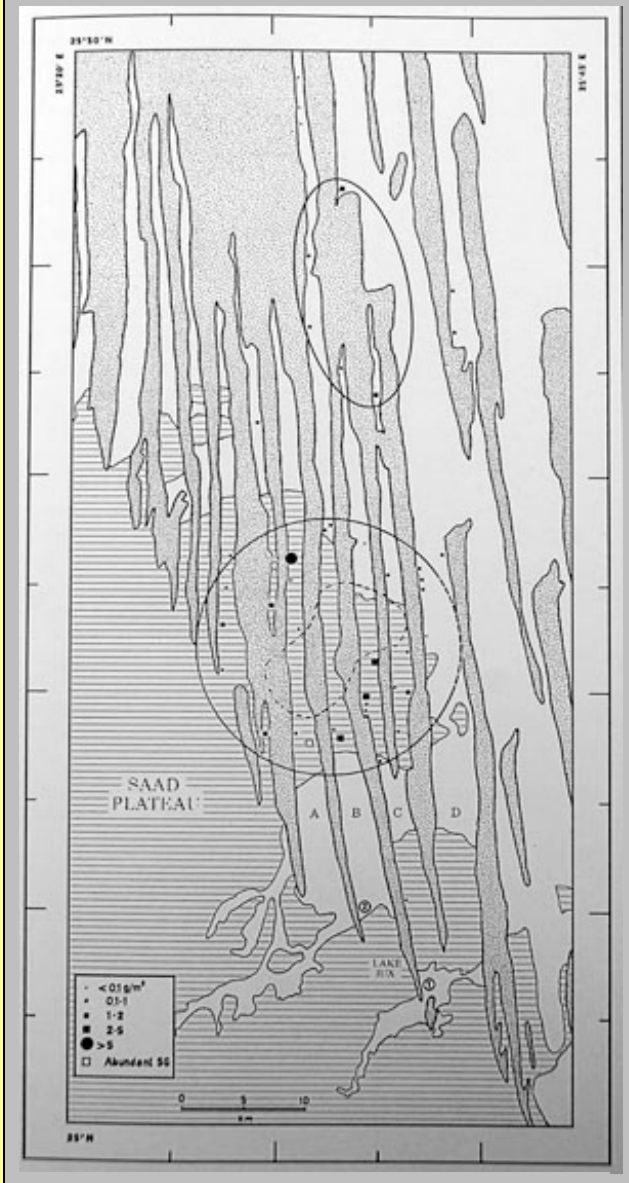
His text was based upon a report of Hadj Hussein who performed a camel trip from Kufra to Dakhla. Later, in 1874, Zittel (Rohlfs Expedition) also reported on this subject. In 1929 Borchardt wrote an article, again referring to this glass.

In 1922, Howard Carter, discovered the pharaoh tombs of Tut Anch-Amon (son of pharaoh Echnaton – 18th dynasty, 3.400 years ago). The numerous treasures from these tombs are preserved in the Egyptian Museum in Cairo. One of these jewels, a pectoral with a winged scarabee, carried on the chest by the king, deserves our attention.

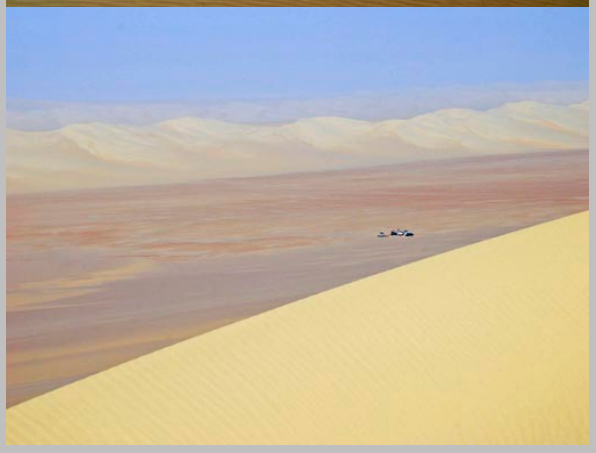
Recent research revealed the material as being Libyan glass instead of chalcedony, as previously believed (V. De Michèle, 1997).

Patrick A. Clayton, manager of the ‘Egyptian Desert Survey’ once again noted the Libyan Glass in 1932. Two years later, Spencer marched into the desert to collect specimens for the British Museum.

Until 1971, two expeditions that were set up with three scientists only recovered about 24 specimens of Libyan Glass. During this expedition they discovered the ruins of an Egyptian airplane with the remains of nine people. The Egyptian authorities hadn’t found the wreck, even after a search lasting three years.



The glass is spread over a surface area of more than 6.500 km^2 and is situated in the South-Western desert of Egypt along the border of Libya. The area is very difficult to access as it is situated between high elongated parallel dunes north of the Gilf Kebir Plateau.



The Southern part of the Libyan Silica Glass Area after a map based upon Klitzch, 1987. The horizontal lines represent the Nubian cretaceous sandstone.

A marvelleous view over the dunes (above right). The predominant wind comes from the North and pushes the sand further up to the South. The camp site (below right) between the floating dunes (dotted areas on the map). These wadis (blank areas) are North-South orientated passages. It's in the pebble soil that the Libyan Silica Glass is found.

