RESULTS OF METEOROLOGICAL OBSERVATIONS TAKEN AT TIBERIAS IN THE YEAR 1899.

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 31·082 inches, in January, and the next in order 30·935 inches, in November.

In column 2 the lowest reading in each month is shown; the minimum for the year was 30·260 inches, in August, and the next in order 30·292 inches, in June.

The range of readings in the year was 0·822 inch. The range in the morning observations was 0·748 inch, being 0·210 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 0·174 inch, in July, and the next in order 0·304 inch, in September; the largest was 0·626 inch, in January, and the next in order 0·490 inch, in November.

The numbers in columns 4 and 5 show the mean monthly reading of the barometer at 8 a.m. and 4 p.m., and in column 6 the lower reading at 4 p.m. than at 8 a.m.; the smallest difference between these two readings was 0·048 inch, in December, and the next in order 0·058 inch, in February; the largest was 0·100 inch, in May, and the next in order 0·094 inch, in September. 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 0·076 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 30·772 inches, in January, and the next in order 30·721 inches, in November; the lowest was 30·407 inches, in July, and the next in order 30·427 inches, in August. The mean for the year was 30·595 inches.

The highest temperature of the air in each month is shown in column 8. The first day in the year the temperature reached 90°

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MONTHLY METEOROLOGICAL TABLE.

Deduced from observations taken at Tiberias, under the direction of Dr. TORRANCE, at about 652 feet below the level of the Mediterranean, and 30 feet above the level of the Sea of Galilee, open on all sides.
Latitude, 32° 48′ N.; Longitude, 35° 34′ E.

