

## RESULTS OF METEOROLOGICAL OBSERVATIONS TAKEN AT JERUSALEM IN THE YEAR 1893.

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 27·668 inches, in November, and the next in order, 27·612 inches, in March. The highest reading in the preceding 32 years, viz., 1861 to 1892 inclusive, was 27·816 inches, in December, 1879.

In column 2 the lowest reading in each month is shown; the minimum for the year was 27·026 inches, in December, and the next in order, 27·060 inches, in March. The lowest in the preceding 32 years was 26·972 inches, in April, 1863, and February, 1865.

The range of readings in the year was 0·642 inch. The largest range in the preceding 32 years was 0·742 inch, in 1876; and the smallest, 0·491 inch, in 1883.

The numbers in the 3rd column show the extreme range of readings in each month; the smallest, 0·129 inch, was in July, the next in order, 0·137 inch, in September; and the largest, 0·557 inch, in December, and the next in order, 0·552 inch, in March. The mean monthly range for the year was 0·319 inch. The mean for the preceding 32 years was 0·309 inch.

The numbers in the 4th column show the mean monthly pressure of the atmosphere; the highest was 27·515 inches, in November, and the next in order, 27·434 inches, in June; the lowest was 27·239 inches, in July, and the next in order, 27·298 inches, in January. The mean yearly pressure was 27·361 inches. The highest mean yearly pressure in the preceding 32 years was 27·443 inches, in 1861, and the lowest, 27·358 inches, in 1892. The mean for the 32 years was 27·391 inches.

The temperature of the air reached 90° on May 27th, which was the only day in May of a temperature so high as 90° (in the preceding 11 years, the earliest day in the year on which the temperature was 90° was March 25th in the year 1888); in June it reached or exceeded 90° on one day; in July, 17 days; in August, 7 days; and in September, 4 days, the 30th being the last day in the year of a temperature as high as 90°. In the preceding 11 years the latest day in the year the temperature reached 90° was October 23rd in the year 1887. The temperature reached or exceeded 90° on 30 days during the year. In the year 1892 the number of days of this high temperature was 23, and in 1887 was 73; the average of the 11 years was 41. The highest temperature in the year was 104°·5 on July 19th. The highest in the preceding 11 years, 1882 to 1892, was 106°, in July, 1888.

The temperature of the air was as low as 27°·5 on December 23rd, and on 4 other nights in this month was at or below 32°, and as low or below

## 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 in month— Corrected to 32° Fahrenheit.				Temperature of the air in month at 9 a.m.							Mean reading at 9 a.m.			Vapour at 9 a.m.			Degree of humidity.	Weight of a cubic foot of air.	Wind. Relative proportions of.								Mean amount of cloud.	Rain.						
	Highest.	Lowest.	Range.	Mean.	Highest.	Lowest.	Range.	Mean of all highest.	Mean of all lowest.	Mean daily range.	Mean.	Dry bulb.	Wet bulb.	Dew point.	Elastic force of vapour.	Weight in a cubic foot of air.	Additional weight required for saturation.			N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.		Number of days on which it fell.	Amount collected.					
1893.	in.	in.	in.	in.	°	°	°	°	°	°	°	°	°	°	in.	grs.	grs.	°	grs.																in.
January ...	27·538	27·102	0·436	27·298	65·5	30·0	35·5	52·4	40·6	11·8	46·5	48·0	44·5	40·7	·253	2·9	0·9	76	498	0	0	0	5	2	14	4	6	5·3	12	7·54					
February ...	27·569	27·279	0·290	27·347	68·8	28·0	40·8	53·0	39·6	13·4	46·3	48·5	44·0	39·1	·239	2·7	1·1	70	499	1	3	1	1	1	7	6	8	4·1	9	2·12					
March ...	27·612	27·060	0·552	27·330	77·0	31·0	46·0	60·5	41·7	18·8	51·1	51·3	46·5	41·5	·263	3·0	1·3	79	495	0	3	3	1	1	10	5	8	6·4	15	12·35					
April ...	27·531	27·162	0·369	27·378	78·0	40·0	38·0	64·9	46·7	18·2	55·8	59·1	51·4	44·6	·294	3·3	2·3	59	499	1	2	5	0	0	10	3	9	5·3	5	0·93					
May ...	27·449	27·093	0·356	27·341	90·8	46·0	44·8	77·0	55·4	21·6	66·2	70·9	59·6	51·0	·374	4·1	4·2	49	477	0	4	3	2	2	10	8	3·3	1	0·06						
June ...	27·480	27·195	0·285	27·434	90·8	53·5	37·3	83·7	67·0	16·7	75·4	78·4	63·1	52·5	·396	4·3	6·1	41	472	6	2	1	0	0	1	7	12	0·7	0	0·00					
July ...	27·296	27·167	0·129	27·239	104·5	60·0	44·5	90·8	67·9	22·9	79·3	83·8	66·9	55·6	·444	4·7	7·6	38	463	3	4	0	0	0	0	5	19	0·9	0	0·00					
August ...	27·420	27·220	0·200	27·309	99·0	56·0	43·0	86·9	61·1	25·8	74·0	78·9	66·0	57·2	·468	5·0	5·6	47	468	3	1	0	0	0	1	9	17	0·5	0	0·00					
September ...	27·402	27·265	0·137	27·334	95·5	52·0	43·5	83·5	57·9	25·6	70·7	76·5	64·5	56·0	·451	4·9	4·9	49	471	4	3	0	0	0	3	3	17	1·6	0	0·00					
October ...	27·556	27·313	0·243	27·416	89·0	47·0	42·0	78·2	53·6	24·6	65·9	71·6	62·8	56·3	·451	4·9	3·5	53	477	4	1	0	2	0	1	8	15	2·7	3	0·11					
November ...	27·668	27·393	0·275	27·515	77·0	45·0	32·0	71·2	50·2	21·0	60·7	66·5	58·9	52·8	·399	4·4	2·7	62	484	3	11	2	0	0	0	2	12	4·1	2	0·00					
December ...	27·583	27·026	0·557	27·389	68·0	27·5	40·5	55·6	39·3	16·2	47·5	51·0	46·7	42·2	·270	3·1	1·2	72	497	0	8	6	1	1	11	2	3	6·7	15	6·83					
Means ...	27·509	27·190	0·319	27·361	83·7	43·0	40·7	71·5	51·8	19·7	61·7	65·4	56·2	49·1	·359	4·0	3·4	58	482	sum. 25	sum. 42	sum. 21	sum. 12	sum. 7	sum. 60	sum. 64	sum. 134	3·5	sum. 62	sum. 30·54					
	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					

