

**Conquest of the Land Through  
Seven Thousand Years**

by

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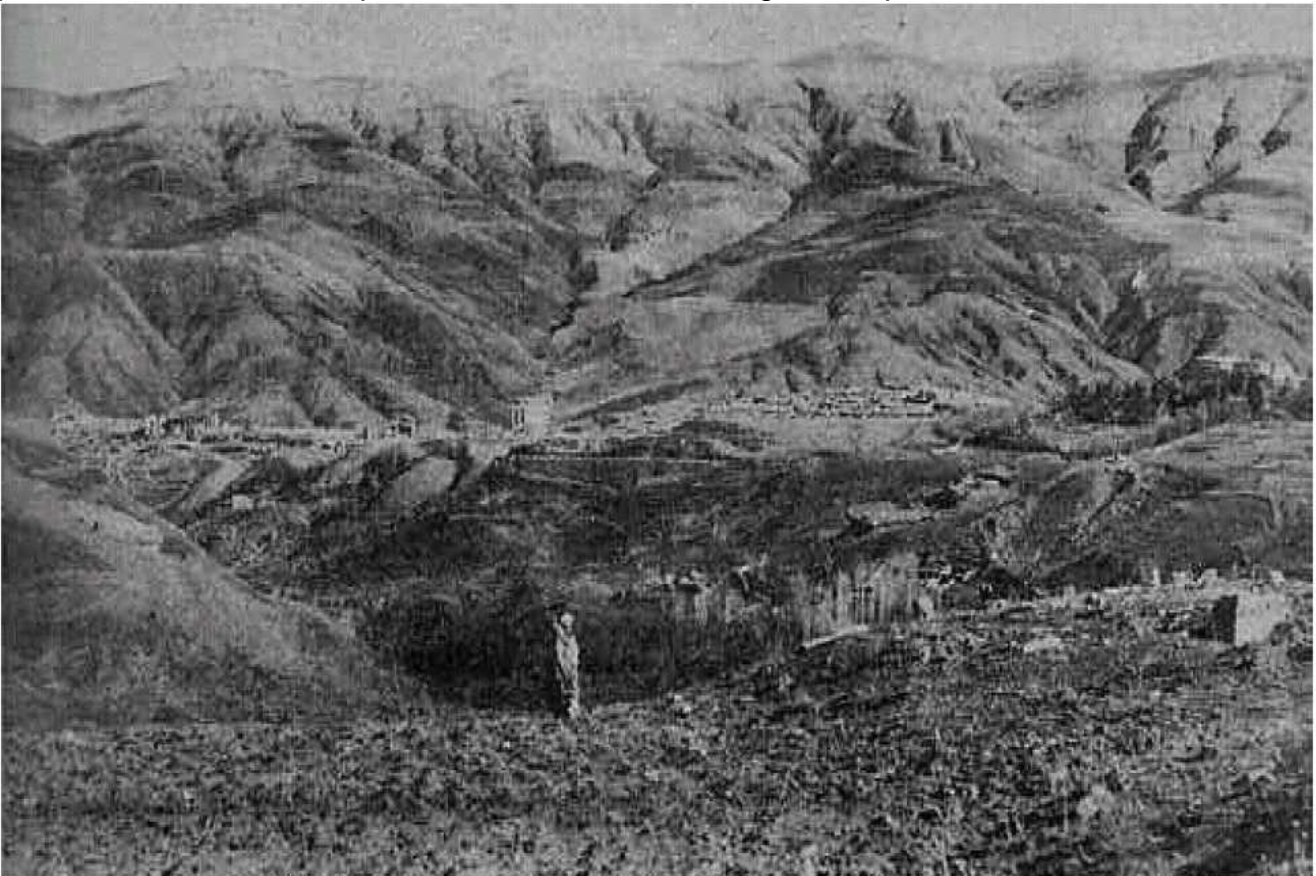
### **Across North Africa**

We shall now continue westward along the northern coast of Africa into Tunisia, and Algeria. Here we read the record of the granary of Rome in North Africa during the Empire, by surveying a cross section across North Africa from the Mediterranean to the Sahara Desert, from 40 inches of rainfall to 4 inches, from Carthage on the coast to Biskra at the edge of mysterious Sahara.