Months.	Pressure of atmosphere—corrected to 32° Fahrenheit.							Temperature of the air.							8 a.m.								4 p.m.								Rain.	
															Mean reading.			Vapour.					Mean reading.			Vapour.						
	Highest.	Lowest.	Range.	Mean at 8 a.m.	Mean at 4 p.m.	Lower reading at 4 p.m. than at 8 a.m.	Mean at 8 a.m. and 4 p.m.	Highest.	Lowest.	Range.	Mean of all highest.	Mean of all lowest.	Mean daily range.	Mean.	Dry bulb.	Wet bulb.	Dew point.	Elastic force of.	Weight in a cubic foot of air.	Additional weight required for saturation.	Degree of humidity.	Weight of a cubic foot of air.	Dry bulb.	Wet bulb.	Dew point.	Elastic force of.	Weight in a cubic foot of air.	Additional weight required for saturation.	Degree of humidity.	Weight of a cubic foot of air.	Number of days on which rain fell.	Amount collected.
1899.	in.	in.	in.	in.	in.	in.	in.	°	°	°	°	°	°	°	°	°	°	in.	grs.	grs.	°	grs.	°	°	°	in.	grs.	grs.	°	grs.		in.
January	31·082	30·456	0·626	30·802	30·742	0·060	30·772	70·0	40·0	30·0	63·4	43·6	19·8	53·5	56·5	50·6	45·1	·302	3·4	1·7	66	552	59·5	53·8	48·8	·345	3·9	1·8	68	548	11	4·16
February	30·898	30·420	0·478	30·712	30·654	0·058	30·683	79·0	37·0	42·0	67·9	46·4	21·5	57·2	59·6	54·5	50·0	·361	4·0	1·7	71	547	64·0	56·7	50·7	·368	4·1	2·5	62	541	11	2·55
March	30·887	30·420	0·467	30·710	30·636	0·074	30·673	97·0	45·0	52·0	73·5	55·9	17·6	64·7	65·2	56·5	49·4	·352	3·9	3·0	56	541	70·8	59·3	50·5	·368	4·0	4·2	49	534	5	1·61
April	30·823	30·444	0·379	30·646	30·563	0·083	30·604	99·0	50·0	49·0	82·5	60·0	22·5	71·2	71·5	62·2	55·2	·437	4·7	3·7	56	533	79·2	63·5	52·7	·399	4·3	6·4	40	524	4	0·78
May	30·693	30·327	0·366	30·575	30·475	0·100	30·525	109·0	59·0	50·0	94·6	68·5	26·1	81·5	79·8	67·7	59·5	·505	5·4	5·5	50	524	90·1	68·6	55·1	·435	4·6	10·3	31	511	1	0·07
June	30·649	30·292	0·357	30·509	30·430	0·079	30·470	114·0	67·0	47·0	97·5	73·6	23·9	85·5	84·4	72·2	64·2	·601	6·3	6·2	50	517	91·3	70·4	57·5	·472	4·9	10·5	33	500	0	0·00
July	30·548	30·374	0·174	30·442	30·373	0·069	30·407	105·0	73·0	32·0	99·8	75·6	24·2	87·7	85·8	74·9	67·8	·681	7·2	5·9	55	514	93·8	73·6	61·4	·544	5·6	11·0	34	506	0	0·00
August	30·590	30·260	0·330	30·468	30·386	0·082	30·427	103·0	75·0	28·0	98·9	77·2	21·7	88·1	86·6	75·5	68·3	·694	7·3	6·2	55	514	93·8	74·9	63·4	·584	6·1	10·5	36	507	0	0·00
September	30·668	30·364	0·304	30·568	30·474	0·094	30·531	104·0	73·0	31·0	97·0	75·5	21·5	86·2	86·0	74·3	66·7	·654	6·9	6·3	53	516	92·1	73·4	61·9	·553	5·8	9·9	37	509	0	0·00
October	30·842	30·482	0·360	30·662	30·580	0·082	30·621	102·0	61·0	41·0	88·7	71·8	16·9	80·2	79·7	67·7	59·5	·508	5·4	5·4	50	525	85·3	68·5	57·5	·476	5·0	7·9	38	518	2	0·38
November	30·935	30·445	0·490	30·761	30·681	0·080	30·721	90·0	51·0	39·0	77·5	62·5	15·0	70·0	69·5	58·8	50·5	·369	4·1	3·9	51	536	74·2	62·4	53·8	·417	4·5	4·7	49	531	4	0·91
December	30·929	30·503	0·426	30·734	30·686	0·048	30·710	80·0	45·0	35·0	68·3	54·2	14·1	61·2	61·1	53·4	46·7	·319	3·6	2·4	59	546	64·2	55·7	48·9	·342	3·8	2·9	57	542	13	6·64
Means	30·795	30·399	0·396	30·632	30·557	0·076	30·595	96·0	56·3	39·7	84·1	63·7	20·4	73·9	73·8	64·0	56·9	·482	5·2	4·3	56	530	79·9	65·1	55·2	·442	4·7	6·9	45	523	sum. 51	sum. 17·10
	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	31	32

was on March 25th, and there was one other day in March on which the temperature reached or exceeded 90°; in April on 11 days; in May on 22 days; in June, July, and August it reached or exceeded 90° on every day; in September on 28 days; in October on 11 days; and in November on two days; thus the temperature reached or exceeded 90° on 168 days during the year. At Jerusalem the temperature did not reach 90° till May 10th, and there were only 20 days in the year on which the temperature was as high as 90°. At Tiberias the temperature was 100° on May 8th, and reached or exceeded 100° on eight other days in this month; in June on six days; in July on 10 days; in August on nine days; in September on seven days; and in October on three days; thus on 44 days in the year the temperature reached or exceeded 100°. The highest temperature in the year at Tiberias was 114°, on June 24th; at Jerusalem it was 99°, on June 25th.

The lowest temperature of the air in each month is shown in column 9.[1] The lowest in the year was 37°·0, on February 21st; the next lowest was 40°, on both January 3rd and 21st; and from February 21st to the end of the year there was no temperature so

[1] In a letter from Dr. Torrance, dated January 23rd, 1900, he states:—

"I am sorry about the error in minimum thermometer of last year. On February 21st I found the spirit column broken in the minimum thermometer, and the readings too low by 10 degrees, and made this correction in the record from January 1st to February 21st.

