

RESULTS OF METEOROLOGICAL OBSERVATIONS TAKEN AT JERUSALEM IN THE YEAR 1898.

By JAMES GLAISHER, F.R.S.

THE numbers in column 1 of this table show the highest reading of the barometer in each month; of these the highest, as usual, are in the winter, and the lowest in the summer months; the maximum for the year was 27·795 inches, in January, and the next in order 27·731 inches, in December. The highest reading in the preceding 37 years, viz., 1861 to 1897 inclusive, was 27·816 inches, in December, 1879, and the next in order was 27·800 inches, in November, 1870; and these are the only two readings in the preceding 37 years that are higher than the maximum for this year.

In column 2 the lowest reading of the barometer in each month is shown; the minimum for the year was 26·860 inches, in March, and the next in order 27·153 inches, in August. The lowest reading in the preceding 37 years was 26·970 inches, in March, 1896.

The numbers in the 3rd column show the extreme range of readings in each month; the smallest was 0·137 inch, in June, and the next in order 0·181 inch, in July; the largest was 0·625 inch, in January, and the next in order 0·575 inch, in March. The mean monthly range for the year was 0·352 inch. The mean for the preceding 37 years was 0·311 inch.

The range of barometer readings in the year was 0·935 inch; this very large range was mostly due to the low reading in March. The largest range in the preceding 37 years was 0·755 inch, in 1897; and the smallest 0·491 inch, in 1883.

The numbers in the 4th column show the mean monthly pressure of the atmosphere; the highest was 27·529 inches, in January, and the next in order 27·486 inches, in December; the lowest was 27·264 inches, in July, and the next in order 27·286 inches, in August. The mean yearly pressure was 27·386 inches. The highest mean yearly pressure in the preceding 37 years was 27·442 inches, in 1863; and the lowest, 27·357 inches, in 1894. The mean yearly pressure for the 37 years was 27·390 inches.

The temperature of the air reached 90° on June 1st, and there were seven other days in June when the temperature reached or exceeded 90°. In the preceding 16 years the earliest day in the year the temperature was 90° was March 25th in the year 1888; in July it reached or exceeded 90° on one day; in August on one day; in September on one day; and in October on one day, the 23rd; this being the last day in the year the temperature was 90°. In the preceding 16 years the latest day in the year this temperature reached 90° was October 23rd, 1887. The temperature reached or exceeded 90° on 12 days during the year. In the year 1897 the number of days of this high temperature was 16, and in 1887 was 73; the average for the 16 years was 37. The

MONTHLY METEOROLOGICAL TABLE.

Deduced from observations taken at Jerusalem, by JOSEPH GAMEL, in a garden, well within the city, about 2,500 feet above the level of the Mediterranean Sea, open on all sides.

Latitude, 31° 46' 40" N., Longitude, 35° 13' 30" E.