Without any doubt this region is one of the most desolate areas on Earth. No habitation, no water and rainfall less than one millimeter only once in ten or twenty years.

A view at the ancient lake (lower right on the map) with the parallel dunes on the horizon. It's here that prehistoric tools made of Libyan Silica Glass can be found.

The chemical and physical characteristics of Libyan Glass don't correspond to any other known form of natural glass (volcanic, tektite and impact glass). It's therefore a unique occurrence on Earth.

Impact Glass is created after a short heath heat (fe. explosion of a comet, asteroid or meteorite). The chemical composition and inclusions are different from Libyan Glass. Tektites and volcanic glass have a much lower viscosity and contain much less water than Libyan Glass.

The colour of Libyan Glass varies from light yellow, honey coloured, greenish yellow to milky white. Specimens found on surface are often beautifully polished by the erosion of wind. Those from under the sand have sharp edges without an attractive finish.

A beautiful naturally polished and very pure specimen of Libyan Glass. The purity results from very few inclusions in order that it may be considered for faceting.
Dimensions: 65 mm x 35 mm x 20 mm.

Typical for the Libyan Glass hidden in the sand are the sharp edges and the rugged structures.

Dimensions: 75 mm x 50 mm x 35 mm.

As for inclusions, numerous small irregular air bubbles are observed, resulting in a white milky colour of the material with decreasing transparency. Rare inclusions are tridymite and cristobalite.

The latter can only be formed by temperatures above 1470°C. Research on inclusions is still ongoing and more rare minerals (fe. baddeleyite > 1670°C) have been discovered, supporting the thesis of an explosion just above surface, some 28 million years ago.

Scientists are still discussing the formation, because another thesis assumes a hydro volcanic origin of the Libyan Glass. This hypothesis supports the lack of impact craters and its regional geological structure presence of magmatic basalt on the plateau.

A perfect example of Libyan Glass with inclusion of cristoballite.
Dimensions: 50 mm x 25 mm x 20 mm.

The first example (next page) is a detail of an isolated crystoballite crystal (linear magnification: x100). The example on the right is uncertain but might be a fragment of sandstone (linear magnification: x120)

The long elongated structure of this air bubble inclusion (center) shows the movement direction of the silica during its fast cooling. High iron content is responsible for the dark colouration. It’s in such material that iridium and siderophile elements have been observed (linear magnification: x150).

Some details of inclusions in Libyan Silica Glass as observed from the facetted stones, illustrated on the next pages.

Stones have always been considered beautiful; even at Faraonic times. The 'magic' of a stone is that it never loses its beauty, even today... Jewelry, as shown below, may be restrained or very elaborate.

Libyan Silica Glass as a necklace kept in place with a golden support.

Description from above left to below right.

1 An exceptionally clear stone of 14.4ct with a modern brilliant cut. The very few and small inclusions are only visible under the microscope. Some very rare and strange formed inclusions as an extension of an air bubble are observed, using a higher magnification(x100).

2 A superb clear and very attractive stone with a shield cut. This stone has 61 faces and a diameter of 22 mm. Very few small air bubbles, but remarkable inclusions of cristoballite. They can only be observed under a microscope with a high magnification (x60).

3 This stone of 13,35 ct with a Mazarin cut has a beautiful hint of yellow and thus a very attractive character. The most important aspect of this stone is the presence of some elongated air bubbles going over into a brown material. All these air bubbles are orientated in the same direction, confirming the theory of a fast cooling.

4 A quite large emerald of 15,05 ct. Inclusions of air bubbles are very common for glass. In the Libyan Glass these inclusions are obviously much smaller which could indicate a fast creation of this material.

The images

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The gems are photographed with a Nikon 200 camera and a TAMRON AF 18-200 1:3.5-6.3 IF MACRO lens equipped with two (x4 and x2) additional Tiffen macro converging lenses. An indirect Nikon SB900 flashgun is used.

Manual focus with preference of fixed aperture setting (F16 and F22), a fixed value of 200 ASA and spot sensing was used. Only external top white light and on some occasions normal backlight was used. The camera was operated by remote control.

The image has been processed using Adobe PhotoShop CS4, however no complex functions were used.

These images may look good on an internet page but they need further improvement. When seen on a larger screen one might observe some blur and a lack of depth of field. To improve this proper macro lens is desirable with additional indirect light. To be continued…

The photos of the inclusions were made with a Nikon Coolpix 4500 pocket camera installed on a third ocular of a Zeiss Stemi Microscope. Multi layering techniques to improve depth of field were used.

Credits

All the material was collected during an expedition in October 2009. My thanks go to ACAM and to Ayman A.Mohamed with his crew (DFC) for making this expedition possible.

To cut and polish this glass is an extremely difficult matter due to the many inclusions. They limit to a large extent the brilliance and smoothness of surfaces. My deepest gratitude goes to Patrick Du-Tré for his selection of my collected material and certainly for the patience he has shown during the many hours of polishing.

Steve Roberts (PMMC) proof-read the text and made suggestions whilst trying to retain the essential elements of my literary style.

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LIBYAN SILICA GLASS

A short notice on Libyan silica glass
The history and the rediscovery.
The location and a word on the chemical and physical properties
The inclusions and the beauties, from rock to jewel.