



Digging for 'Sand Roses' in Saudi Arabia

By Arun Kumar

It is a common hobby for naturalists, especially geologists in the Eastern Provinces of Saudi Arabia to go for digging for sand roses. It is indeed a lot of fun and has a very satisfying experience if one gets good quality specimens of sand roses.

During the past almost forty years I had opportunity to travel, work and live in several countries distributed over all continents except Africa. But I had never heard of sand roses till I came to Saudi Arabia in August, 2006. I remember when my friend and colleague Dr. Khalid A. Al-Ramadan, a young and enthusiastic geologist and Assistant Professor in the Department of Earth Science at my university invited me for a weekend field trip to 'dig and search' for sand roses. I thought he was joking, because I did not know what sand roses were. Anyway one weekend I along with Dr. Al-Ramadan, and Dr. Gerald Keuscher, a geologist friend from Saudi Aramco decided to go for sand rose digging.

I am sure a lot of readers of this article would be inquisitive about what sand roses are? Where do they occur? And how are they formed? Let me briefly answer these questions before I further talk about our search for sand roses.

What are sand roses?

Sand Roses are not roses as commonly known and they do not bloom on any plant. They are mineralogical structures that look like roses and since they are found in hot deserts they are also known as desert roses. They are unique products of nature that occur in diverse shapes and sizes. They may occur as a single sand rose of variable dimensions ranging from one cm across to over 25 cm and may also occur as small rosettes or large clusters over one meter in diameter. Sand roses are found in a variety of colors ranging from light grey to dark gray, grayish brown, brown and dark brown. Color of a sand rose depends on the color of the sand in which they crystallize and grow. According to Mougnot (see website below) *"they are assemblages of bladed gypsum crystals that thin towards the edge, where the blade becomes transparent and sharp."*

How sand roses form?

There is not much literature about sand roses. Mougnot has written about them in some detail including their origin. The following account is primarily based on this report. It is well known that Gypsum ($\text{CaSO}_4 + 2\text{H}_2\text{O}$) is dissolved in the sea water that crystallizes by concentration through evaporation. In the Arabian Gulf coastal region of the Arabian Peninsula gypsum crystallizes in the form of sand roses at the water table, about one meter below the surface in Sabkhas (Figure 1). Although sand roses (Figures 2-7) occur mainly below the surface of Sabkhas but sometimes they can be observed on the surface also. Mougnot explains the formation of sand roses as follows:

"Since gypsum crystallizes in the pore spaces of coarse sand, its growth is driven by the complex organization of the porosity network. The main trend is the horizontal stratification of the sand that also conforms to the surface of the water table. This preferential plane explains the growth of sand roses from well-developed horizontal blades, together with the clustering of rosettes in large horizontal plates."

"The brine of the Arabian Gulf seeps into this eolian sand, pumped by the evaporation at the surface of the sabkhas. When it isolates from the sea, the brine concentrates. As the water table rises and falls with

seasons, the gypsum crystal grows in the pore space, trapping sand grains. In the early 90's, analyses performed by KFUPM (King Fahd University of Petroleum and Minerals) confirm this mix between quartz (about 10%) and gypsum (about 65%), with some other evaporites (e.g. salt and dolomite)."

