

# JOSHUA'S CURSE AND THE ABANDONMENT OF ANCIENT JERICHO: SCHISTOSOMIASIS AS A POSSIBLE MEDICAL EXPLANATION

by

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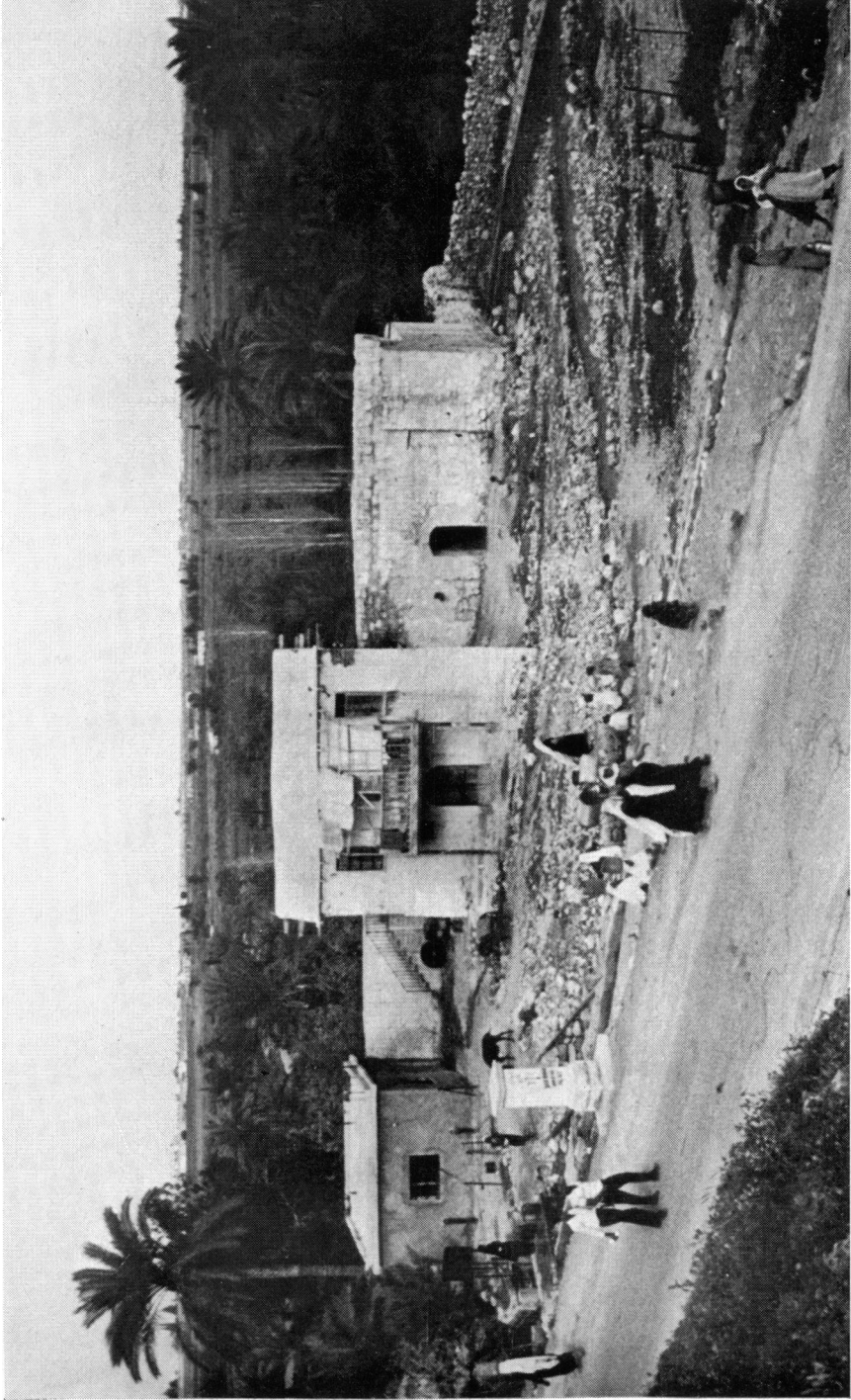
JERICHO IS 900 ft. below sea-level in the deep valley of the river Jordan, 8 kms. west of the river and 8 kms. north of the Dead Sea. It is an oasis and its well provides a plentiful supply of water for cultivation; the name Jericho probably means 'city of palms'. Jericho existed as a walled city during pre-pottery Neolithic times, c. 7000 B.C., and is one of the oldest towns in the world. In spite of its very favourable situation, the site was left uninhabited from the third quarter of the fourteenth century to the eighth century B.C., i.e. from the Late Bronze Age to the Early Iron Age. The biblical narrative states that Jericho remained uninhabited because Joshua, after capturing the city, cursed it and this curse remained operative until the time of Elisha, a period of time which agrees with the archaeological dating.