Months.	Pressure of atmosphere—corrected to 32° Fahrenheit.				Temperature of the air.								9 a.m.							Wind.								Rain.								
	Highest.	Lowest.	Range.	Mean.	Highest.	Lowest.	Range.	Mean of all highest.	Mean of all lowest.	Mean daily range.	Mean.	Mean reading.			Vapour.				Weight of a cubic foot of air.	Relative proportions of.								Mean amount of cloud.	Number of days on which it fell.		Amount collected.					
												Dry bulb.	Wet bulb.	Dew point.	Elastic force of.	Weight in a cubic foot of air.	Additional weight required for saturation.	Degree of humidity.		N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.		in.	in.						
1898.	in.	in.	in.	in.	°	°	°	°	°	°	°	°	°	°	in.	grs.	grs.	°	grs.																	in.
January ...	27·795	27·170	0·625	27·529	55·0	25·0	30·0	46·6	35·6	11·0	41·1	42·5	39·4	35·6	·209	2·4	0·7	77	508	1	5	9	0	2	6	6	2	4·8	12	4·40						
February ...	27·565	27·177	0·388	27·402	64·5	29·0	35·5	54·1	41·7	12·4	47·9	48·4	43·5	38·1	·231	2·7	1·2	68	500	0	8	4	0	0	5	7	4	5·0	8	6·19						
March ...	27·435	26·860	0·575	27·290	77·0	35·0	42·0	59·6	45·8	18·8	52·7	54·3	49·1	44·1	·267	3·0	1·7	63	492	2	2	4	0	1	6	7	9	6·5	13	7·29						
April ...	27·581	27·175	0·356	27·408	86·0	39·0	47·0	71·7	52·8	18·9	62·2	64·5	53·8	45·1	·298	3·3	3·4	49	484	1	8	4	3	0	0	7	7	4·5	2	0·35						
May ...	27·450	27·206	0·244	27·352	89·8	49·0	40·8	77·3	56·3	21·0	66·8	70·2	57·9	48·5	·341	3·7	4·3	46	478	2	4	4	4	1	5	2	9	2·4	0	0·00						
June ...	27·406	27·269	0·137	27·327	98·5	54·0	44·5	84·6	63·4	21·2	74·0	77·3	67·9	61·3	·544	5·8	4·6	57	470	6	6	3	2	1	1	3	8	0·9	0	0·00						
July ...	27·361	27·180	0·181	27·264	93·0	61·0	32·0	84·7	64·6	20·1	74·6	77·3	70·0	64·9	·616	6·6	3·4	66	468	1	0	0	1	0	3	9	17	1·1	0	0·00						
August ...	27·381	27·153	0·228	27·286	90·5	60·0	30·5	83·7	62·8	20·9	73·8	74·9	67·9	62·8	·565	6·2	3·2	66	471	1	0	0	0	0	0	17	13	1·8	0	0·00						
September ...	27·538	27·256	0·282	27·368	92·0	56·0	36·0	82·7	61·2	21·5	71·9	73·8	64·9	58·4	·483	5·3	3·7	59	474	4	2	1	0	0	1	6	16	0·8	0	0·00						
October ...	27·569	27·328	0·241	27·454	90·0	54·0	36·0	83·6	64·3	19·3	74·0	76·9	63·3	53·8	·416	4·5	5·5	45	473	1	4	8	0	2	0	6	10	1·4	0	0·00						
November ...	27·715	27·291	0·424	27·473	83·8	42·0	41·8	66·7	54·1	12·6	60·4	61·7	54·0	47·3	·327	3·6	2·5	59	488	0	9	7	1	0	4	2	7	5·0	13	3·83						
December ...	27·731	27·184	0·547	27·486	73·0	31·0	42·0	55·7	43·5	12·2	49·6	51·0	47·1	42·7	·275	3·1	1·1	74	498	0	11	6	0	1	5	4	4	4·4	11	6·60						
Means ...	27·540	27·188	0·352	27·386	82·8	44·6	38·2	70·9	53·8	17·1	62·4	64·4	56·6	50·2	·381	4·2	2·9	61	484	sum. 19	sum. 59	sum. 50	sum. 11	sum. 8	sum. 36	sum. 76	sum. 106	mean. 3·2	sum. 59	sum. 28·66						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30						

highest temperature in the year was $98^{\circ}5$, on June 19th; the highest in the preceding 16 years, viz., 1882 to 1897, was 108° , in June, 1894.

The temperature of the year was as low or lower than 40° in January on 27 nights; in February on 13 nights; in March on 9 nights; in April on 1 night; and in December on 6 nights. Thus the temperature was as low or lower than 40° on 56 nights during the year. In the year 1892 the number of nights of this low temperature was 19, and in 1894 was 113; the average of the 16 years was 55. The lowest temperature in the year was 25° on January 1st. The lowest in the preceding 16 years was 25° , on December 31st, 1897.

The highest temperature of the air in each month is shown in column 5. In January it was 55° , and $5^{\circ}5$ below the mean of the 16 high day temperatures in January. The high day temperature was also below its average in February, March, May, July, August, September, and October; and above in the remaining months. The mean for the year was $82^{\circ}8$, being $1^{\circ}0$ below the average of 16 years.

The lowest temperature of the air in each month is shown in column 6. In January it was 25° , being the lowest in the year, and $6^{\circ}6$ below the average of the 16 low night temperatures in January. The low night temperature was also below its average in February, April, and December; and above in the remaining months. The mean for the year was $44^{\circ}6$, being $0^{\circ}2$ above the average of 16 years.

The range of temperature in each month is shown in column 7; the numbers vary from 30° in January to 47° in April. The mean range for the year was $38^{\circ}2$, being $1^{\circ}2$ less than the average of 16 years.

The range of temperature in the year was $73^{\circ}5$. The largest in the preceding 16 years was 81° , in 1894; and the smallest, $63^{\circ}5$, in the year 1885.

The mean of all the high day temperatures in each month is shown in column 8. The lowest was $46^{\circ}6$, in January, being $4^{\circ}5$ lower than the average. The highest was $84^{\circ}7$, in July, being $3^{\circ}0$ lower than the average. The mean for the year was $70^{\circ}9$, or $1^{\circ}1$ below the average of 16 years.