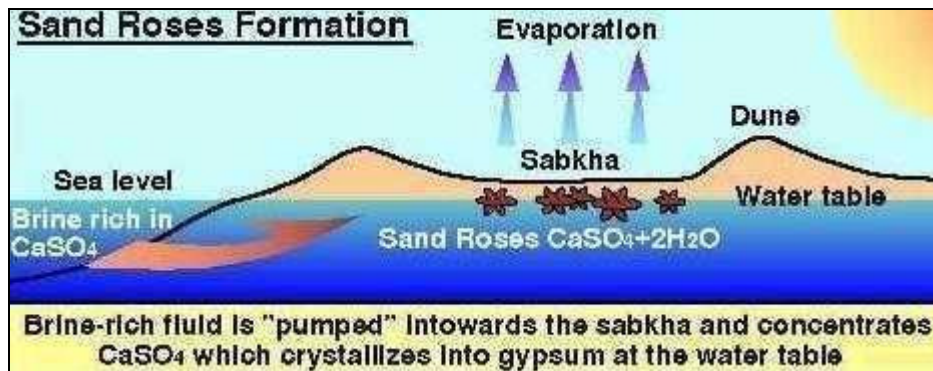


Figure 1: Formation of sand roses (after Mougnot) by Chris Heine

Where sand roses are found?

Sand roses are found in the coastal sabkhas along the Arabian Gulf Coast of the Arabian Peninsula. Sabkhas are supra tidal salt flats found along the coast between a desert and an ocean. There are inland sabkhas also for example, sabkhas of the Rub-al-Khali of southern Saudi Arabia. They are characterized by a crusty surface consisting of evaporite deposits like salt, gypsum, and calcium carbonate, windblown sediments, and tidal deposits. Sabkhas form primarily through the evaporation of sea water that seeps upward from a shallow water table and through the drying of windblown sea spray. Sand roses occur in hot and arid coastal environments of the Sahara Desert and also the east coast desert regions of the Arabian Peninsula. Sand roses seldom lie on the surface and they have to be dug out from the water table beneath sabkhas.



Dr. Al-Ramadan and Dr. Gerald Keuscher trying to locate sand roses in this hole

Dr. Gerald Keusher showing dug sediments from the water table. Small sand roses may be found in these sediments.



Our search for sand roses

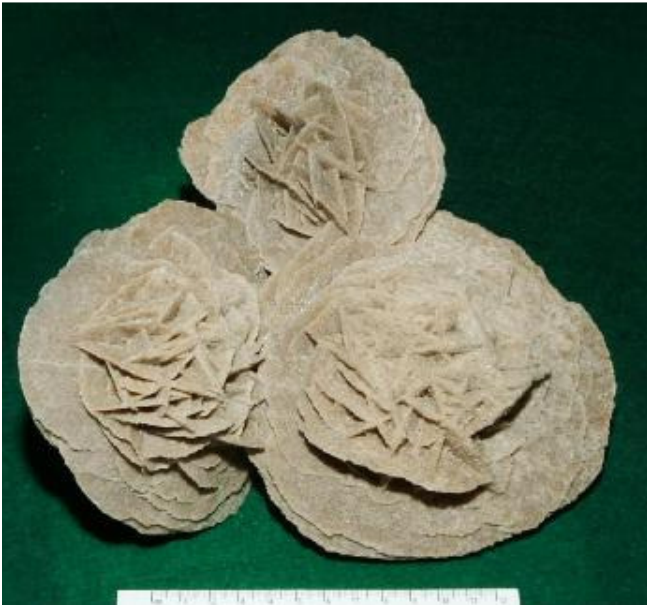
Digging a wide (about one meter diameter) hole over one meter deep in sabkhas is quite a strenuous task (Figures 8-10). The digging was primarily done by Dr. Al-Ramadan, and Dr. Keuscher and I acted as a lazy observer and took few photographs. Once we reached the water level at around one meter depth, we found several specimens of small (up to 10 cm in diameter) sand roses which were in semi-solid condition and they dispersed quickly. We did get some 'not too bad' specimens to collect. We did not have enough time to dig more, otherwise we would have collected few good quality specimens also.

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Online Reference:

Mougenot, Denis. (October, 2009). Sand Roses of Saudi Arabia

SAND ROASES



A typical specimen of sand roses (scale: cm)



A sand rosette showing various stages of formation of 'petals' of sand roses (scale: cm)



Blades of gypsum crystals of a sand rosette (scale: cm)



Sand roses with blades of gypsum crystals with coarse sand grains



About the Author

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