Recently there have been suggestions (Blake, 1967; Hulse, 1970) that Joshua's curse and the abandonment of the town are open to a medical explanation. One theory is that the water of the well at Jericho temporarily contained a sufficiently high degree of natural radioactivity to cause serious harm (Blake, 1967) but this has to be dismissed on physical, biological and medical grounds (Mazor, 1969; Hulse, 1970). An alternative theory is that schistosomiasis existed in ancient Jericho (Biggs, 1960; Hulse, 1970). This paper attempts to show that a detailed examination of the evidence emphasizes this possibility and indicates that schistosomiasis could have produced conditions which fit the archaeological findings and explain the biblical narrative.

## BIBLICAL EVIDENCE

When Joshua invaded Palestine his primary object was to lead his nomad army from the desert on the eastern bank of the Jordan to the fertile highlands of Judea. Jericho lay on his route and was obviously of strategic importance. The two spies whom he sent to Jericho found that the terrified inhabitants were expecting to be defeated by the advancing Israelite army (*Joshua*, 2:11). Even though morale was low the city's counter-espionage was reasonably efficient and the spies were forced into hiding. They were befriended by Rahab, the prostitute, who eventually helped them to escape after extracting a promise of protection for herself and her family when Joshua attacked Jericho. The spies returned to Joshua confident that the city would be captured (*Joshua*, 2:24).

Joshua led his people across the Jordan, laid siege to Jericho and captured it. The biblical narrative dwells on both incidents and describes in detail how the waters of the Jordan parted to allow the Israelites to pass (*Joshua*, 3:15-4:18) and how the



*Figure 1. Elisha's well ('Ain-es-Sultan) which is situated alongside the site of ancient Jericho. The photograph, taken in 1964, shows local women going for water.*

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walls of Jericho crumbled to give the army easy access to the city (*Joshua*, 6:6–20). On Joshua's orders all the inhabitants were put to the sword, men, women, children and domestic animals, only Rahab and her family were saved. Joshua then cursed the city in these words:

Cursed before the Lord be the man that rises up and rebuilds this city, Jericho.  
At the cost of his first-born shall he lay its foundation,  
and at the cost of his youngest son shall he set up its gates. (*Joshua*, 6:26, R.S.V.)

Laying of foundations is a phrase indicating the commencement of building operations and setting up of the gates its completion.

Many years later, when Ahab was King of Israel, Hiel of Bethel attempted to rebuild Jericho but 'he laid its foundation at the cost of Abiram his first-born, and set up its gates at the cost of his youngest son Segub, according to the word of the Lord which he spoke by Joshua the son of Nun' (I *Kings* 16:34, R.S.V.).

Later still the prophet Elisha was asked to cleanse the well by some men who apparently wished to recolonize the area. They said 'Behold the situation of this city is pleasant, as my Lord sees; but the water is bad, and the land unfruitful' (II *Kings*, 2:19, R.S.V.). Elisha obliged by throwing some salt into the well and the well was cleansed. The local Arabic name for the well is 'Ain-es-Sultan but amongst the local Christians it is known as Elisha's Well (fig. 1).

The general impression given by the biblical story is that there was a strong local belief that any community which lived in Jericho would produce fewer children than normal. Both reduced fertility and unexpected deaths amongst the younger inhabitants are mentioned and the Elisha narrative suggests that the dangerous qualities of the locality were associated with the well.

#### ARCHAEOLOGICAL EVIDENCE

Recent excavations have provided a large amount of information about Middle Bronze Age Jericho, i.e. the city which existed when the Patriarchs were in Palestine, well before Joshua's time. It was a prosperous, if not actually wealthy town, surrounded by a substantial wall and the people used simple but skilfully-made furniture. Evidence from the tombs suggests that towards the end of the period there may have been a serious epidemic (Kenyon, 1965, p. 192).

