Not since the Ptolemaic-Roman-Byzantine era (late 4th century B.C. to 7th century A.D.) have the Eastern Desert and Red Sea coast of Egypt witnessed the activity now taking place, as tourism and settlements for Egypt's burgeoning population encroach into once sparsely settled areas. During the Ptolemaic, Roman, and Byzantine periods, a healthy trade between the Mediterranean region, South Arabia, East Africa, and South Asia traversed the Eastern Desert and the Red Sea (Fig. 1). These trade routes fell into disuse with the decline of the Roman Empire and virtually disappeared with the discovery of the sea route around the Horn of Africa in the late 15th century. The opening of the Suez Canal in 1869 somewhat revived commerce in this area, but for most of the period between the 7th and the 19th century, the Eastern Desert lay nearly abandoned. Evidence of scores of ancient sites remained unrecorded until now.

Fig. 1 Patterns of trade through the port of Berenike.
TRADE ROUTES

Ceramic analysis indicates that the oldest classical thorntailers in Egypt connecting the Nile to the Red Sea were those between the Nile environs of Edfu (ancient Apollonopolis Magna) and Qift (ancient Coptos) and the Red Sea port of Berenice (Fig. 2). Graffiti and pictographs, some possibly prehistoric (before circa 3,000 B.C.), suggest that sections of the routes were used at least by the pharaonic era, before the advent of the Ptolemaic and Roman periods. The roads and installations served several functions, one of which was to facilitate commerce passing between the Nile and Berenice. Berenice, founded in circa 275 B.C. by Ptolemy II and named after his mother, was—according to our survey and excavations—still occupied into at least the 6th century A.D. It was Egypt's major emporium on the Red Sea coast throughout the Ptolemaic-Roman period and was a conduit for merchandise passing between the Ptolemaic and Roman realms on the one hand and other areas of the Red Sea and Indian Ocean littorals on the other. Sources detail many aspects of this ancient inter-regional and Berenice's role in it (e.g., Terza Oretta, Strabo's Geography, Pliny the Elder's Natural History, and the Periplus Maris Erythraei).

A wide variety of merchandise passed through Berenice and the other Red Sea ports of Egypt. In Ptolemaic times the main imports were elephants and gold to bolster Ptolemaic military and political ambitions in the Mediterranean. In Roman times there was more emphasis on the civilian aspect of this commerce. For this period literary sources, including a 1st century A.D. navigational and entrepreneurial guide called the Periplus Maris Erythraei, complement the scanty archaeological records. Exports from the Mediterranean included red coral, much in demand by Indian women, glass buttons, wine, grape, silver, and gold plate and coinage. There were human cargoes, too—singing boys and maidens for the harems of Indian monarchs. Imports from the Red Sea-Indian Ocean littoral into the Mediterranean world via the Red Sea ports were both luxury and non-luxury in nature and included pearls, pepper, silk, frankincense and myrrh, various other spices, textiles, medicines, and all kinds of exotic animals. The discovery of Roman gold and silver coins in India suggests payment was made in coin, though many of these coins seem to have been deliberately defaced and more likely served as bullion. Certainly much of the trade must have been conducted by barter. Such was probably also the case between the Roman world and Sri Lanka (ancient Tampobara), Arabia and coastal sub-Saharan Africa.

Maritime trade between the Red Sea-Indian Ocean and the Mediterranean had been going on since pharaonic times, if not earlier, but it increased dramatically in the Ptolemaic and especially the Roman era. The monsoon winds in the Indian Ocean were a secret the Arabs and other "Easterners" seem to have long kept from Mediterranean entrepreneurs. The discovery of these winds by the Ptolemies, probably at the end of the 2nd century B.C., and their exploitation on an even larger scale after the Roman annexation of Egypt in 30 B.C., made the voyages faster and became cheaper, but no less dangerous. Pirates and shipwreck were constant threats. Archers were hired to protect merchant ships from the former; there may also have been a Roman coast guard fleet patrolling the Red Sea. Only a combination of good luck, skill, and timing of the voyages could save merchant ships, their vessels, and valuable cargoes from shipwreck. Both the Ptolemaic and later, the Roman governments taxed the trade heavily: 25-50 percent at altercation in Ptolemaic times and 25 percent in the Roman era. That trade persisted despite these numerous adverse factors attests to the fabulous profits that could be made from a successful voyage. Debate continues over the extent of direct government involvement as opposed to that of private entrepreneurs in this commerce, including the plundering Roman term.