In Tunisia we found that it rains in the desert of North Africa in winter time now as it did in the time of Caesar, who in 44 B.C. complained of how a great rainstorm with wind had blown over the tents of his army encampment and flooded the camp. It rains hard enough to produce flash floods in the wadies. At one place muddy water swept across the highway in such volume that we decided to wait until the next day until the flash flow had gone down before proceeding.

As we make a rapid survey of land use across Tunisia and Algeria from the Mediterranean coast to the edge of the Sahara, through the center of what was the granary of Rome, we shall begin at Carthage the principal city of North Africa in Phoenician times.

We stood on the site of ancient Carthage, one of the colonies of Phoenicia that grew to be great and powerful—the city that produced Hannibal and became a dangerous rival of Rome. In 146 B.C. at the end of the Third Punic War, Scipio destroyed Carthage, but out of the doomed city he saved 28 volumes of a work on agriculture written by a Carthaginian by the name of Mago, who was recognized by the Greeks and Romans as the foremost authority on agriculture in the Mediterranean. These works of Mago were translations in the existing works of such Roman writers on agricultural subjects as Columella, Varro, and Cato. This incident tells us that the traditions of conserving soils and waters that we believe were first discovered on the slopes of ancient Phoenicia had been brought by their colonists to North Africa; we suspected these measures furnished the basis of the great agricultural production that was so important to the Romans during the Empire.



**Fig. 9. (L-132) In the middle distance may be seen the ruins of the ancient Roman city of Cuicul. It was a rich and prosperous city in North Africa when that region was known as the "granary the Roman Empire." Note that the ruin of the land, as seen in the distance and foreground, is almost as complete as the ruin of the city.**

Over a large portion of the ancient granary of Rome we found the soil washed off to bed rock and the hills seriously gullied from overgrazing. The valley floors are usually still cultivated but are still eroding in great gullies fed by accelerated storm runoff from barren slopes. This was in an area that once supported many great cities in Roman times.

We found at Djemila the ghosts of Cuicul, a city that was once great and populous and rich but later was covered completely, except for about 3 feet of a single column, by erosion debris washed off slopes of surrounding hills. For 20 years French archaeologists had been excavating this remarkable Roman city and unearthed great temples, two great forums, splendid Christian churches, and great warehouses for wheat and olive oil. All this had been buried by erosional debris washed from the eroding slopes above it. The surrounding slopes once covered with olive groves are now cut up with active gullies.