The Late Bronze Age in Palestine began about 1550 B.C., when the Semitic Hyksos Kings in Egypt were replaced by the native XVIII dynasty, and Joshua may well have entered Palestine during the third quarter of the fourteenth century B.C. (Kenyon, 1957, p. 262; 1965, p. 211). Late Bronze Age remains would have been very important in understanding the biblical stories about Jericho. However, all but a few traces had been eroded away, there being just sufficient to show that a town did exist in Jericho in the Late Bronze Age. The erosion certainly occurred before the Early Iron Age and the Late Bronze Age remnants do not suggest that the town was rebuilt shortly after it had been abandoned. Indeed the evidence points to there not being a town at Jericho for a period of some four hundred years. The finding of a small mud oven of the Late Bronze Age and a single dipper juglet by it suggests that the town

was abandoned suddenly, i.e. in a manner consistent with the biblical record of Joshua's attack on it (Kenyon, 1957, p. 263).

During the Bronze Ages Jericho was built of mud bricks. The water used for making the bricks contained mollusca and these were incorporated into the buildings, large numbers of *Melanopsis praemorsa* being found in the excavations (Biggs, 1960). A juvenile example of *Bulinus truncatus* was found in a Middle Bronze Age stratum dated about 1650 B.C. This friable mollusc was preserved solely because it had been washed inside the shell of a dead *Melanopsis praemorsa* (Biggs, 1960). *Bulinus truncatus* is the intermediate host of *Schistosoma haematobium*, which causes genito-urinary schistosomiasis and the finding of the shell of this water snail opens up the possibility that schistosomiasis occurred in ancient Jericho. There was no positive evidence of the presence of the parasite but, as parasitological examinations of archaeological material are possible (Pike, 1967; 1968), earth from beneath the pelvis of Bronze Age skeletons might have revealed traces of ova. Unfortunately it was not known at the time that the point was worth investigating. Only one *Bulinus truncatus* is mentioned in the reports but Biggs did not take part in the actual excavations and had to rely solely on those shells which the excavators noticed and saved. If a specific search had been made and mud bricks specially broken for the purpose, as was done elsewhere (Zakaria, 1959), it is possible that more specimens might have been found.

#### GENITO-URINARY SCHISTOSOMIASIS IN ANCIENT TIMES

The life history of *Schistosoma haematobium* is complicated but in some areas of the ancient Middle East conditions were suitable for its propagation, particularly where land was irrigated, notably in Egypt and Mesopotamia. Schistosomiasis follows close contact with contaminated water. The parasites leave the water snail *Bulinus truncatus* as free-swimming forms (cercariae). These enter the human body usually by penetrating the skin, although entrance via the epithelium of the mouth and upper alimentary tract is possible. They pass into the circulation by way of a local vein and eventually, after they have matured and mated in the portal system, the female lays her eggs in the plexus of veins round the urinary bladder. These eggs ulcerate through the bladder mucosa and are passed in the urine. If they then enter fresh water, each egg ruptures releasing a miracidium and these enter *Bulinus truncatus*, if present, and complete the cycle by developing into cercaria.

Genito-urinary schistosomiasis produces dramatic external signs which, even in ancient times, could be readily noticed by affected individuals and be remarked upon by their physicians. When the schistosoma eggs penetrate the bladder mucosa haematuria and often cystitis result. Mild cases have few other signs and symptoms but repeated contact with infected water increases the number of parasites present and leads to severe infections. Any of the pelvic organs may become involved in the disease and complications include urinary tract obstruction with fistula formation and granulomata of the external genitalia. General effects also develop, such as anaemia, wasting, debility and a greater liability to intercurrent infections.

#### *Egypt*

Ruffer (1910) identified the calcified eggs of *Schistosoma haematobium* in the kidneys

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of two mummies of the twentieth dynasty (1250–1000 B.C.) and thus demonstrated that genito-urinary schistosomiasis occurred in ancient Egypt.

A number of medical papyri refer to *aaa* disease, the hieroglyphic representation of which is shown in fig. 2. In a detailed study Jonckheere (1944) lists 50 prescriptions for treating the disease, 28 from the Ebers papyrus, 12 from the Berlin papyrus, 9 from the Hearst papyrus and one from the London papyrus. The grouping of the disease with various forms of bleeding and the phallic symbol in the hieroglyphics (fig. 2) led to the conclusion that by *aaa* the physicians of Ancient Egypt meant haematuria. Considering Ruffer's (1910) findings and the prevalence of schistosomiasis in modern Egypt it is widely accepted that the majority, if not all, of the case of *aaa* were genito-urinary schistosomiasis (Pfister 1912; Jonckheere, 1944; Sigerist, 1951; Steuer and Saunders, 1959; Rowling, 1967). Thus it may be concluded that infection with *Schistosoma haematobium* was, at the very least, not uncommon in Ancient Egypt.