The Berenice-Nile roads also facilitated the transport of gold and "emeralds" (beryl) from mining sites to the Nile. In most cases the mines seem to have generated thriving "boom" towns that were connected to the main routes by branch roads. Large forts protected certain important gold mines, such as those at Simelekh and Daghbic. These forts most likely served to defend against potential threats from outside the mining community than to guard the miners, most of whom were probably free, not penal, labor. These mining communities might even boast their own temples, such as the one dedicated to Serapis that was cut into a mountain side near the emerald mines at Sikait. An inscription from the time of the Ptolemaic emperor Gaius Julius Caesar (A.D. 260-268) still exists in this temple. While no specifics about these mines survive in the ancient sources, the fact that these temples indicates activity in the Ptolemaic and especially the Roman periods. Emerald mines abound in the area of Sikait-Middle Sikait-North Sikait-Nagras-Wadi Abu el Khusheb, but we have not been able to locate authors as Mons Smaragdus (Emerald Mountain).

These mines were heavily exploited into late antiquity, in early Islamic times, and even in this century. Literary sources from the Roman period to the 5th and 6th centuries A.D.—Strabo's Geography, Pliny the Elder's Natural History, Claudian Ptolemy's Geography, Ephrathas's De Gemmis, Olympiodorus's History, Cosmas Indicopleustes's Christian Topography—refer either to the emerald trade, likely consisting of lower grade beryls, or to the mines at Mons Smaragdus. In the Roman period the provincia munita Bereniciade was also the chief overseer of these mines. Pottery from the mining settlements corroborates dates of activity provided by ancient literary sources. 

The roads, and the stations alongside, allowed the Roman military, like their Ptolemaic precursors, to monitor potentially hostile tribes. An administrative area called a "limes" was common in Roman frontier regions, including the Eastern Desert of Egypt. It consisted of a series of roads, forts, and other signal and communications points which defended the region and monitored the movement of potentially hostile peoples. In the Eastern Desert of Egypt these included the murrands of Blemmyes and Nobatea. By late antiquity the frontier of both the Kings of the Blemmyes (History Fragments 15-37). The 6th century writer Procopius (History of the Wars 1.I.28-33) mentions that the Roman government had made annual payments in gold to both the Nobatea and Blemmyes to keep them from the impending Roman armies entering the desert from the time of DIOCLETIANUS A.D. 284-305) until his own day. One wonders what other kinds of de facto arrangements existed between the Blemmyes and Nobatea on the one hand and the Egyptian-Roman populations and the Roman government on the other.

Later, Muslims used the routes from Edfu and the Qift port, as well as from Aswan (Numeiri), to make the hajj, arriving at the Red Sea port of Alwiya-Selim el-Qazim (circa 210 kilometers south of Berenice) whence they journeyed by sea to Jeddah and then overland to Mecca.
ROADS AND INSTALLATIONS

The Eastern Desert contains the Red Sea Mountains, which form longitudinal chains roughly paralleling the Red Sea coast. Among the mountains are sandy plains. Wadis (seasonally filled water channels) dissect the region and it is along their dry beds that the ancient roads traversed, crossing from wadi to wadi. The classical period routes were cleared tracks—some more than 20 meters wide—which generally lay in wadis with convenient orientations and water supplies. Sometimes, shallow excavations were made through high areas for ease of passage. In at least one case the road is a low, artificially built-up causeway across a wadi. These desert roads were not paved like the better known Roman roads in Europe such as the Via Appia in Italy or the Via Egnatia in Greece; we have found no paving whatsoever along the Berenike-Edfu-Qift thoroughfares. Nor were there any inscribed or painted milestones such as occur in other regions of the Roman Empire; the Eastern Desert of Egypt seems to have been the only place where these were not used. Instead, cairns of piled stones frequently marked the routes, along with occasional signal towers. We have little evidence of who was responsible for their construction though it was most likely the military, as was the case with road building elsewhere in the Roman Empire.