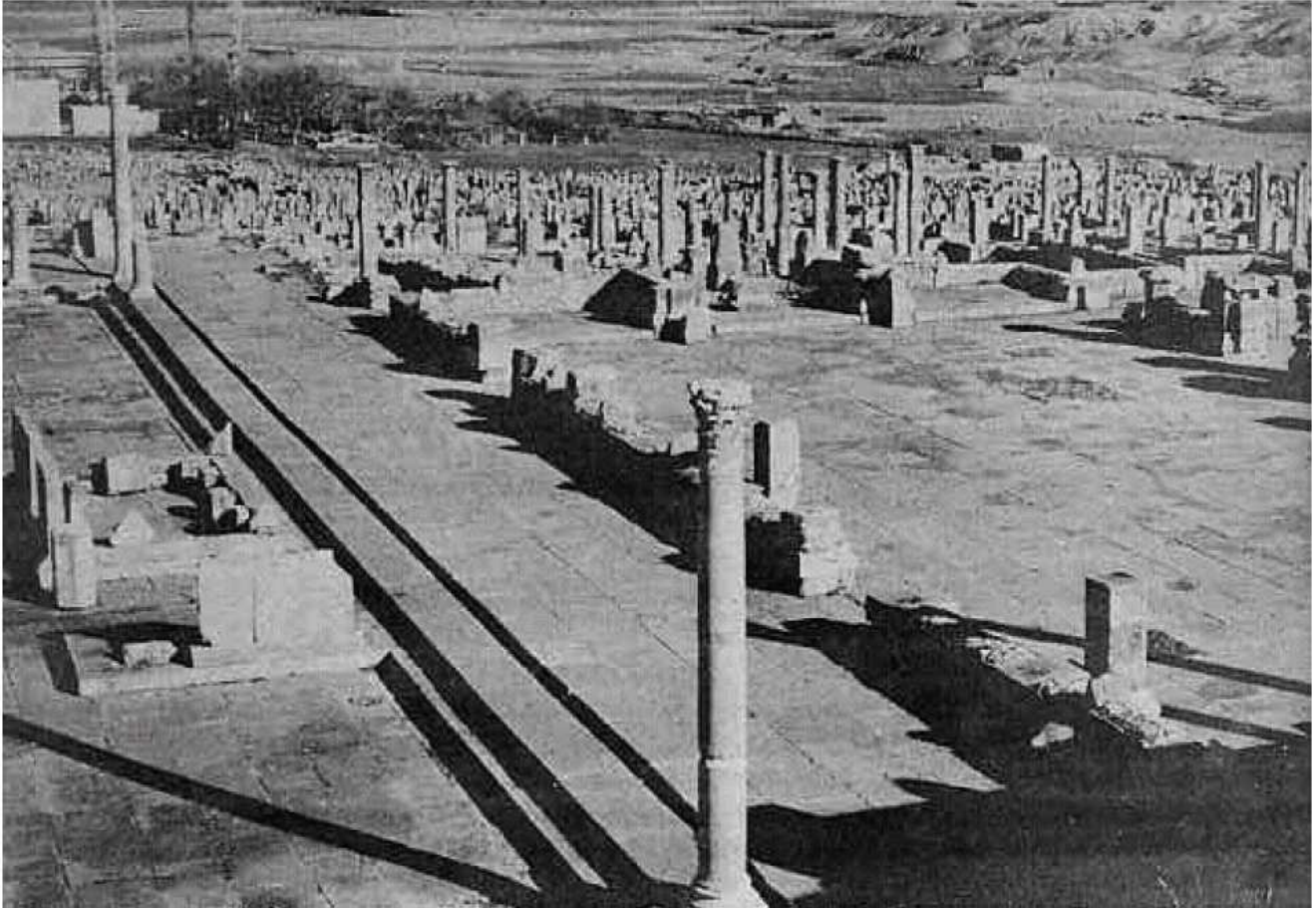
**Fig 10. This small flock of scrawny sheep graze on the scant vegetation that may be found near the ruins of Cuicul. This is about the only productive use the land now has; the gullied hillsides in the distance do not even support enough vegetation for that.**

The modern village that falls heir to this once beautiful Roman city houses only a few inhabitants. The flat lands are still farmed to grain but the slopes once planted to olives are bare and eroding and wasting away. What is the reason for this astounding decline and ruin?

### **Timgad, Lost Capital of a Lost Agriculture**

Further to the south we stopped to study the ruins of another great Roman city of North Africa, Thamugadi, now called Timgad. This city was founded by Trajan in the first century A.D., laid out in symmetrical pattern and adorned with magnificent buildings, with a forum embellished by statuary and carved porticoes, a public library, a theater to seat some 2500 persons, 17 great Roman baths, and, if you please, with marble flush toilets for the public. After the invasion of the nomads in the seventh century had completed the destruction of the city and dispersal of its population, this great center of Roman culture and power was lost to knowledge for 1200 years. It was buried by the dust of wind erosion from

surrounding farm lands until only a portion of Hadrian's arch and 3 columns remained like tombstones above the undulating mounds to indicate that once a great city was there.



**Fig. 11. The ruins of Timgad—another ancient Roman city of North Africa. The few squalid huts, seen in the middle distance, now house about 300 inhabitants; which is all that the eroded land will support at present — another example of a city that remains dead because the land that supported it is dead.**