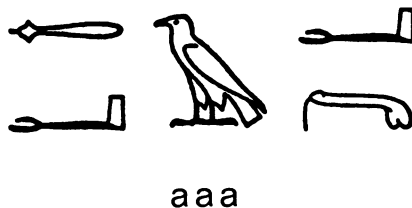


Figure 2. The hieroglyphics which denote the disease which Ancient Egyptian physicians called *aaa* (from Jonckheere 1944).

Jonckheere (1944) considered that *hrrw.t*, mentioned with *aaa*, was the adult stage of the parasite and supporters of this theory consider that worms may have been seen in the portal vein during embalming (Steuer and Saunders, 1959). Sigerist (1951), however, did not consider that the embalmer's workshop provided Egyptian physicians with pathological information and Rowling (1967) is very doubtful whether *aaa* was recognized to be a parasitic disease.

#### *Mesopotamia*

In modern Iraq *Bulinus truncatus* is present in irrigation canals and genito-urinary schistosomiasis is one of the medical problems of the area. Ancient Mesopotamia does not provide the same paleopathological material as Egypt (Sigerist, 1951). However, the widespread archaeological remains of buildings consisting of mud bricks made with water from irrigation canals allowed a specific search for subfossil aquatic molluscs. Zakaria (1959) examined mud bricks at Tel 'Aqeir (4000–2500 B.C.), the ziggurat at 'Aqar Quf (1350 B.C.), the summer palace at Babylon (c. 625 B.C.) and Tel Bismaya (third to sixth centuries A.D.) and found shells of *Bulinus truncatus* at each site. Thus the intermediate host of *Schistosoma haematobium* was present in Mesopotamia throughout ancient times.

The Assyrian medical texts provide further evidence. The disease *mūṣû*, which was essentially a discharge associated with the penis, was once believed to be gonorrhoea (Thompson, 1926) but is now thought to be genito-urinary schistosomiasis with septic inflammation of the bladder (Kinnier Wilson, 1967). The urine in *mūṣû* was like the dregs of beer or wine (Thompson, 1926) and this suggests that blood and pus were present. There was pain on micturition resembling strangury, pus was discharged continuously and it seems very likely that sufferers of the disease were impotent (Thompson, 1926). These signs and symptoms would fit a diagnosis of severe schistosomiasis with complications such as cystitis, urinary obstruction and the formation of fistulas in the perineum, scrotum and rectum. Purulent discharges in schistosomiasis can resemble gonorrhoea (Faust and Russell, 1964). It is also possible that the *mūṣû* stones mentioned with *mūṣû* are not a medicament for the disease as Thompson (1926) supposed but are bladder stones (Kinnier Wilson, 1957), which can occur in severe cases of schistosomiasis (Faust and Russell, 1964).

The descriptions of *mūṣû* coupled with the finding that *Bulinus truncatus* was present in Mesopotamia throughout ancient times makes it reasonable to conclude that genito-urinary schistosomiasis was not a rare disease in the area.

### *Palestine*

All Semitic languages are interrelated and there is a Hebrew word, *môṣâ* (מוֹסָא) which is related to the Assyrian *mūṣû*. However, the Hebrew word means 'a place or act of going forth' and when applied to man means an issue or utterance from the mouth or lips, especially a solemn or formal speech (Thompson, 1926; Brown, Driver and Briggs, 1955).

Cases of discharge from the genitalia in the male are discussed in *Leviticus*, 15:2 *et seq.*, and although it is usually presumed that gonorrhoea is intended (Thompson, 1926; Sussman, 1967) the passage can be applied to any type of genital discharge, including that of advanced genito-urinary schistosomiasis. However, *Leviticus* is not necessarily as early as Joshua's time, most authorities agreeing that it did not reach its present form until relatively late, probably after the captivity in Babylon (581–538 B.C.). Thus Palestine does not provide the same sort of literary evidence as Ancient Egypt and Assyria and the problem has to be approached somewhat differently.

Palestine is centrally situated in the 'fertile crescent' which extends from the Euphrates and Tigris to the valley of the Nile. If schistosomiasis occurred in Palestine in the late Bronze Age it seems very likely that it reached there from the chief centres of infection, Egypt and Mesopotamia, at either end of the crescent. The Old Testament provides plenty of evidence of the comings and goings of the Egyptian and Assyrian armies in Palestine several centuries after Joshua's time but provides only minor evidence of communications with the two areas before Joshua's invasion. However, other sources of information show that Bronze Age Palestine was in close contact with the two civilizations between which it was situated.