There were both unfortified and fortified water stations (hydræmata) for travelers. The larger hydræmata often supported satellite settlements and mining activities in the area. We have studied 28 principal stations—and a number of smaller stops—located on the approximately 530 kilometers of the main Berenike routes, or an average of one major station approximately every 19 kilometers. Not all of the 28 stations were in use at the same time, as some were constructed after others had fallen into disuse; the actual travel distances were accordingly longer. The Iter Antonini Anonimus (171-3-173-4) lists 18 stations in operation in the approximately 365 kilometer distance between Qift and Berenike; this would give an average of 36.5 kilometers between stations. Nearly all travel was by foot, sometimes using camels or donkeys as pack animals. At an average speed of 5 kilometers/hour, or slightly less, a traveler could easily cover 35 kilometers or more in a day—which leads to the conclusion that the installations were placed a day's travel apart for human pedestrian traffic. The more mountainous the passage between two stations, the closer together they tended to be. If the terrain between two stations was relatively level and easily traversed, they might be farther apart. Placement also depended upon availability of water.

These stations are predominantly quadrilateral in plan, though some are semi-circular or elliptical, and they vary greatly in size. The smallest may have one wall length as short as 15 meters. The largest is that in Wadi Gemal; it was mostly destroyed by floods, but exant portions of the north and east walls hint at the installation's huge size: circa 118-meter-long north wall and circa 78-meter-long east wall.

The stations are typically built of stacked stone, and occasionally mud brick. They often contain prominent fired brick or stone hydraulic features lined with waterproof mortar (see below). Many stations have towers along their perimeter walls and rooms inside to accommodate the garrisons. Some stations have outbuildings whose specific functions remain unknown. The forts generally lay on low ground despite more readily defensible higher terrain nearby. Construction of stations on lower ground indicates an attempt to control, specifically, the communication routes and water sources and not to dominate large expanses of the desert.

Fig. 3 WADI ABU GREIYA. Identified by Pliny the Elder as Venus Hydæmata or Tragodyzium, this station accommodates 1,000 travelers. Remains of five forts lie on the west side of the wadi; two are relatively small hill-top installations. A third, from which this photograph was taken, overlooks the two large forts in the main wadi below. Pottery from all five forts spans the Ptolemaic period to the 6th and, possibly, the 7th century A.D.

Fig. 4 PLAN OF THE EASTERNMOST FORT IN WADI ABU GREIYA (seen in the distance in Fig. 3)
We know the ancient names of many of these stations from the 1st century A.D. encyclopaedia Pliny the Elder (Natural History 6.26.182-03) and three later maps/travellers: the Tabula Peutingeriana (segment VIII), the Iter Britannicorum (171.5-173.9), and the Ravenna Cosmography (2.7). The latter probably merely copied one or more of the earlier sources. These documents, separated by several centuries, do not always agree on the names and locations of the stations. Some stations apparently were not cited due to lack of firsthand knowledge or because they no longer functioned or had yet to be constructed when the sources were compiled.

RESULTS OF THE SURVEY

The University of Delaware's archaeological survey of these roads and installations from 1991 to 1995 has located dozens of classical sites, ranging from major fortified installations to camping areas and other evidence of the ancient routes. Figure 2 shows the location of the more noteworthy sites. We have determined their precise latitudes and longitudes using the satellite Global Positioning System, drawn measured plans, and collected and dated surface artifacts (mainly pottery).

The following sections and the illustrations offer a quick tour along these desert routes.

The Berenike-Edfu Road

The ancient route from Berenike to Edfu (ancient Apollinopolis Magna) included stations at Wadi Abu Greiya (ancient Vetor Hydreuma; Figs. 3, 4), Wadi Lahma (Fig. 5), Wadi el-Khashir (ancient Novum Hydreuma; Fig. 6), the badly preserved station at Abu Ghalaq which, as its sherds suggest, was used only in late antiquity, the nearby Abu Gluma (ancient Cabadi), which suffered severe flooding so that only one wall survives, two small forts in Wadi Abu Hefgil (Figs. 7, 8), the extensive complex at Wadi Gerual (ancient Apollonopolis) and associated satellite installations (Fig. 9), the small semi-circular fort at Umum Gariya (Fig. 10), and ad-Dweig (ancient Falcroo).

The roads to Qift and Edfu lifecycles at a point north of the fort in Wadi ad-Dweig. Considering its proximity to the juncture of two important roads, the relatively small size of the installation in Wadi ad-Dweig and the slight quantities of pottery dating only to early Roman times raise questions about the extent of its use. Apparently, this fort was not directly associated over a long period of time with activity on the roads.

