a little over three miles; and the other Zatras, about 15 miles to the south-east of Kerak. The latter, *Zatras*, corresponds to the one we visited. The soldiers and Bedouin who were with us called it Datras. About the former I could get no information; it appears to be unknown.

JEWISH MEASURES OF CAPACITY.

By Colonel C. M. Watson, C.M.G., R.E.

In a paper which was published in the *Quarterly Statement* for July, 1897, on the probable "Length of the Jewish Cubit," I gave some reasons for concluding that it was approximately 17·7 inches, subject to a slight correction on either side of this figure.

I did not, however, allude to the connection between the length of the cubit and the contents of the Jewish measures, and as this is a question of considerable interest I now propose to make some remarks with regard to it.

The Jews had two scales of measures of capacity: one for things dry, such as grain, &c., and one for things liquid.

The various measures on the two scales are usually given as follows, and there seems no reason to doubt the correctness of the proportions:—

Dry Measure.	*Liquid Measure.*
Homer.	Kor.
Epha = $\frac{1}{10}$ homer.	Bath = $\frac{1}{10}$ kor.
Seah = $\frac{1}{3}$ epha.	Seah = $\frac{1}{3}$ bath.
Omer = $\frac{1}{10}$ epha.	Hin = $\frac{1}{2}$ seah.
Cab = $\frac{1}{6}$ seah.	Log = $\frac{1}{12}$ hin.

Of these measures, the homer was equal in capacity to the kor, and the epha to the bath, while the seah was common to both scales. If, therefore, the bath or the seah was known there would be no difficulty in fixing the capacity of the other measures. But, unfortunately, there is considerable difference of opinion as to the capacity of the bath, and as a natural result the contents of all the measures vary, as given by different writers on the subject.

Neither in the Bible nor in the works of Josephus is there any accurate information, probably because both Josephus and the writers of the Sacred Books were well acquainted with the measures and did not realise the trouble that they would cause students many centuries later. Josephus, for example, states that a hin was equal to two Athenian choas, but this was probably only approximate, and as the Athenian choa is not very accurately known, it is not much help. What is required is an expression of the cubic content of a measure in terms of

linear measure, and then if the unit of linear measure was known the capacity could be calculated.

Fortunately there is an instance in the Old Testament where this was done, namely, as regards the brazen sea and the 10 lavers which Hiram made for King Solomon when the Temple of Jerusalem was built. Of these we have three accounts: in the First Book of Kings, the Second Book of Chronicles, and in the Eighth Book of Josephus's "Antiquities of the Jews." Indeed, there may be said to be five accounts, as the descriptions in the Septuagint do not quite agree with those in the Hebrew Version from which the English translations have been made, and the variations are of considerable help in throwing light upon the subject.

I am not aware that these descriptions have been much used in endeavouring to ascertain the exact values of the Jewish measures, but this may be due to the fact that there are apparent difficulties, due probably to mistakes in transcription, which make the matter seem more puzzling than it really is. That such mistakes should occur is only natural, as in all cases of copying from manuscript to manuscript.

I propose, therefore, first to quote the description of the vessels, as given by the different authors, then, by comparing the discrepancies, to try to ascertain the actual facts, and then from those facts to endeavour to calculate what was the actual capacity of the vessels. And I will begin with the accounts of the brazen sea, quoting from the Revised Version of the Bible, which is presumably the most accurate.

The Description of the Brazen Sea.

Revised Version.

1 Kings vii, 23. And he made the molten sea of 10 cubits, from brim to brim, round in compass, and the height thereof was 5 cubits, and a line of 30 cubits compassed it round about.

26. And it was a handbreadth thick, and the brim thereof was wrought like the brim of a cup, like the flower of a lily; it held 2,000 baths.

Septuagint.

1 Kings vii, 23. And he made the sea 10 cubits from the lip of it to the lip of it, made in a circle, and 5 cubits the height of it.

(N.B.—The content is not given.)

Revised Version.

2 Chron. iv, 2. And he made the molten sea of 10 cubits from brim to brim, round in compass, and the height of it was 5 cubits, and a line of 30 cubits compassed it about.

5. And it was a handbreadth thick, and the brim thereof was wrought like the brim of a cup, like the flower of a lily; it received and held 3,000 baths.

Septuagint.

2 Chron. iv, 2. And he made the molten sea of 10 cubits the diameter, disposed circlewise, and 5 cubits the height, and the circumference 30 cubits.

5. And the thickness of it a handbreadth, and the lip of it as the lip of a cup, formed like the flower of a lily, containing 3,000 measures (*μετρητὰς τρισχελίους*), and he completed it.

