A VISIT TO HADJER EL HAMIS, WEST-CENTRAL CHAD

J. Gregory Shellnutt*

In late January of 2013, my colleagues and I visited Chad (République du Tchad) for a week as part of an ongoing research project focusing on the Central Africa Shear Zone and the basement rocks of oil-producing basins. The intent of the new project is to characterize the plutonic and volcanic basement rocks of west-central Chad. The general geology of Chad is documented by regional-scale maps; however, the detailed geological history, in particular the geochronology, is poorly constrained and a number of geological problems need to be resolved, not just for resource exploration but also to fully understand the tectonomagmatic history of north-central Africa.

The exposure of bedrock in west-central Chad is limited due to the fact that 7000 years ago the region around N'Djamena was submerged beneath a ~400 000 km^2 inland sea, the precursor to modern Lake Chad (~1350 km^2). Consequently much of the region is now mostly a featureless, arid transition zone between the Sahel (dry grassland) and Sudanese savanna (semiarid grassland). The adverb *mostly* is used because the region is not entirely featureless: rising out of the Sahel, just to the east of Lake Chad, is a spectacular, semicircular arrangement of five variably sized, columnar-jointed buttes collectively known as Hadjer el Hamis (Figs. 1, 2).

The buttes tower over the flat landscape and are reminiscent of Devils Tower, Wyoming, USA. The 40-million-year-old Devils Tower, known as Mathǒ Thípila (Bear Lodge) by the Lakota people, is one of the finest examples of a protruding, columnar-jointed, phonolitic, hypabyssal stock. In addition to the sanctity of Devils Tower to the Lakota, it became the first national monument in the United States, dedicated in 1906. The hexagonal, columnar structures at both Hadjer el Hamis and Devil's Tower are due to cooling of subaerial volcanic and hypabyssal magmatic rocks.

Figure 1 Location of Hadjer el Hamis, Chad

Figure 2 The five buttes of Hadjer el Hamis (the western butte is on the left and the four eastern buttes are on the right).

The impressive appearance of columnar-jointed structures is recognized around the world as they are often preserved as heritage sites or geoparks.

The geological relationships of the five buttes at Hadjer el Hamis indicate they are remnants of at least two separate volcanic structures within the same caldera and may be tectonically linked to regional magmatic activity associated with the Cameroon Line during the Late Cretaceous. The buttes are composed of peralkaline pantellerites (silicic volcanic rocks) and are separated into two main groups. The four smaller buttes to the east are actually part of the same stock, whereas the larger butte (more of a hill) to the west is a structurally different stock. The eastern grouping contains the famous "Le rocher des éléphants," in which the jointed rocks resemble two elephants, and "La roche du lion," which resembles the mouth of a yawning lion (Figs. 3, 4, and 5). In the past, when Lake Chad was larger, the buttes would have been a group of small islands.

* National Taiwan Normal University
88 Tingzhou Road, Section 4
Taipei 11677, Taiwan

Figure 3 East-looking view of elephant rock (on the right)

Figure 4 Tony Lee (left) and the author appearing to be studious while visiting Hadjer el Hamis. The yawning lion is in the background.

Figure 5 A cave into the weathered columnar joints resembles the mouth of a yawning lion.

The outcrops are frequented by determined tourists, not only to see the unique formations and their beauty but to view a troop of Tantalus monkeys living among the rocks. The monkeys often become agitated if they see their taller, hairless relatives walking around, especially if one has a geological hammer (Figs. 4, 6). The rocks themselves have not been studied in detail, and the only age (69 ± 1.4 Ma) available was by the K–Ar method and published in the late 1960s. Unfortunately the area is one of the few places where one can find gravel suitable for construction, and so there is active quarrying between the western and eastern stocks. The stocks themselves are not being quarried, just the bedrock separating the western and eastern parts. It would be nice to see the entire area fully protected as a heritage site or geopark because of the beauty of the rock formations, but resource exploitation in the region often takes precedence.

Working in west-central Chad presents many challenges. The near-equatorial climate means that there is a rainy season from June to September and a dry season from October to May. The daily temperature during our trip typically peaked at around 42 °C, which, in my opinion, is better than the hot and humid conditions of Southeast Asia. The population density of Chad is highest along the Chari River (i.e. N'Djamena) and in the south near Central African Republic, but the area to the north and east of N'Djamena is remote. The relative remoteness of Hadjer el Hamis and other areas we visited (Ngoura) reminded me of working in the southern Arctic of North America where great distances separate communities and services are limited. Logistical support for our project was provided by the Chinese Petroleum Corporation (Taiwan), which has been investing in Chad (along with other state and multinational oil companies) for nearly a decade. In cooperation with the World Bank, the government of Chad wishes to develop the petroleum industry so that much-needed infrastructure projects can be built, thus providing stable and gainful employment. There are already signs of infrastructure investment as power lines were being extended to communities surrounding N'Djamena and roads were being constructed. Perhaps in the near future geological field work will be a little easier.

Figure 6 An inhabitant (Tantalus monkey) of Hadjer el Hamis