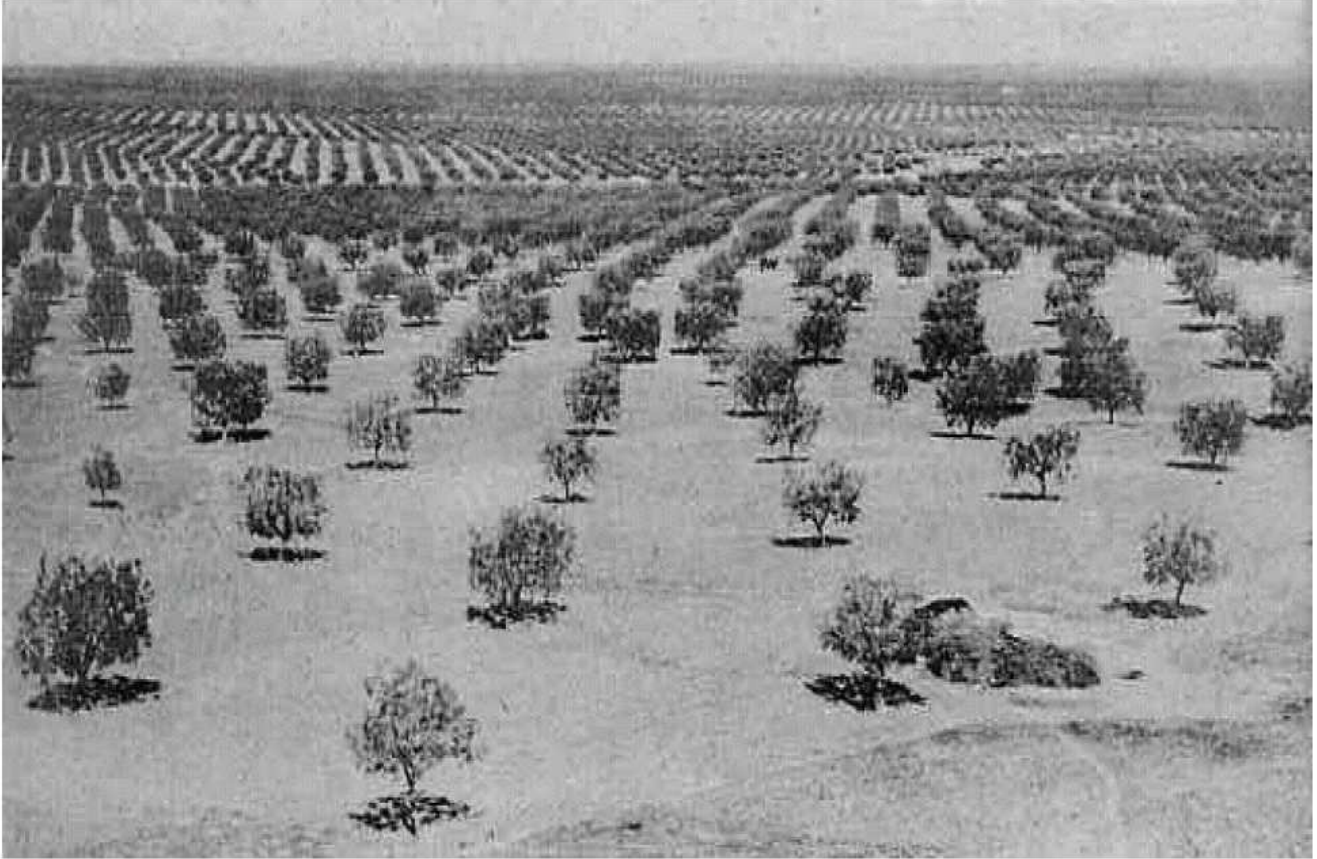
Since discovery of the site, the French Government has been excavating this great center for 30 years and has disclosed remarkable examples of building, of art, and of ways of living during Roman times in North Africa, all supported by the agriculture of the "Granary of Rome." The mosaics that lined the public baths were beautiful in design. Within the city we found ruins of a great bakery with its many grist mills turned by slaves to grind the wheat that grew on the plains. But today this great center of power and culture of the Roman empire is desolation; it is represented by a modern village of only a few hundred inhabitants who live in squalid structures, the walls of which are for the most part built of stone quarried from the ruins of the ancient city.

We saw also where water erosion cut a gully down into the land and exposed an ancient aqueduct that supplied water to the city of Timgad from a great spring some 3 miles away. Within and surrounding Timgad, we studied remarkable ruins of great olive presses where today there is not a single olive tree within the circle of the horizon.