Josephus.

"Ant." VIII, iii, 5. And he made a brazen sea, constructed as a hemisphere (*εἰς ἡμισφαίριον εσχηματισμένην*), and the brazen vessel was called a sea on account of its largeness, for the laver was in diameter 10 cubits, and the thickness made of a handbreadth. . . . . And the sea contained 3,000 baths (*βάτους τρισχιλίους*).

The descriptions agree except as to the content of the vessel, which is given as containing 2,000 measures and also as containing 3,000 measures. At first sight the two contents, differing so greatly from one another, appear to offer a considerable difficulty, but there is an easy explication. From the accounts in the Bible it would not be possible to say whether the vessel was a hemisphere of 10 cubits diameter or a cylinder of 10 cubits diameter and 5 cubits height. In the latter case it would, of course, contain exactly half as much again as in the former case, *i.e.*, if the hemisphere contained 2,000 measures the cylinder of the same diameter and height would contain 3,000 measures. Josephus makes it clear that it was a hemisphere, but the scribe who wrote 3,000 probably calculated it as a cylinder.

I think, therefore, that we may safely assume that the vessel was a hemisphere, 10 cubits in diameter, and that it contained 2,000 measures. The cubical content was, therefore, equal to 261·799 solid cubits, and the capacity of $\frac{1}{2000}$ part of this was ·1309 solid cubit.

Before discussing what this measure represented it is necessary to consider the question of the capacity of the smaller lavers, of which there were 10, five on each side of the Temple. These were supported upon quadrangular bases with wheels underneath. The varying descriptions of the bases are of very considerable interest, but as they have no direct bearing upon the subject of the measures of capacity I need not refer to them further.

The Description of the Ten Lavers.

Revised Version.

1 Kings vii, 38. And he made 10 lavers of brass: one laver contained 40 baths, and every laver was 4 cubits, and upon every one of the 10 bases one laver.

Septuagint.

1 Kings vii, 38. And he made 10 brazen vessels; one vessel containing 40 measures (*τεσσαράκοντα χοεῖς*) measuring 4 cubits; one vessel upon one base of the 10 bases.

Revised Version.

2 Chron. iv, 6. He made also 10 lavers, and put five on the right hand and five on the left hand, to wash in them.

Septuagint.

2 Chron. iv, 6. And he made 10 lavers, and placed the five on the right and the five on the left, to wash in them the parts of the sacrifices.

(N.B.—There is no mention in Chronicles of the capacity of the 10 lavers.)

Josephus.

"Ant." VIII, iii, 6. And he constructed 10 round brass vessels, of which each contained 40 measures (*χυτρογάυλους δέκα λουτῆρας στρογγύλους χαλκοῦς ὧν ἕκαστος ἐχώρει τεσσαράκοντα χόας*). And the height was 4 cubits, and the rims had the same distance apart. And he placed these lavers on the 10 bases, which were called *Μεχενώθ*.

From these descriptions it is not quite easy to say what the forms of the lavers were. From the Bible accounts they might have been cylindrical, hemispherical, or quadrilateral, and, looking to Josephus, they might have been either of the former. The height, as given by him, is clearly excessive, and may possibly refer either to the height of the laver from the ground or from the bottom of the base. All that is certain is that each laver was 4 cubits across and contained 40 measures, translated in the English version as baths.

It is quite clear that the measure used for the lavers is not the same as that for the brazen sea, or that, assuming them to be the same, the number 2,000 is too large or 40 is too small. But it is worthy of note that, though in the English Bible the word "bath" is used for both, in the Septuagint and in Josephus different words are used for the measure of capacity of the sea and of the lavers, as will appear by reference to the quotation given above.

A cursory examination shows that the unit of measure of the lavers is about three times as great as that of the measure of the brazen sea, and this naturally leads us to remember that the first sub-multiple of the Hebrew measure translated "bath" was the "seah," which was one-third of the former. If, therefore, the measure of the sea, which we have already shown to be equal to ·1309 solid cubit, was the "seah," the capacity of the "bath," as derived from the same vessel, would be ·3927 solid cubit; 40 of such baths would be equal in capacity to ·3927 × 40, or 15·708 solid cubits.

Let us see now how this would compare with the probable contents of one of the smaller lavers.

A quadrilateral vessel, of which the length of each side was 4 cubits and the depth 1 cubit, would contain 16 solid cubits, and the fortieth part of this is ·4000 solid cubit.

A hemispherical vessel of 4 cubits diameter would contain 16·755 solid cubits, of which the fortieth part is ·4188 solid cubit.

