

# Science Rescues Two

Of all the historic monuments and ruins of ancient Nubia, now threatened by the building of Aswan Dam on the Upper Nile, the two temples of Abu Simbel have most captured the popular imagination.

The magnificent facades of the Great Temple and the Little, or Queen's, Temple, both hewn out of solid rock some thirty-two centuries ago in the reign of King Rameses II, and erected in honour of Rameses and his Queen Nefertari, rise up majestically from the banks of the Nile.

These great temples, dedicated to three gods, Aman-Rah, Ptah and especially to Re-Harakhte, god of the Rising Sun, evoke admiration of the skill of those who fashioned and decorated these monuments, and wonder at the scientific knowledge of the architects who conceived and created such temples.

At that time, man's knowledge of geology and chemistry could have been only elementary. Yet—and this amazes present-day experts—these unknown Egyptian masters

obviously knew enough about types of soil and the effects of water and wind erosion to build for an eternity on a site perfectly suited to the needs of worship.

## *A Project Worthy of Ancient Egypt*

The scope of these temples probably can be matched only by that of a proposed plan to save them from being swallowed up by the Nile once the new dam is built. This is the boldest aspect of the entire campaign to save the Nubian monuments, launched by Unesco in co-operation with the United Arab Republic and the Sudan.

The final choice made by the government of the U.A.R., and endorsed by Unesco, on the advice of a number of commissions of experts, is for a plan submitted by Italian specialists (Italconsult). This calls for raising bodily the two blocks of rock in which the temples are embedded to somewhat more than 180 feet above their present site, and then restoring their present setting.

# Egyptian Temples

It is estimated that the task will take more than six years. A small army of technicians and workmen will have to carry it out in a spot which is practically a desert. And, during this time, there will be the danger of rising flood waters.

## *Preliminary Work*

First, a network of roads must be built to spots selected for storing materials; an air strip has to be prepared for planes and a floating dock, unaffected by changes in the level of the Nile, must be built; an electric power station must be constructed; and, of course, a temporary city created to house those working on the project and give them facilities needed by a community in the desert.

Meanwhile, actual construction work on the project will start with the building of a dike running the length of the facades of the two temples. This water-tight earthwork is to protect the whole operation from the rising level of the new lake. Between this earthwork and the facade, a

trench will be dug, 50 feet deep, from which underground galleries will burrow into the rock under the temples.

During this preliminary stage, an important task will be to re-inforce the structures both inside and outside. This is an exceedingly delicate operation. The rock and the monuments carved in it have suffered from the ravages of time, and the rock itself still bears the same cracks and fissures that existed before the temples were built, and with which those early stone workers knew so well how to deal. Today, these weak points which might give way during the moving operation must be reinforced.

It is only after these preliminaries have been completed that the real work can begin of directly raising the temples.

## *Two Giant "Boxes"*

Three complicated operations are involved. First, the "scalping" of the temples by the removal of the mass of rock which covers them in

order to lessen the overall weight to be raised. The portion of the hill, thus taken off, will be replaced in its original position when it comes to the final landscaping.

Next, the huge block of rock containing the temples must be sliced free and an artificial casing built in front of their facades so that the space between the casing and each facade can be filled with a "padding" of sand. Finally, and most important, three parallel groups of underground galleries must be driven under what will serve as the floor of the "boxes". It is this base, with the thickness of from twelve to fifteen feet, that will take the upward thrust of the lifting jacks.

This lengthy phase of operations is the one which calls for the most meticulous precision. It will be impossible to use explosives or machinery which could cause vibration. Experiments carried out in Norway with even more brittle rock than that at Abu Zimbel show that only compressed air machinery can be used. At 20 to 25 feet inside the rock, pneumatic hammers, weighing no more than 75 pounds and capable of 1,000 blows a minute, will be used, but electric saws and scissors will be employed at the most sensitive cutting

points. During all these operations, a 24-hour micro-seismic watch will be kept to detect the slightest danger.

With the two "boxes" of rock and sand, hermetically sealed and finally sliced away from the rest of the mass of rock, jacks can be placed under the base, beneath which a metal grating is stretched to insure uniform pressure from the jacks. Then follows the mighty task of lifting the temples in synchronised movements, at the rate of two millimetres at a time. Each hydraulic jack is operated from a central control point where any break in the equilibrium will be immediately visible.

The jacks themselves, which may be either hydraulic or mechanical, will have an individual lifting power of either 2,000 or 1,000 tons each, working alternately in two groups. So far, however, the experts have reached no decision on this point.

Thus, little by little, four-square on the giant piles that are to serve as their permanent base, the temples will rise more than over 180 feet.

#### *Tribute to the Experts of the Past*

After the major operation of lifting the base of the temples is completed, the final

phase of the work begins: the restoring of the previously "scalped" summit on top of the hill, and of the original landscaping. This involves re-creating not only the actual scenery, but the same physical conditions—the facades will be at the same height above water as before—chosen by the original builders.

The preservation of Abu Simbel is not the only project being undertaken in the "Campaign to Save the Monuments of Nubia." Throughout the area of what will be a 300 mile-long lake to be created between the First and the Second Cataract to hold the water behind the new dam, teams from a number of countries have answered the appeal sent out by Unesco at the request of the governments of the Sudan and the U.A.R. These teams are carry-

ing out almost non-stop work, excavating, making photographic pictures, drilling down into prehistoric times, and moving whole temples and works of art from the threatened area.

By the time the dam is completed, work to preserve another historic, and no less illustrious, monument, the Island of Philae, will have been completed, thanks again to international assistance.

But the saving of Abu Simbel, both in its scientific daring and the amount of financial help which the world is being asked to contribute, takes on a special symbolic value. It will enable today's civilization to pay tribute to another, long since gone, which dared to create a monument that still startles us with its size and beauty.

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*"A wife and an automobile are expensive luxuries."*

*"I don't agree with you. With both of them, the expense is in the accessories."*

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*Mrs. Methuselah: Just received this note from mother saying she will arrive tomorrow for a short visit—but don't worry, dear—it will only be a couple of years.*