On the plain of Tunisia we came upon in El Jem, the ruins of a great coliseum, second only in size to that of Rome, for the amusement of a city in a populous region. It was built to seat some 65,000 people, whereas it would be difficult to find 5000 persons today within this district. The ancient city now lies buried around the coliseum and a sordid modern village is built on the buried city.

What was the cause of the decadence of North Africa and the decline of its population? Some students have suggested that the climate changed and became drier, forcing people to abandon their remarkable cities and works. But Gsell, the renowned geologist who studied this problem for 40 years, challenged the conclusion that the climate

has changed in any important way since Roman times. So Director Hodet, of the Archaeological Excavations at Timgad, decided as an experiment to plant olive trees on an unexcavated portion of the city where there would be no possibility of sub-irrigation. He planted young olive trees in the manner prescribed in Roman literature, watering them in the following two long dry summer seasons. These olive trees are thriving, indicating that where soils are still in place, olive trees will grow today probably very much as they did in Roman times.



**Fig. 12. (L-I41) This large grove of olive trees are thriving on the plains near Sfax, Tunisia. The scattered groves of this kind that may be found in North Africa today show that the climate is still suitable for agriculture where productive soil is still on the land.**

On the plains about Sfax, ruins of olive presses were found by early travelers, but no olive trees. An experiment was decided upon 40 years ago to plant olive trees there, and they grew. Now more than 150,000 acres are planted to olive trees, and their products support thriving industries in the modern city of Sfax. These plantings indicate that the climate of today, as far as production of olives is concerned, is not unlike that of Roman times; in other words, that the climate has not become drier in a significant degree since Roman times.

Other students of this baffling problem have suggested that pulsations of climate with intervening dry periods have taken place, sufficient to blot out the civilization of North Africa. Such undoubtedly might have been the case, but at Sousse we found telling evidence on this point in an olive grove that has survived since Roman times. These olive trees are at least 1500 years old, we were informed. I was interested in the way these trees were planted—in basins bordered by banks of earth with ways of leading in unabsorbed storm runoff from higher ground. We passed along this area at a time of heavy rains which showed just how this method had worked since the trees were first planted. If there have been pulsations of climate since Roman times this grove should show that the drier periods were not sufficiently severe to kill the olive trees. We conclude that it does not seem probable that either a progressive change of climate or pulsations of climate account for the decadence of North Africa. We must seek other causes for this colossal tragedy.

On hillsides between Constantine and Timgad, we found written on the land a record that indicates what has happened to soils of the granary of ancient Rome. We found some hills which, according to the botanists, were covered with savanna vegetation of scattered trees and grass. Vegetation had conserved a layer of soil on these hills for unknown ages. With the coming of a grazing culture brought in by invading nomads of Arabia, erosion was unleashed by overgrazing of the hills. We can see written here on the landscape how the soil mantle was washed off the upper slopes to bed rock. Accelerated runoff from the bared rock cut gullies into the upper edge of the soil mantle, working it down hill as if a great rug were being pulled off the hills, and depositing material at lower levels. The accumulation of torrential flows during winter storms is cutting great gullies through the alluvial plains just as it does in New Mexico, Arizona, and Utah of our own country. The effect of this is to lower the water table, bringing about the effects of desiccation without reduction in rainfall. In this manner has the country been seriously damaged and its capacity to support a population much reduced. Unleashed and uncontrolled soil erosion is sufficient to undermine a civilization, as we found in North China and as seems to be true in North Africa as well.

### **The Dry Lands of North Africa**

We traveled across North Africa southward toward the Sahara Desert into zones of less and less rainfall. Beyond the cultivated area in Roman times was a zone devoted to stock raising on a large scale. Thousands of cisterns were built in Roman or pre-Roman times to catch storm runoff from the land to store it for outlying villages and for watering herds of livestock during the dry summer seasons. Many of these cisterns were being cleaned out and repaired by the French Government before World War II, to use for the same purpose as they were used for in ancient times. And the French Government was going the Romans one better because of the advantage in steel reinforced concrete construction. We looked upon one of the modern cisterns four times as large as any Roman cistern, with a capacity of 100,000 cubic feet. This cistern was filled in two years and now waters the herds of seminomads who inhabit this portion of North Africa.