A cylindrical vessel of 4 cubits diameter and $1\frac{1}{4}$ cubits in depth would contain 15·7183 solid cubits, of which the fortieth part is ·3929 solid cubit. The value for the bath as derived from this is almost exactly the same as that derived from the brazen sea, and leads one to think that the small lavers were cylindrical in form. As this, however, cannot be regarded as quite certain, and as the shape and size of the brazen sea leave no cause for doubt, it seems preferable to depend on the latter for the measure of capacity and to take the bath as being equal to ·3927 solid cubit.

The contents of the subdivisions of the bath would then be as follows:—

1 seah = $\frac{1}{3}$ bath = ·1309 solid cubit.
1 hin = $\frac{1}{2}$ seah = ·0654 ,,
1 log = $\frac{1}{12}$ hin = ·0054 ,,

These are the results as obtained from the description of the vessels in the Temple, but I do not think it would be desirable to adopt them as conclusive unless it can be shown that they are easily derivable from the linear cubit. That this is the case, however, the following considerations indicate:—

A cylindrical vessel, 1 cubit in diameter and half a cubit in depth, is equal in capacity to ·3927 solid cubit.

A cylindrical vessel, half a cubit in diameter and 4 palms in depth, is equal in capacity to ·1309 solid cubit.

A similar vessel, half a cubit in diameter and 2 palms in depth, is equal in capacity to ·0654 solid cubit.

A similar vessel, 1 palm in diameter and a quarter of a cubit in depth, is equal in capacity to ·0054 solid cubit.

It is evident, therefore, that the different measures, as based on the capacity of the brazen sea, are connected in a simple and probable manner with the length of the cubit.

In the considerations given above I have only dealt with the measures relatively to one another and to the length of the Jewish cubit, independently of what the latter was, as expressed in modern measure. The actual capacity of each I will now proceed to investigate.

In order to find what are the equivalents of the Jewish measure of capacity in English measures, it is necessary to know the value of the length of the cubit as compared with the latter. I have already given in the paper referred to above some reasons for considering that most probably the length was about 17·7 British inches.

Assuming this to be the case, the contents of a solid cubit was 5,545·233 cubic inches, and the capacity of each of the Jewish measures was as follows :—

1 bath or epha	=	2,177·613	cubic inches.
1 seah	=	725·871	„ „
1 hin	=	362·935	„ „
1 log	=	30·245	„ „

These results do not agree with some previous determinations, but I am not satisfied as to the value of the data upon which the latter are based. For example, in the table of measures given in Bagster's Bible the log is given as being equal to ·833 pint, which would make the bath equal to 59·976 pints or 2,073·17 cubic inches. This determination, however, appears to be based upon the statement by Josephus in the "Antiquities," Book iii, Chapter 8, that the hin was equal to two Athenian choas, and as the exact size of the latter is not very well fixed this cannot be regarded as quite satisfactory.

Colonel Conder, in his interesting "Handbook to the Bible," gives another determination of the Jewish measures of capacity, and arrives at the conclusion that the bath, or epha, was equal to 1,728 cubic British inches. This he derives from the fact that the capacity of the log is stated by the Rabbis to have been equal to the content of six hens' eggs, which he has found to average ·4 cubic inch each, thus making the log 24 cubic inches. But it appears to me rather doubtful whether this is altogether satisfactory, especially as, in the same article, he remarks that Maimonides, in his comments on the tract Peah, states that the contents of the log were equal to 4 digits by 4 digits by $2\frac{7}{10}$ digits, the digit being equal to the width of the thumb. As the ordinary digit, or finger-breadth, was probably equal to ·737 inch, the digit referred to by Maimonides must have been considerably larger, and the log must therefore have been more than 24 cubic inches.

If, however, the log is taken as 30·245 cubic inches, in accordance with the calculations already given, Maimonides's digit would be ·88 inch, or about 7 barleycorns, as opposed to 6 barleycorns, the equivalent of a fingerbreadth. It is probable, therefore, that the calculation made by Maimonides was fairly correct. If the log, as estimated by him, was not exactly equal to 30·245 cubic inches, it is more likely to have been a little greater rather than less.

On the whole, therefore, I see no reason to doubt the determination of 2,177·6 cubic inches as the approximate capacity of the bath.

It is somewhat remarkable, although it may be only a coincidence, that this value of the bath corresponds very nearly with the value of the British bushel.

The present standard bushel is equal to 2,218·19 cubic inches ; but this is slightly larger than the older British measures, which derived their origin from very ancient sources. The Winchester bushel, which existed

in the time of King Henry VII, measures 2,150·4 cubic inches, and this, without doubt, is a representative of much older measures.