The mean of all the low night temperatures in each month is shown in column 9. The lowest was $35^{\circ}6$, in January, being $2^{\circ}8$ lower than the average; the highest was $64^{\circ}6$, in July, being $0^{\circ}2$ higher than the average. The mean for the year was $53^{\circ}8$, or $1^{\circ}4$ above the average of 16 years.

In column 10 the mean daily range of temperature in each month is shown; the smallest was 11° , in January, and the next in order $12^{\circ}2$, in December; the greatest was $21^{\circ}5$, in September, and the next in order $21^{\circ}2$, in June. The mean for the year was $17^{\circ}1$, being $2^{\circ}5$ less than the average. The smallest ranges in the preceding 16 years were $9^{\circ}3$, in January, 1883, and $9^{\circ}4$, in December, 1897; the greatest were $33^{\circ}8$, in August, 1886, and $30^{\circ}1$, in August, 1887. The smallest mean for the year was $16^{\circ}4$, in 1897, and the greatest $24^{\circ}3$, in 1886.

The mean temperature of the air, as found from the mean of the

maximum and minimum temperatures only, is shown in each month in column 11; the lowest was $41^{\circ}1$, in January, and the next in order $47^{\circ}9$, in February, and $49^{\circ}6$, in December; the highest was $74^{\circ}6$, in July, and the next in order $74^{\circ}0$, in both June and October. The mean for the year was $62^{\circ}4$, being $0^{\circ}2$ above the average of 16 years. The lowest mean temperatures in the preceding 16 years were $39^{\circ}8$, in January, 1890, and $42^{\circ}3$, in January, 1894; the highest were $81^{\circ}2$, in August, 1890, and $81^{\circ}1$, in July, 1888. The highest mean for the year was $63^{\circ}5$, in 1892, and the lowest 60° , in 1894. January was the coldest month of the year, and was below its average both by day and night.

The numbers in column 12 are the mean readings of a dry-bulb thermometer. If those in column 12 be compared with those in column 11 it will be seen that those in column 12 are a little higher in every month, the difference of the means for the year being $2^{\circ}0$; the mean difference between the mean temperature of the air and that at 9 a.m. for the 16 years was $3^{\circ}3$.

For a few days in the winter months the dry and wet-bulb thermometers read alike, or nearly so, but in the months of April, May, June, September, and October the difference between the readings often exceeded 15° , and was as large as 24° on June 14th.

In column 13 the mean monthly readings of the wet-bulb are shown; the smallest differences between these and those of the dry-bulb were $3^{\circ}1$ in January, and $3^{\circ}9$ in December; the largest were $13^{\circ}6$ in October, and $12^{\circ}3$ in May. The mean for the year was $56^{\circ}6$, and that of the dry-bulb $64^{\circ}4$.

The numbers in column 14 are the mean temperature of the dew-point, or that temperature at which the air would be saturated by the quantity of vapour mixed with it; the smallest difference between these numbers and those in column 12 were $6^{\circ}9$, in January, and $8^{\circ}3$ in December; and the largest were $23^{\circ}1$, in October, and $21^{\circ}7$ in May. The mean temperature of the dew-point was $50^{\circ}2$; the mean for the 16 years was $50^{\circ}1$.

The numbers in column 15 show the elastic force of vapour, or the length of a column of mercury in inches corresponding to the pressure of vapour; the smallest was $0\cdot209$ inch, in January; and the largest $0\cdot616$ inch, in July. The mean for the year was $0\cdot381$ inch; the average of the 16 years was $0\cdot375$ inch.

In column 16 the weight in grains of the water present in a cubic foot of air is shown; it was as small as $2\cdot4$ grains in January, and as large as $6\cdot6$ grains in July. The mean for the year was $4\cdot2$ grains; the average of the 16 years was $4\cdot1$ grains.

In column 17 the additional quantity of water required to saturate a cubic foot of air is shown; it was as small as $0\cdot7$ grain in January, and as large as $5\cdot5$ grains in October. The mean for the year was $2\cdot9$ grains; the average of the 16 years was $3\cdot3$ grains.

The numbers in column 18 show the degree of humidity, saturation being represented by 100; the largest numbers appear in January and

December, and the smallest in April, May, and October; the smallest of all is 45 in October. The mean for the year was 61; that of the 16 years was 59.