Palestine was under the military control of the Hyksos rulers of Egypt in the Middle Bronze Age and many of the towns of the period, including Jericho, were defended in the Egyptian (Hyksos) style by a plaster-faced bank, or glacis, surmounted by a wall, the whole probably being designed to make the use of battering rams difficult

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(Gray, 1964a; Kenyon, 1965). After the defeat of the Hyksos, the Pharaohs of the XVIII dynasty conducted many expeditions against Palestine and the Amarna tablets tell how the Egyptians dominated the country during the late fifteenth and early fourteenth centuries (Gray, 1964a). The various cities of Palestine acted independently, as separate states, thus the Egyptians would have to communicate with each city separately, including Jericho, in their attempts to maintain control over the area. The Egyptian language was spoken in Palestine and so was Akkadian and some of the writing was done in Akkadian syllabic cuneiform. The varieties of pottery also indicate a free circulation of trade with Egypt and Mesopotamia and artistic influences from both areas are apparent in archaeological remains (Gray 1964a). Amongst the molluscs collected during the Jericho excavations Biggs (1963) found many marine shells some of which could be identified as coming from the Mediterranean and some from the Red Sea which emphasizes the wide ranging contacts maintained by the inhabitants. Thus it can be concluded that the whole area was visited by people who came from schistosomiasis areas and some may well have been excreting *Schistosoma haematobium* eggs. If *Bulinus truncatus* was living in water which was contaminated by such visitors then the disease could become established in the vicinity.

SCHISTOSOMIASIS AND THE BIBLICAL NARRATIVE

*The Walls of Jericho*

The stopping of the waters of the Jordan which allowed Joshua's army to enter Palestine and the collapse of the city walls at the end of the siege of Jericho may both have been due to earthquakes. The area is liable to earthquakes and Joshua's invasion might have coincided, miraculously from the Israelite point of view, with a series of such disturbances.<sup>1</sup> Excavations have shown that a number of the earlier walls of Jericho were destroyed by earthquakes (Kenyon, 1957, p. 262).

Even more than modern buildings, those of ancient Palestine needed continual repair and renovation (Gray, 1964a) e.g. the famous verse: 'A continual dropping in a very rainy day and a contentious woman are alike' (*Proverbs*, 27:15) refers to the annoying leaks which winter rains readily produced in a mud brick house. Biggs realized that the possibility of schistosomiasis occurring in Jericho offered a further reason for the fate of the city walls and suggested:

If the contention is correct, namely that about 1650 B.C. the inhabitants of Jericho suffered from this parasite, it is not by any means impossible that at the time of the fall of the city of Jericho to Joshua, in the middle of the fourteenth century, they were also sufferers. The listlessness and

<sup>1</sup> This interpretation of the crossing of the Jordan appears to have been accepted in Old Testament times:

Jordan turned back  
The mountains skipped like rams,  
the hills like lambs  
. . . . .  
Tremble, O earth, at the presence of the Lord,  
at the presence of the God of Jacob.

(*Psalm* 114: 3b, 4 and 7, R.S.V.)

apathy, common to suffers from schistosomiasis, would have made them careless and inattentive to the repair of the city walls. The more virile and parasite-free desert dwellers were more than a match for the inhabitants of old Jericho and it fell to the invaders as much from a medical reason as a military one. (Biggs, 1960).

This suggestion tends to fit the archaeological findings as a poorly repaired wall may well have started to erode before the town was abandoned.

#### *Defeatism and Increases in Mortality*

Mild cases of schistosomiasis, such as follow rare exposures to the parasite may give the impression that the disease is relatively benign, resulting only in occasional slight haematuria and minor degrees of ill health. However, when exposures are frequent, as they would be in a community like ancient Jericho which depended on the one supply of fresh water, the disease can result in serious chronic illness and death may ensue. In present-day Egypt about half the total population suffers from schistosomiasis (Makar, 1955, Farooq, 1967) and it has been calculated that the general ill health amongst the fellaheen results in a yearly loss of wages amounting to 560 million dollars (Farooq, 1967).

Serious chronic ill health in a community is liable to lower morale and the occurrence of schistosomiasis in Jericho would explain the defeatist attitude of its inhabitants (*Joshua*, 2:1). In modern Egypt, it is well known that the bedouin are healthier and more vigorous than the fellaheen (Farooq, 1967). A similar contrast would have existed between the Israelites, who had spent more than a generation as nomads, and the ailing inhabitants of Jericho. Thus the spies' confidence in the Israelite army may have been as much due to a reasoned assessment of the enemy as to natural loyalty.