40° on 12 other nights. In January it was at or below 32° on 2 nights, and as low or below 40° on 14 other nights; in February it was 28° on the 3rd, and as low or below 40° on 18 other nights; in March at or below 32° on 4 nights, and as low or below 40° on 9 other nights; and in April, on the 9th it was 40°. Thus the temperature was as low or lower than 40° on 65 nights during the year. In the year 1892 the number of nights of this low temperature was 19, and in 1886 was 97; the average for the 11 years was 49. The lowest temperature in the preceding 11 years was 26°·5, in January, 1890.

The highest temperature of the air in each month is shown in column 5; in January it was 65°·5, being 4°·9 above the mean of the 11 high day temperatures in January. The high day temperature was above its average in February, July, August, November, and December, and below in all other months. The mean for the year was 83°·7, being 0°·3 below the average of 11 years. The highest in the year was 104°·5, in July.

The lowest temperature of the air in each month is shown in column 6; in December it was 27°·5, being 6°·4 below the average of 11 years; in February it was 28°·0, being 6°·2 below the average; it was above the average in the months from May to July, and in November, and below in all other months. The mean for the year was 43°·0, being 1°·8 below the average of 11 years.

The range of temperature in each month is shown in column 7; the numbers vary from 32°·0 in November to 46°·0 in March. In the months of January, February, and December the ranges were large, owing to the high high day temperature, and the low low night temperature, being 7°·0, 8°·2, and 7°·6 respectively larger than its average. The mean range for the year was 40°·7, being 1°·5 larger than the average of 11 years.

The range of temperature in the year was 77°·0. The largest in the preceding 11 years was 76°·5, in each of the years 1884, 1886, and 1888, and the smallest, 63°·5, in 1885.

The mean of all the high day temperatures in each month is shown in column 8. The lowest was 52°·4 in January, being 1°·6 higher than the average. The highest was 90°·8, in July, being 3°·1 above the average, and the next in order 86°·9, in August. The mean for the year was 71°·5, being 0°·8 below the average of 11 years.

The mean of all the low night temperatures in each month is shown in column 9. The lowest was 39°·3, in December, being 3°·3 lower than the average. The highest was 67°·9, in July, being 3°·7 higher than the average. The mean for the year was 51°·8, or 0°·8 below the average of 11 years.

In column 10 the mean daily range of temperature in each month is shown; the smallest was 11°·8, in January, and the next in order, 13°·4, in February; the greatest was 25°·8, in August, and the next in order 25°·6, in September. The mean for the year was 19°·7, being 0°·1 greater than the average. The smallest ranges in the preceding 11 years were

9°·3, in January, 1883, and 9°·7, in December, 1890; the greatest were 33°·8, in August, 1886, and 30°·1, in the same month of 1887. The smallest mean for the year was 17°·8 in 1883, and the greatest, 24°·3, in 1886.

The mean temperature of the air, as found from the maximum and minimum temperatures only, is shown in each month in column 11; the lowest was 46°·3, in February; and the next in order 46°·5, in January; the highest was 79°·3, in July, and the next in order 75°·4, in June. The mean for the year was 61°·7, being 0°·8 below the average of 11 years. The lowest mean temperatures in the preceding 11 years were 39°·8, in January, 1890, and 42°·0, in December, 1886; the highest were 81°·2, in August, 1890, and 81°·1, in July, 1888. The highest mean for the year was 63°·7, in 1885, and the lowest, 60°·1, in 1886.

February was the coldest month of the year, by reference to columns 5 and 6 it will be seen that the temperature was above its average by day, but greatly below by night; the nights in the months of May, June, July, and November were warm; but were cold and below the average in the remaining 8 months, being particularly so in February and December.

