Egypt's Secret Treasure

"There is no country which possesses so many wonders." So said the Roman Heroditus when he visited Egypt in 420BC, confirming that Egypt has been a magnet for tourists for thousands of years. For the earth scientist, however, there are wonderful treasures to be found in the constantly changing shapes, colours, landscapes and rocks of the desert areas surrounding Cairo and the Nile Valley.

Photos: Anne Whaley Sousou

Despite an abundance of truly amazing cultural and archaeological features, one of the greatest sights in Egypt remains the simple phenomenon of the Nile Valley. When seen from the air one can appreciate fully how the river is the life force of the country, carving a fertile green channel sometimes less than a mile wide through the otherwise endless desert. On the ground it is fascinating to travel across the Nile Valley to the point where the irrigated fertile valley changes abruptly into barren, inhospitable desert.

Photos: Anne Whaley Sousou

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The spectacularly sculpted limestone rocks and pinnacles of the White Desert, more than 500 km south-west of Cairo, are a unique example of karst topography. This area has been designated a protected zone by the Egyptian Government.

Some of the fossil whales found in Wadi Hitan have been reconstructed and are now protected, but many vertebrae and other bones have been stolen over the years, leaving only partial skeletons in most cases. The large numbers and wide variety of creatures found here were probably attracted to the warmth and security of an embayment and the abundant nutrients brought into it by the Proto-Nile, but there is no evidence that the unusual quantity of whale skeletons was the result of a 'beaching' episode.

Jane Whaley

Travelling south out of Cairo, the desert seems a very unattractive proposition for the geotourist. A flat sabkha plain, covered in a layer of small dark rounded pebbles, stretches for miles in all directions, broken only by interminable pipelines, the occasional small rig, and the rotting wrecks of large trucks. But persevere with the journey, and there are treasures in the desert every bit as spectacular and unique as the wonders of the Pharaohs.

Once known as the breadbasket of Egypt, the oasis of Fayoum lies about 100kms south-west of Cairo. This thriving town, the largest oasis in Egypt, is built around Lake Qarun, which in Pharaonic times was part of the much larger Lake Moeris, linked by a series of canals to the Nile. The Fayoum Basin initially formed in the Jurassic along the Tethyan margin, developing its present shape through subsidence that terminated in the late Eocene. It contains a thick sequence of Eocene clastics, reflecting deposition from emerging highland areas surrounding the basin. To date the area is relatively undisturbed by the Egyptian hydrocarbon industry, which is concentrated further west in the Western Desert, as well as in the Nile Delta and Red Sea.

World Heritage Site

The Fayoum Basin, which lies mostly below sea level, is a very important cultural and natural environment, with large numbers of migratory birds found near Lake Qarum. Many rare animals, such as white deer, Egyptian deer and sand foxes, are also seen in the surrounding areas. The geotourist, however, must travel out of the green oasis and into the desert to the west of Fayoum to find the greatest treasure of the region.

This is the UNESCO World Heritage site of Wadi Al Hitan, a beautiful valley of golden sandstone and shale cliffs with strangely eroded rocks. Within the 25 square kilometres of the valley the fossilised remains of more than 400 primitive whales and other vertebrates have been found, all of Eocene age, with two species particularly prominent. There are nearly 100 partial skeletons of Basilosaurus isis, a very large whale which has an unusually long serpentine body about 18m long. The fossilised remains of about 80 specimens of a smaller whale, Dorudon atrox, which has a more compact dolphin-like body, have also been found.

Both these whales have small hind legs and it is this feature that marks the fossils in this valley as being unique, as it shows the point at which the whale predecessors abandoned the land and became ocean-going mammals. This is the most important site in the world for the demonstration of this stage of evolution, gaining it UNESCO protection.

It is thought that in the Eocene the Wadi Hitan area was a protected estuary and judging from the proportion of juvenile Dorudon remains it may have been a favoured birthing ground for these animals. By contrast, only one juvenile Basilosaurus was identified, suggesting that the abundance of young and weak Dorudon probably attracted the larger predatory whales into the bay. The rich fossil record in the valley also includes sea cows, similar to the modern Manatee, as well as fossilised sharks, fish, sea snakes and even turtles.

Evidence that this area was close to land in the Eocene can be found toward the south-western end of the 'Whale Valley', where a paleoshoreline, complete with a worm-bored petrified tree, can be identified. The shoreline is delineated by an area of deeply rooted fossilised mangrove forest, which stands out impressively against the well-bedded sandstone above and below.

Wadis and Buttes

Other geological features in the Fayoum

A well rooted mangrove horizon delineates the palaeoshoreline in Wadi Hitan, the Whale Valley.

Valley include several large, well-preserved petrified forests, found in Palaeo-Nile fluviatile deposits in the north of the basin. The Paleogene strata in this area are considered to hold one of the most complete records of late Eocene - early Oligocene vertebrate evolution in Africa, including a number of early primates.

In the northern part of the basin, at a place called Widan el-Faras, there is a basalt quarry which has been worked since 3,000BC. Leading to it is possibly the oldest paved road in the world, down which basalt has been transported since Neolithic times, some of it to the Nile and on to the constructions at Giza and Abu Sir.