The majority of serious illnesses and deaths from *Schistosoma haematobium* are due to lesions in the genito-urinary tracts, often complicated by obstruction of the urinary passages and bacterial invasion. In addition there is an increased incidence of carcinoma of the bladder in schistosomiasis areas and there are a number of correlations between the two diseases (Makar, 1955; Honey and Gelfand, 1960; Jordan and Webbe, 1969). Other anatomical situations where serious and fatal complications can occur are the liver, giving cirrhosis, and the lungs and pulmonary arteries, leading to cor pulmonale.

Young people under twenty-five years of age are particularly prone to urological complications (Honey and Gelfand, 1960) and severe lesions may be seen in school-children (Jordan and Webbe, 1969). Rarer complications can also occur in youth. Carcinoma of the urinary bladder may occur in children in schistosomiasis areas and pneumonitis and cor pulmonale occur in adolescents (Jordan and Webbe, 1969). Thus Joshua's emphasis on hazards to young people (*Joshua*, 6: 26) is consistent with the theory that schistosomiasis was prevalent in Jericho.

#### *Reduced Fertility*

Joshua's curse implies that the families of those who tried to settle at Jericho would be small but the more important evidence that the fertility of the inhabitants was



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below normal comes from remarks made to Elisha (II *Kings*, 2:19). In the translation given in the Revised Standard Version, quoted above, the key word is 'unfruitful' and the corresponding word in the Authorised Version is 'barren'. The New English Bible, however, uses the phrase 'the country is troubled with miscarriages'. The Hebrew word in question (תְּבֵרָה) is derived from a verb meaning 'to be bereaved' and suggested meanings are: 'make childless', 'cause barrenness' or 'cause abortion' (Brown, Driver and Briggs, 1955). The Septuagint, the third to second century B.C. translation into Greek which can be useful in doubtful passages, uses the word ἀτεκνουμενη which implies childlessness rather than miscarriages and the Vulgate uses *sterilis*. One recent commentary suggested that the Hebrew means 'human barrenness' (Montgomery, 1950). Another used the phrase 'fails of fruition' and translated Elisha's pronouncement on cleansing the well (II *Kings*, 2:21) as 'No longer shall death and barrenness come from it' (Gray, 1964b). The same word is applied to the vine in *Malachi*, 3:11 (Gray, 1964b) and the New English Bible translates the phrase 'make your vines barren'.

Terms which now have a precise technical meaning can be misleading if used in a translation of an ancient document, unless it is obvious from the context that the modern technical meaning is implied in the text. In the present instance, particularly as different authorities use different translations, the less technically precise term is more likely to convey the meaning of the original. The most reasonable deduction to be made from the translations quoted above is that it was believed that the fertility of the inhabitants, as a group, was reduced, i.e. the number of progeny was below what would be expected from the size of the adult population.

Lesions due to *Schistosoma haematobium* and sepsis associated with them can involve any of the pelvic organs and may obstruct the vas or the Fallopian tubes, so causing sterility. Similar lesions might, in some instances, cause abortions. Schistosomiasis can also cause impotence and so reduce the fertility of a population. At the end of the nineteenth century many natives of Zanzibar who had chronic schistosomiasis were impotent and consequently a cure was in great demand (Petrie, 1903). In Egypt, Makar (1955) found that schistosomiasis of the penis, penile urethra and prostate could cause impotence and vividly describes the effect on his compatriots:

The disease is commonly seen in vigorous young men: it maims their genital apparatuses, clogs their working pieces and may put those proud young males in most humiliating situations towards their female partners. The psychologic effects of such unfruitful experiences on the patient cannot be ignored.

Other aspects of the disease may also have been important in focusing attention on sexual and reproductive function. Even in the mildest cases the majority of the symptoms of genito-urinary schistosomiasis are associated with the genitalia and in chronic heavy infections *Schistosoma haematobium* granulomas are common in the skin of the vulva, penis and perineum but very rare elsewhere (Cahill and el Mofty, 1964). Thus sterility, impotence and the obvious lesions of the genitalia could all have played a part in giving Jericho a bad reputation for the fertility of its inhabitants.

### *The Curse*

Joshua knew of conditions inside Jericho from his spies. As the spies seem to have been forced into hiding soon after entering the city much of the information must have come from Rahab (*Joshua*, 2:1) whose profession may well have ensured that the genito-urinary lesions and their often dramatic effects were accurately reported. It is impossible to tell whether the Israelites brought any knowledge of *aaa* disease from Egypt but, whether they did or not, reports of the effects of severe schistosomiasis could have made Joshua suspicious of the area and have encouraged him to forbid it to his followers. Viewed in the light of the present theory, the curse becomes a description of what Joshua believed was already happening in Jericho as well as a promise of what would happen to anyone who tried to re-establish the city. The implication that a family would have fewer sons and consequently suffer economically as well as emotionally would add to the effectiveness of the curse.