Our pottery analysis suggests that the road leading to Edfu was the older of the two classical routes connecting Berenike and the Nile. Ceramics we found along the route dated Ptolemaic and early Roman, with very little trace of later Roman material. The presence of Islamic sherds at some sites suggests possible use by travelers making the baj.

There were two small Ptolemaic-early Roman stations west of Dweig on the route toward Edfu, neither of which had been previously recorded: a hydreuma at Sayhir (Fig. 11) and a small fort at Rod el-Legag (Fig. 12). Both stations may have been on the main route to Edfu. There was also a stop at Umum Garadis between Rod el-Legag and Samut.

Numerous cairns marked the route between Samut (Figs. 13, 14) and subsequent stops at Abu Midrak (Fig. 13), Abu Rabah, and Abu Rabah West. There was little distinguishing terrain in the area and ancient travelers looking guides could have easily missed these stops. Attempts to remedy this problem included placing numerous cairns on low hills along the route.

After the large station at el-Kanaw (Figs. 16, 17), the last station (at al-Bahad) on the thoroughfare to Edfu is small and consists of a fort and three other structures.

Several unfortified stops of lesser importance were located on the road. At the juncture of the natural routes from the stations in Wadi Lahma and Wadi Abu Greiya (at Wadi Qefr Rijrj/Shawalq) is a site that has little extant architecture, but many sherds which date

**Fig. 5** PLAN OF THE WADI LAHMA STATION. An alternate route from Berenike ran northeast of Vetor Hydreuma to this small station in the Wadi Lahma.

**Fig. 6** WADI EL-KHASHIR (ANCIENT NOVUM HYDREUMA). Plan of the large elliptically shaped "fort" built of gravel banks.

**Fig. 7** THE SOUTHERN FORT IN WADI ABU HEFQIL. This site preserved evidence that water was channeled from a nearby mountain runoff into two internal oval cisterns.
FIG. 9. **Satellite settlement at Wadi Gemal** (ancient Apollonios). This station was a pivotal point on the road and was occupied over a long period of time. A Latin inscription indicates that Apollonios received repairs during the time of the emperor Augustus (27 B.C.-A.D. 14) or Tiberius (A.D. 14-37).

Apollonios had a number of satellite settlements, including nearby emerald mining operations. The satellite settlement approximately 1 km north at Kah Marfu’s was active, apparently, in the 1st/2nd to 3rd/4th centuries; its purpose remains uncertain. A larger one lies 2-3 km to the south, at Merinert Wadi Gemal/Gelil.

Inhabited at least in the 1st–2nd centuries, 5th century and Islamic times, it also has no known raison d’être.

FIG. 10. **Plan of Umm Gariya station**. The small, semi-circular, towerless station structurally resembles other Ptolemaic period forts/lebemma on the route, but the pottery collected was early Roman.

FIG. 11. **Plan of the Hydreuma at Sehrijig**. This installation contained two stone-lined circular cisterns.

FIG. 12. **Plan of the fort at Rod el-Legah**.

FIG. 13. **Station at Samut**. The eastern corner of this large station has been washed away. A trash dump outside the northwestern fort wall produced Ptolemaic and early Roman pottery and iron slag suggesting, possibly, repair of mining equipment or other industrial activity. Numerous grinding stones lay inside the fort. Smaller buildings lay to the west.
activity from the early Roman period and again from the 5th century A.D. or later. Northwest along the road are a small camp several kilometers west of the main road at Hild and the stop at Umun Keftush which lacked any extant architectural remains and could be identified only by its extensive scatter of 1st-3rd century A.D. sherds.

The Edfu branch of the Berenike-Nile road accommodated subsidiary routes leading to regional mines. About 38 kilometers east of Abu Rahal are the gold mines and hydreuma at Barramiya. South of the thoroughfare were early Roman gold mines at Harmash and Sibrit. East of Abu Midri were gold mines at Dumqash which preserve pharaonic-era graffiti, ancient structures, and Roman sherds. The mines here were worked as late as the 1980s.

The Qift Road

The more northerly route to the Nile left the ad-Dweiq area for Qift. This resulted in a longer trip from Berenike than to Edfu and, based upon pottery dates of early and later Roman periods, seems to have been the preferred route after the early Roman period for travel between the Nile and Berenike.