The numbers in column 19 show the weight in grains of a cubic foot of air, under its mean atmospheric pressure, temperature and humidity. The largest number was 508 grains in January, and the smallest 468 grains in July. The mean for the year was 484 grains; that of the 16 years was 482 grains.

The most prevalent winds in January were E., S.W., and W., and the least prevalent wind was S.E.; the most prevalent in February were N.E. and W., and the least were N., S.E., and S.; the most prevalent in March were N.W. and W., and the least was S.E.; the most prevalent in April were N.E., W., and N.W., and the least were S. and S.W.; the most prevalent in May was N.W., and the least was S.; the most prevalent in June were N.W., N., and N.E., and the least were S. and S.W.; the most prevalent in July were N.W. and W., and the least were N.E., E., and S.E.; the most prevalent in August were W. and N.W., and the least were N.E., E., S.E., S., and S.W.; the most prevalent in September was N.W., and the least were S.E. and S.; the most prevalent in October were N.W. and E., and the least were S.E. and S.W.; the most prevalent in November were N.E., E., and N.W., and the least were N. and S.; and the most prevalent in December was N.E., and the least were N. and S.E. The most prevalent wind in the year was N.W., which occurred on 106 times, of which 17 were in July, 16 in September, and 13 in August; and the least prevalent wind was S., which occurred on only 8 times during the year, of which 2 were in both January and October, and 1 in each of the months of March, May, June, and December.

The total number of times of each wind are shown in the last line of columns 20 to 27; those winds less in number than the average of the preceding 16 years were:—

N.	by	7
S.E.	„	13
S.	„	1
S.W.	„	17
N.W.	„	11

and those winds greater in number than the average of 16 years were:—

N.E.	by	18
E.	„	21
W.	„	10

The numbers in column 28 show the mean amount of cloud in each month; the month with the smallest amount is September, and the largest March. Of the cumulus or fine weather cloud, there were 4 instances; of the nimbus or rain cloud 31 instances, of which 9 were in March and 6 in January; of the cirrus there were 4 instances; of the stratus 3 instances; of the cirro cumulus 60 instances; of the cumulus stratus 47 instances; of the cirro stratus 28 instances; and 188 instances

of cloudless skies, of which 26 were in September, 24 in October, and 23 in both June and July, and only 4 in March.

The largest fall of rain for the month in the year was 7·29 inches, in March, of which 2·50 inches fell on the 20th and 1·33 inch on the 10th. The next largest fall for the month was 6·60 inches, in December, of which 2·53 inches fell on the 26th, 1·97 inch on the 25th, and 1·18 inch on the 15th. No rain fell from April 9th till November 3rd, making a period of 207 consecutive days without rain. The total fall of rain for the year was 28·66 inches, being 2·42 inches above the average of 37 years, viz., 1861 to 1897. The number of days on which rain fell was 59, being 3 more than the average.

RESULTS OF METEOROLOGICAL OBSERVATIONS TAKEN AT TIBERIAS IN THE YEAR 1898.

By JAMES GLAISHER, F.R.S.

THE numbers in column 1 of this table show the highest reading of the barometer in each month; the highest appear in the winter, and the lowest in the summer months; the maximum for the year was 31·214 inches, in January, and the next in order 31·103 inches, in December.

In column 2 the lowest reading in each month is shown; the minimum for the year was 30·126 inches, in March, and the next in order 30·192 inches, in August.

The range of readings in the year was 1·088 inch, being 0·153 inch greater than the range at Jerusalem; both the maximum and minimum readings of the barometer at Tiberias occurred in the morning observations.

The numbers in the 3rd column show the extreme range of readings in each month; the smallest was 0·309 inch, in June, and the next in order 0·350 inch, in August; the largest was 0·800 inch, in January, and the next in order 0·686 inch, in December.

The numbers in columns 4 and 5 show the mean monthly reading of the barometer at 8 a.m. and 4 p.m., and those in column 6 the lower reading at 4 p.m. than at 8 p.m.; the smallest difference between these two readings was 0·051 inch, in March, and the next in order 0·062 inch, in February; the largest was 0·163 inch, in October, and the next in order 0·098 inch, in July. In England, in January, the readings at 8 a.m. and 4 p.m. are practically the same; in all other months the reading at 4 p.m. is lower than at 8 a.m.; the greatest difference is 0·025 inch, in June. The mean for the year at Tiberias was 0·082 inch, being about four times greater than in England.

The numbers in the 7th column show the mean monthly pressure of the atmosphere; the highest was 30·896 inches, in January, and the next in order 30·784 inches, in December; the lowest was 30·360 inches,