*Schistosoma haematobium* persists in a locality only if each new generation of *Bulinus truncatus* is reinfected. When Jericho was captured the whole of the population, except Rahab and her family, were killed and in this way the reservoir of infection would have been removed. The wholesale killing of the domestic animals would not play any part in ridding the area of the parasite as it is only very rarely harboured by animals (W.H.O., 1967).

### *The Removal of the Curse*

The one preventive measure against *Schistosoma haematobium* which was not covered by the curse and the massacre at Jericho was the killing of the intermediate host. *Bulinus truncatus* tends to thrive best in water contaminated during usage by human beings (Jordan and Webb, 1969). Thus, when Jericho was abandoned, conditions for the snail would be less than ideal but presumably the snail would continue to exist in the well, even though its numbers might be reduced.

Environmental changes, hydrological or climatic, could have led to the disappearance of *Bulinus truncatus*. Biological changes, such as loss of the aquatic vegetation on which the snails feed or the introduction of their natural enemies, could also have helped. The most likely factor seems to be changes in climate. During the period 2350–500 B.C. there was a period of desiccation in the Middle East (Butzer, 1961). The vast majority of the references to droughts in the Old Testament belong to the period before 850 B.C. and it has been suggested that nomadic disturbances, comparable to Joshua's invasion, may well have coincided with deteriorations in climatic conditions (Butzer, 1961). *Bulinus truncatus* has no operculum and its shell cannot be effectively sealed under dry conditions (Jordan and Webb, 1969). This means it would have been particularly sensitive to the periods of excessive desiccation which were occurring and the well at Jericho could have been cleared of *Bulinus truncatus* during a period of drought.

### *Hiel of Bethel*

When Hiel tried to recolonize Jericho the death of his eldest son coincided with the laying of the foundations and that of his youngest son with the construction of the gates (*I Kings* 16: 34). The incident occurred three or four centuries after Joshua's

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invasion and, as it is stated that Jericho was being built, the presumption is that up to that time the site was still deserted. *Bulinus truncatus* might still have been present in the well and it is possible that the snails could have been reinfected with schistosomes by passing travellers. However, it seems unlikely that the concentration of parasites in the well would be so great as to produce killing infections under such circumstances, even if the rebuilding took a few years. It is more reasonable to suppose that Hiel's two sons died during the building operations, either accidentally or through disease, and that the superstitious community naturally attributed their deaths to the action of the curse.

A further interesting possibility stems from Middle Eastern customs associated with doorways and thresholds which, being intermediate or transitional areas, demanded protection against supernatural forces. Modern Arab peasants sacrifice an animal at the door of a new house and, for the Israelites, the Passover combined animal sacrifice and protection of the threshold. The skeletons of two newborn infants were found beneath the Middle Bronze Age gate at Tell el-Far'a which, being distant from any other burials, may well have been human sacrifices and it has been suggested that Hiel similarly sacrificed his sons whilst attempting to rebuild Jericho (Gray, 1964a). Old Testament writers condemn human sacrifice, particularly of children (*Leviticus*, 18: 21; *II Kings*, 23:10; *Psalms*, 106:37; *Isaiah*, 57:5), and the author of *I Kings*, by mentioning the curse, might have been attempting to explain, and almost excuse, Hiel's conduct.

#### *Elisha*

The handful of salt which Elisha cast into the water when requested to cleanse the well would not act as a molluscicide. Presumably *Bulinus truncatus* was no longer present and Elisha was carrying out a ritual purification (*Leviticus*, 2: 13) designed to counteract superstitions and folk-memories of the curse. As *Bulinus truncatus* is very sensitive to desiccation it is interesting to note that one of the most impressive biblical stories of drought is the one which lasted three years (*I Kings* 17: 1; 18: 1) and played a prominent part in the story of Elijah, who was Elisha's immediate predecessor.