Leaving ad-Dweiq one traveled north-northwest to a small stop at Shafr and then to the station in Wadi Gerf (ancient Aristonitis). A substantial trash dump with copious amounts of pottery indicates the importance of this facility. In the vicinity of the fort in Wadi Gerf there is a natural route to Samaat via the southern reaches of Wadi Gerf and Wadi Mowelha where there is evidence of water in antiquity. This may have been an alternate route to ad-Dweiq for traffic between Edfu and Berenike. Near Aristonitis was a small stop at Rod Legiya with early Roman pottery and nondescript small structures. Another settlement at Rod el-Baram served as a rest and water stop, remains of a citadel are still evident in the sand.

Major structures exist at Beizah (ancient Juvitis; Fig. 18), Wadi Abu Greiya (ancient Juvitis), Wadi Daghbag (ancient Complus; Fig. 19), Daghbag South (very ruined now) and Khaww ej-Jir (ancient Aphroditos; Fig. 20). A natural rock shelter (Fig. 21) provided protection from the sun for some travelers passing between Khaww ej-Jir and Kham el-Menih/Zydyun (ancient Didyma). Nothing survives of the important station at El-Latgata (ancient Phoenician) northwest of Khour el-Menih, although earlier in this century remains could still be seen. In addition to being a stop on the Berenike-Qift road, it was also a station on the road between Qift and the early Roman and medival Islamic Red Sea port at Quseir al-Qadim. Also sharing the route to Quseir al-Qadim is a badly preserved hydreuma in Wadi el-Matula; this small station served as the last stop before Qift.

CONCLUSION

The University of Delaware survey pinpointed locations of the classical period features on the routes between the Red Sea port of Berenike and the Nile emporia of Apollinopolis Magna and Coptos. These included both fortified and unfortified stations, a large number of cairos marking the thoroughfares, signal towers, and mines and settlements connected by branch roads. We documented a number of previously unrecorded sites and road sections and drew measured plans of all forts, including some not previously published (Lahma, Wadi el-Khashir, Abu Heglig South and North, Seyrfig, Rod el-Legh, the hilltop fort at...
Fig. 18 The hydreuma at Bezah. This installation has a typical rectangular layout with internal rooms aligned against the perimeter wall. The well is located in an interior depression. Ancient ancillary buildings are visible just across the modern road; the building to the left is more recent and connected with use of the facility as a water source in modern era mining operations. The proximity, several kilometers to the northwest, of a larger station in the Wadi Abu Greiya suggests that Bezah may not have been the major stop in this area.

Fig. 19 Cut stone circular channel in Wadi Daghbag. A much ruined fort at a narrow point in Wadi Daghbag (ancient Compo) preserves only a portion of its eastern wall and parts of a cistern. The inscription mentioning repairs at Apollonia records renovations here, too. This fort also supported gold mining operations; the remains of grinding stones and rooms of Roman houses near the fort stretch for several kilometers to the north. Prehistoric petroglyphs depicting animals and humans and pharaonic hieroglyphs at Bir (Wadi) Daghbog about 0.5 km south of the fort show this segment of the route was important in the pre-classical period.

Fig. 20 Khawr el-Jir, general view. Many scholars have placed Aphrodite in Wadi Menih el-Heir, but we pinpointed it in Khawr el-Jir several kilometers away. This station is difficult to visit today because the ancient route approaching from the northwest has been blocked by huge sand dunes nearly impassable by vehicles. About 3.25 and 8.35 km to the south are petroglyphs, recent Bedouinúmeros (tribal markings), and other graffiti from different ages. Clearly this part of the route carried pre-classical traffic. J. G. Wilkinson visited the site in 1926 and dated a now illegible Latin inscription to the 1st century A.D.

Fig. 21 Inscriptions from a rock shelter. The rock shelter on the road between Khawr el-Jir (ancient Aphrodite) and Khawr el-Menih/Zeydun (Didyme) provided relief from the sun for numerous travelers. Many left graffiti which record their names and in some cases dates, occupations, and ethnic origins. Three graffiti are shown here (two in Latin, one in Greek). The topmost, dated July A.D. 6, mentions Iyra, a freed slave of Aristides Pluchamin who may be mentioned in Pliny’s Natural History 6.24.84-85 as being involved in the collection relating to the international maritime commerce. The one below it, also in Latin, mentions Cainiamus Eric, also involved in the India trade. The Greek inscription mentions Ephremos, son of Lucius Aetius Phelisios, and is dated April A.D. 44, but does not say why he was traveling along the route.

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