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 3°·7. The mean difference between the mean temperature and that at 9 a.m. for the 11 years was 3°·2.

For a few days in the winter months the dry and wet-bulb thermometers read alike, or nearly so, but in the months from May to October the difference between the readings often exceeded 20°, and was as large as 29°·8 on May 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°·5, in January, and 4°·3, in December; the largest were 16°·9, in July, and 15°·3, in June. The mean for the year was 56°·2, and that of the dry 65°·4; the mean difference was 9°·2.

The numbers in column 14 are the temperature of the dew-point, or that of the temperature at which the air would be saturated by the quantity of vapour mixed with it; the smallest differences between these numbers and those in column 12, were 7°·3, in January, and 8°·8 in December; and the largest 28°·2, in July, and 25°·9 in June. The mean temperature of the dew-point for the year was 49°·1; the mean for 11 years was 50°·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 0·239 inch, in February, and the largest, 0·468 inch, in August. The mean for the year was 0·359 inch; the average of 11 years was 0·374 inch.

In column 16 the weight in grains of the water in a cubic foot of air is shown; it was a little more than 2½ grains in February, and as large

as 5 grains in August. The mean for the year was 4.0 grains; the average of 11 years was 4.1 grains.

In column 17 the additional quantity of water required to saturate a cubic foot of air is shown; it was less than one grain in January, and more than  $7\frac{1}{2}$  grains in July. The mean for the year was 3.4 grains; the average of 11 years was 3.4 grains.

The numbers in column 18 show the degree of humidity of the air, saturation being represented by 100; the largest numbers appear in January, February, March, November, and December; and the smallest from April to October; the smallest of all was 38 in July. The mean for the year was 58; that of the 11 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 in February, decreasing month by month to the smallest in July, then increasing to December. The mean for the year was 482 grains; that of the 11 years was 482 grains.

The most prevalent wind in January was S.W., and the least prevalent winds were N., N.E., and E.; in February the most prevalent winds were N.W., S.W., and W., and the least were N., E., S.E., and S.; in March the most prevalent were S.W. and N.W., and the least was N.; in April the most prevalent were S.W. and N.W., and the least were S.E. and S.; in May the most prevalent winds were W. and N.W., and the least was N.; in June and July the most prevalent was N.W., and the least prevalent were E., S.E., S. and S.W.; in August and September the most prevalent was N.W., and the least were E., S.E., and S.; in October the most prevalent was N.W., and the least were E. and S.; in November the most prevalent were N.E. and N.W., and the least were S.E., S., and S.W.; and in December the most prevalent winds were S.W. and N.E., and the least prevalent wind was N. The most prevalent wind for the year was N.W., which occurred on 134 times, of which 19 were in July and 17 in both August and September, and the least prevalent wind was S., which occurred on only 7 times during the year, of which 2 were in both January and May, and one in each of the months of February, March, 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 11 years were—

N.	by	5
E.	„	10
S.E.	„	16
S.	„	4
W.	„	3

and those winds greater in number than the average of 11 years were—

N.E.	by	4
S.W.	„	9
N.W.	„	26

The numbers in column 28 show the mean amount of cloud in each month; the month with the smallest amount was August, 0·5, and the largest December, 6·7. Of the cumulus or fine weather cloud there were only 2 instances; of the nimbus or rain cloud there were 27 instances, of which 9 were in March and 8 in December, and only 3 instances from April to November; of the cirrus there were 13 instances; of the cirro cumulus 81 instances; of the cirro stratus 16 instances; of the cumulus stratus 72 instances; and 154 instances of cloudless skies, of which 26 were in June, 24 in July, and 22 in August, and only 3 instances in December.

The largest fall of rain for the month in the year was 12·35 inches, in March, of which 3·37 inches fell on the 24th, and 3·06 inches on the 23rd. The next largest fall for the month was 7·54 inches, in January, of which 2·25 inches fell on the 26th, and 1·46 inch on the 27th. No rain fell from May 17th till October 10th, making a period of 145 consecutive days without rain. The total fall of rain for the year was 30·54 inches, being 5·31 inches above the average for 32 years, viz., 1861 to 1892. The number of days on which rain fell was 62, being 7 more than the average.

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## RESULTS OF METEOROLOGICAL OBSERVATIONS TAKEN AT TIBERIAS IN THE YEAR 1893.

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 31·220 inches, in November, and the next in order 31·084 inches, in January.

In column 2 the lowest reading in each month is shown; the minimum for the year was 30·226 inches, in August; and the next in order 30·247 inches, in July.

The range of readings in the year was 0·994 inch. The range in the morning observations was 0·875 inch, being 0·233 inch greater than the range at Jerusalem.

The numbers in the 3rd column show the extreme range of readings in each month; the smallest was 0·291 inch, in July, and the next in order 0·357 inch, in September; the largest was 0·710 inch, in November, and the next in order 0·696 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 a.m.; the smallest difference between these two readings was 0·032 inch, in January, and the next in order 0·060 inch, in December; the largest was 0·110 inch, in November, and the next