#### LATER HISTORY OF JERICHO

There are no further biblical complaints about the situation of Jericho and presumably the district prospered. When Cleopatra coveted Judea, Mark Anthony tried to protect the throne of his friend Herod the Great by giving Cleopatra the revenues of some of the richest areas and these included Jericho (Bruce, 1969). Jericho is mentioned a number of times in the gospels and flourished in Byzantine times, Justinian himself building a church there. During the Crusades, Queen Melisende (daughter of Baldwin II, King of Jerusalem, and wife of his successor, Fulk of Anjou), founded a convent at Bethany in 1143 and endowed it with Jericho, all its orchards and surrounding farms (Runciman, 1952). Following the formation of the state of Israel in 1947 Jericho became part of Jordan and a large Arab refugee camp was established there. The well continued to be used (fig. 1) and the camp was better known for the number of twins born there than for miscarriages (Rev. Leslie G. Farmer, personal communication).

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REFERENCES

- BIGGS, H. E. J., *J. Conch.*, Lond., 1960, 24, 379.  
BIGGS, H. E. J., *Man*, 1963, 63, 125.  
BLAKE, I., *Palest. Explor. Q.*, 1967, 99, 86.  
BROWN, F., DRIVER, S. R. and BRIGGS, C. A., *A Hebrew and English Lexicon of the Old Testament*, London, Oxford University Press, 1955.  
BRUCE, F. F., *New Testament History*, London, Nelson, 1969.  
BUTZER, K. W., in *A History of Land Use in Arid Regions*, ed. L. Dudley Stamp, p. 31, Paris, U.N.E.S.C.O., 1961.  
CAHILL, K. M. and el MOFTY, A. M., *Am. J. trop. Med. Hyg.*, 1964, 13, 800.  
FAROOQ, M., *WHO Chron.*, 1967, 21, 175.  
FAUST, E. C. and RUSSELL, P. F., *Craig and Faust's Clinical Parasitology*, 7th ed. London, Henry Kimpton, 1964.  
GRAY, J., *The Canaanites*, London, Thames and Hudson, 1964a.  
GRAY, J., *I and II Kings, A Commentary*, London, S.C.M. Press, 1964b.  
HONEY, R. M. and GELFAND, M., *The Urological Aspects of Bilharziasis in Rhodesia*, Edinburgh, E. & S. Livingstone, 1960.  
HULSE, E. V., *Palest. Explor. Q.*, 1970, 102, 92.  
JONCKHEERE, F., *Une Maladie Egyptienne*, Brussels, Fondation Egyptologique Reine Elisabeth, 1944.  
JORDAN, P. and WEBBE, G., *Human Schistosomiasis*, London, Heinemann Medical Books, 1969.  
KENYON, K. M., *Digging Up Jericho*, London, Ernest Benn, 1957.  
KENYON, K. M., *Archaeology in the Holy Land*, 2nd ed., London, Methuen, 1965.  
KINNIER WILSON, J. V., in *Diseases in Antiquity*, ed. D. R. Brothwell and A. T. Sandison, Illinois, C. C. Thomas, 1967, p. 191.  
MAKAR, N., *Urological Aspects of Bilharziasis in Egypt*, Cairo, S.O.P. Press, 1955.  
MAZOR, E., *Palest. Explor. Q.*, 1969, 101, 46.  
MONTGOMERY, J. A., *The International Critical Commentary: Kings*, ed. H. S. Gehman, Edinburgh, T. & T. Clark, 1951.  
PETRIE, J., *Lancet*, 1903, ii, 133.  
PFISTER, E., *Arch. Gesch. Med.*, 1912, 6, 12.  
PIKE, A. W., in *Diseases in Antiquity*, op. cit., p. 184.  
PIKE, A. W., *Nature (Lond.)*, 1968, 219, 303.  
ROWLING, J. T., in *Diseases in Antiquity*, op. cit., p. 532.  
RUFFER, M. A., *Brit. med. J.*, 1910, i, 16.  
RUNCIMAN, S., *A History of the Crusades*, vol. II, *The Kingdom of Jerusalem and the Frankish East 1100-1187*, Cambridge University Press, 1952.  
SIGERIST, H. E., *A History of Medicine, I. Primitive and Archaic Medicine*, London, Oxford University Press, 1957.  
STEUER, R. O. and SAUNDERS, J. B. de C. M., *Ancient Egyptian and Cnidian Medicine*, Berkeley and Los Angeles, University of California Press, 1959.  
SUSSMAN, M., in *Diseases in Antiquity*, op. cit., p. 209.  
THOMPSON, R. C., *Proc. R. Soc. Med., Sect. Hist. Med.*, 1926, 19, 29.  
W.H.O., *Epidemiology and Control of Schistosomiasis. W.H.O. Technical Report Series, 372*, Geneva, World Health Organisation, 1967.  
ZAKARIA, H., *J. Fac. Med., Baghdad*, 1959, 1, 2.