Still farther toward the desert about 70 miles south of Tebessa we found a remarkable example of ancient measures for the conservation of water. At some time in the Roman or possibly pre-Roman period, peoples of this region built check dams to divert storm water around the slope—in canals that the French are now cleaning out again—to spread upon a remarkable series of bench terraces. This area of unusual interest raises a number of puzzling questions which we are not yet able to answer. If these terraces were cultivated to crops in times past they are the best evidence we have that climate has become drier since they were first built. But if they were built for spreading water to increase forage production for grazing herds then, as the French are using them today, they are not evidence for an adverse change of climate. This evidence alone could leave us in doubt, but other evidence would indicate that water spreading was most used here for crops.

This region of North Africa is similar to the Navajo country in the United States where in recent years our Soil Conservation Service has developed measures for spreading storm water on alluvial valley floors to increase forage growth for herds of Navajo sheep. It would be interesting to know the date and the reason for building these terraces. They may indicate that with Roman occupation of North Africa the native tribes were driven beyond the border of the Roman Empire and were forced to devise these refined measures for conservation and use of water in a dry area; or they may indicate that North Africa was, so densely populated that it was necessary to use these refinements in the conservation of water to support the population on the margins of a crowded region. Whatever may be the answers to these questions, the French Government during our visit in North Africa in 1939, was in the course of restoring these ancient practices of diverting storm water with check dams around slopes in canals to spread it upon the gentle slopes that had been flattened by a remarkable series of bench terraces.

We passed through the Saharan Atlas, mountain range by a narrow valley and into the mysterious Sahara Desert that spreads out toward the horizon as a faint blue sea. Salmon-colored sands form restless dunes that wander hither and yon in a lifeless landscape. At the north wall of the Sahara Desert, near the foot of the mountain wall we came upon the oasis of Biskra. We found the oasis a refreshing contrast to the glare of the desert. This oasis is nourished by sweet water from great springs issuing at the foot of limestone mountains.

The importance of an oasis in North Africa is measured not by the number of its inhabitants, but rather by the number of its date-palm trees. The oasis of Biskra has 250,000 date palms that furnish crops of delicious dates, as we know from personal experience, that are the chief articles of trade in the markets and the chief article of diet of the people.

We have now completed a transect across North Africa from 40 inches of rainfall on the coast to 4 inches at Biskra—across the granary of Rome—and have seen how great cities were built and grew up in this fertile region supported chiefly by crops of grain and olive oil. We have told how these great cities were abandoned and the former dense population dispersed; how the cities were buried in the overwash of erosional debris from eroding hills and by the dust of wind erosion from surrounding farm lands, and lost to knowledge for a period of 1200 years. We have noted the evidences that this decline and decadence of North Africa was neither due to a progressive adverse change of climate nor to pulsations of climate, but was due to the breakdown of an agriculture of remarkable refinements which arose out of colonization by the Phoenicians who, we believe, brought from ancient Phoenicia the solutions to problems of conserving soils and waters encountered in their mountainous homeland.

Soil erosion by water and by wind has so damaged this once fair province of the Roman Empire that its capacity to support people has been much reduced. The soils have been washed off the hills and deposited in the valleys, where they may still be cultivated but are still eroding, as we saw by great gullies that cut through alluvial valley fills

While the land has been seriously damaged, as you can see written on landscape after landscape, the country is still capable of far greater than its present production. In Roman times a high stage of conservation of soils and waters was reached with an intensive culture of orchards and vineyards on the slopes, and intensive grain-growing in the valleys. All this depended on efficient conservation and use of the rainfall. We find numerous references to such practices in the literature of the time. But as nomads swept in out of the desert, their extensive and exploitive grazing culture replaced these highly refined measures of land use and let them fall into disuse and ruin. Erosion was unleashed on its destructive course, and the capacity of the land to support people was seriously reduced.

The veteran student of North Africa, Prof. Gautier, answered my query as to whether climate of North Africa had changed since Roman times, in the following way: "We have no evidence to indicate that the climate has changed in an important degree since Roman times; but," he said, "the people have changed." We conclude that the decline of North Africa is due to a change in a people and more especially to a change in culture and methods of use of land that replaced a highly developed and intensive agriculture and that allowed erosion to waste away the land and to change the regime of waters.

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