Also found in the Western Desert near Fayoum are magnificent examples of desert topography, as what seems like an flat, endless, barren rock plateau suddenly terminates in deep incised ravines or wadis, where the usually almost horizontally bedded rocks are clearly exposed. Thick sequences of predominantly non-marine Tertiary clastics can be observed, with coarse and gravelly sandstones interspersed by thinner and more deeply eroded shales. Prominent cross bedding can be seen in some horizons, whilst others hold evidence of beach and tidal flat deposits and sediments, with some desert areas being literally carpeted with large shells. Isolated hills or buttes are also common, their steep-sided and flat-topped, table-like forms standing out prominently from the surrounding desert.

Petrified wood is a common feature of the desert close to Cairo, with samples ranging from a few centimetres across to many metres in length. They are found in accumulations which suggest that they were carried by the flood waters of the Proto-Nile and then deposited as the water subsided. Most are considered to be Oligocene in age.

The Spectacular White Desert

To enjoy some of the greater wonders of the Egyptian desert, it is necessary to travel a little further from Cairo, preferably with a convoy of 4 x 4s, a GPS positioning system, and someone who knows the desert well! To the south and west of the Fayoum Valley, beyond the isolated oasis town of Bahariya and 500km from Cairo, lies the spectacular area known as the White Desert. This barren but fantastic land is characterised by strangely shaped chalk pinnacles, mounds and ridges, sculpted by the erosional force of the desert winds. They rise out of a flat limestone platform, which is covered by fine sand. The combination of dazzling white chalk, golden sand and brilliant, pollution-free blue sky makes this one of the most stunning and impressive sights even in a land as full of superlatives as Egypt. Add to this palette a vivid desert sunset, followed by a night under a sky bright with stars and with the moon casting shadows through the chalk sculptures; surely this is one of the strangest, most beautiful and unique landscapes in the world.

The carbonates are Late Cretaceous and the amazing karst landscape a result of years of erosion, originally by the more pluvial environments experienced during the Tertiary, followed by sand and wind attrition in more recent times. Some of the landforms now seen were initially formed through water erosion in underground caverns in the Tertiary and paleocaves are sometimes exposed on the surface, complete with isolated stalagmites. The resulting topography is made even more dramatic by differential wind erosion, with the uppermost harder horizon withstanding erosion better than the underlying softer layers, resulting in the distinctive mushroom shapes of many of the rocks.

Desert Treasures

There are other treasures which take more seeking out. When lightning strikes the desert, energy continues travelling through the sand in order to reach bedrock. The current superheats the sand, which may be liquefied or even vaporized for an instant as the current passes through it. Any air and moisture present are also rapidly heated, and the resultant explosion-like expansion forms a central tubular void. As the sand cools down, it reforms into a solid, glassy channel, known as a fulgurite. These are usually only a few centimetres in length, very delicate and fragile and as a result, extremely rare.

North of the White Desert is the less appealingly named 'Black Desert', called after small hills which are covered with what looks like a layer of soot, rather unattractively resembling slag heaps. Closer examination, however, reveals that the black colouration is a result of weathering, producing what is known as 'rock varnish', principally composed of iron and manganese oxides selectively deposited over many years on the surface rock fragments.

Even the areas of flat desert pavement can yield treasures to the geoscientist. Much of the surface of the desert area is made up of a sheet of rock fragments, all that remains after wind and water have

Photo: Anne Whaley Sousou

Spectacular barkhan dune formations in the Western Desert of Egypt. It is estimated that dunes move at a rate of between 10 and 100m a year and their width is about 10 times their height.

removed the fine particles. These are also frequently black due to 'rock varnish', but in many places the rocks are actually fossil corals and shells, petrified wood, or beautifully formed crystals, and the haematisation process gives them a beautiful shine and a strange metallic feel.

Even a short trip to the Western Desert, with its many different landscapes, long distant horizons and astonishing geological, geographical and archaeological riches, is a wonderfully refreshing and different experience. Arriving back to the hustling noise, excitement and activity that is modern Cairo seems an extreme adjustment and it is hard to believe that the peace and tranquillity of the desert are only a short drive away.

But Cairo itself has the greatest treasure of Egypt running through it; the Nile. The river, with its green agricultural islands and busy waterborne life, still dominates the city. And if the noise of car horns, donkeys, children and building sites all become too much, it is easy to escape. Just go down to the river front, hire a felucca, the elegant traditional Nile sailing boat, and float gently and silently through Cairo, watching the sun set over this amazing and magical land.

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Wadi Degla

Wadi Degla lies to the south-east of Cairo and forms a haven of peace and tranquility right on the edge of the noise and bustle of the city. It is about 30km in length and up to a kilometre wide in places, with the steep valley sides rising 50m from the valley floor. It is formed in the Eocene limestone pavement, with a hard band of siliceous limestone forming the upper plateau, underlain by further limestones, some of which have been dolomitised. It is rich in fossils, including Middle Eocene nummulites and gastropods. The valley floor and differentially eroded sides clearly show the paths of the rivers that have carved their way through the limestone over millions of years. After a heavy rainstorm, which only occurs every few years, the Wadi fills with fast-flowing water, and the valley floor blossoms.

The steep sides of the wadi protect the unique wildlife found there, including the rare Dorcas Gazelle and Nubian Ibex, as well as mountain rabbits and hares, foxes, bats and up to 18 species of reptiles, some of which are very rare.

Because of its proximity to Cairo, Wadi Degla has been used for many years for quarrying to provide building stone and cement, with the consequent deterioration in environment and habitat. It has now been declared a Protected Zone by the Egyptian Government in order to maintain the fragile ecosystem.

Photo: Anne Whaley Sousou

Fulgurites form when lightening strikes the desert and melts the sand in its path, turning it to glass. These are very rare and fragile formations.

Photo: Jane Whaley