The standard bushel, which dates only from 1824, was purposely made a little larger than the Winchester bushel, in order that the gallon, which is one-eighth of the bushel, should contain exactly 10 pounds weight of distilled water. It is the older measure, therefore, which must be taken into consideration when making comparisons with other ancient measures.

There is another curious point with reference to the comparison of the British measures with measures based upon the cubit, which is worthy of note. I am well aware of the danger of giving too much value to what may only be coincidences, but at the same time do not like passing over this point. The British standard measures are, as is well known, cylindrical in form, the height being equal to half the diameter of the cylinder. Now, if we take a cylinder of which the diameter is 2 cubits (of 17·7 inches), and the height 1 cubit, the content is

equal to	17,421·03	cubic inches.
Compare this with the standard quarter of 8 bushels	17,745·53	,,
And with the quarter of 8 Winchester bushels	17,201·60	,,
Again, a cylinder 1 cubit in diameter and $\frac{1}{2}$ cubit in height equals....	2,177·63	,,
The standard bushel equals	2,218·19	,,
The Winchester bushel equals	2,150·20	,,
A cylinder $\frac{1}{2}$ cubit in diameter and $\frac{1}{4}$ cubit in height equals	272·20	,,
Standard gallon equals	277·27	,,
Winchester gallon equals	272·25	,,
Lastly, a cylinder $\frac{1}{4}$ cubit in diameter and $\frac{1}{8}$ cubit in height equals....	34·02	,,
Standard pint equals	34·66	,,
Winchester pint equals	34·03	,,

Thus showing that the British measures are given by measures of standard forms based on the cubit, and following one another in the simplest possible way. On the other hand, they are *not* based on measures commensurate with the British foot or inch. For example, the standard bushel (according to the interesting work by Mr. H. J. Charny, entitled "Our Weights and Measures") is contained in a cylindrical measure of which the diameter is 17·80927948 inches and the height is 8·90463974 inches, which are rather inconvenient numbers for ordinary use.

I think, therefore, there is considerable probability that the British bushel is the modern representative of the Jewish bath, and this gives an indirect confirmation to the statement that the cubit was approximately 17·7 inches. For example, if we calculate the length of the cubit from

the Winchester gallon, we have the equation (x being the length of the cubit):—

$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{4} x^3 = \frac{272{\cdot}25}{{\cdot}7854}$$

$\therefore x = 17{\cdot}692$ inches.

This differs by a small fraction only from the length of the cubit as otherwise determined.

In conclusion, I will give a *résumé* of the scale of Jewish liquid measures as calculated:—

1 log	....	·873	standard pint.
12 logs = 1 hin	....	1·309	standard gallons.
24 logs = 2 hins = 1 seah	....	2·618	„ „
72 logs = 6 hins = 3 seahs = 1 bath	....	7·854	„ „

THE PROSPECT FROM PISGAH.

By Rev. W. F. Birch, M.A.

The panorama seen by Moses is thus described in Deut. xxxiv, 1-3:—And Moses went up from the steppes of Moab unto Mount Nebo, to the top (or head) of Pisgah, that is fronting Jericho. And Jehovah showed him all the land, (even) Gile'ad, as far as Dan, and all Naphtali, and the land of Ephraim and Manasseh, and all the land of Judah as far as the hinder sea, and the South, and the Round, (even) the plain of Jericho, the city of palm-trees, as far as Zo'ar ("Crit. Comm. Deut.," Prof. Driver).

The Hebrew word (עַד), so useful in locating the sepulchres of David (*Quarterly Statement*, 1883, p. 107; 1890, p. 206), and thrice translated in Deut. *unto*, Dr. Driver says "means distinctly *as far as*." It is needless, then, to prove it. Failure has apparently dogged all attempts to find a point on the east side of the Jordan or Dead Sea, from which all the tracts or spots named above may be seen in their respective positions. Accordingly, Professor Driver ("Deuteronomy," p. 419), observes:—"The panorama is superb, though the terms in Deut. xxxiv, 1-3, are hyperbolical, and must be taken as including points filled in by the imagination as well as those actually visible to the eye."

Let me lead a forlorn-hope to what I believe will prove to be the long-lost head of Pisgah.

To me it seems all but certain that the Biblical description is literally true; that imagination has no place in it, otherwise snowy Hermon or Lebanon, which Moses entreated to see (Deut. iii, 25), would surely have followed the mention of Gilead; and that the perplexity is due to taking