"The observations for January, February, March, and April were taken by my late dispenser, Mr. David Lawin, who has had to retire on account of illness. The observations afterwards were taken by our Scripture-reader, Mr. James Cohen; now they are being taken by my new dispenser, Mr. R. Nassar.

"On January 5th, about 2 a.m., we were awakened by an earthquake, which must have lasted from five to ten seconds. I have felt several shocks during my fifteen years' residence here, but this was the most severe. No damage was done to buildings, as far as I can ascertain, but many people fled into the fields and remained there a considerable time in fear and trembling, some of whom afterwards became ill from the effects of the exposure. From correspondence, I learn the earthquake extended to Mount Lebanon, to Jerusalem, and to the coast of the Mediterranean.

"A bridge of good stonework has now been built over the Amud on the way from Tiberias to Safed, at the northern end of the plain Genessaret. It was very needful, as many lives have been lost in that stream. It is rather low, however, as already this year, after a heavy rainfall, the water rose above the level of the bridge. The Government contemplate building another bridge in the plain of Genessaret, over the Rubudeyeh."

low as 40°, the nearest approach being 45°, which occurred on each of the nights of February 22nd, March 2nd, and December 23rd and 24th; thus the temperature was as low or lower than 40° on only three nights during the year. At Jerusalem the lowest in the year was 31°, on January 18th; and there were 54 nights in the year when the temperature was as low or lower than 40°.

The yearly range of temperature was 77°; at Jerusalem it was 68°.

The range of temperature in each month is shown in column 10, and these numbers vary from 28° in August to 52° in March. At Jerusalem the range varied from 23°·5 in January to 49° in both April and May.

In column 11 the mean of all the high day temperatures in each month is shown. The lowest was 63°·4, in January, being 13°·1 higher than that at Jerusalem, the next in order were 67°·9, in February, and 68°·3, in December; the highest was 99°·8, in July, and the next in order were 98°·9, in August, and 97°·5, in June. At Jerusalem the lowest were 50°·3, in January, 55°·3, in December, and 55°·9, in February; the highest were 85°·4, in August, 85°·3, in September, and 84°·7, in July. The mean for the year at Tiberias was 84°·1; at Jerusalem it was 71°·8.

In column 12 the mean of all the low night temperatures in each month is shown. The lowest was 43°·6, in January, and the next in order were 46°·4, in February, and 54°·2, in December; the highest was 77°·2, in August, and the next in order were 75°·6, in July, and 75°·5, in September. At Jerusalem the lowest were 38°·2, in January, 42°·0, in February, and 44°·1, in December; the highest were 64°·8, in September, 64°·4, in August, and 64°·0, in July. At Tiberias the mean for the year was 63°·7; at Jerusalem it was 54°·1.

In column 13 the mean daily range of temperature is shown in each month; the smallest was 14°·1, in December, the next in order were 15°·0, in November, and 16°·9, in October; the greatest was 26°·1, in May, and the next in order were 24°·2, in July, and 23°·9, in June. At Jerusalem the smallest were 11°·2, in December, 12°·1, in January, and 13°·8, in November; the greatest were 24°·5, in May, 21°·2, in June, and 21°, in August. At Tiberias the mean daily range for the year was 20°·4; at Jerusalem it was 17°·7.

The mean temperature of the air, as found from the maximum and minimum temperatures only, is shown in each month in column 14; the lowest was 53°·5, in January, and the next in order 57°·2, in February, and 61°·2, in December; the highest was 88°·1, in August, and the next in order 87°·7, in July, and 86°·2, in September. At Jerusalem the lowest temperatures were 44°·2, in January, 49°·0, in February, and 49°·7, in December; the highest were 75°·0, in September, 74°·9, in August, and 74°·3, in July. At Tiberias the mean temperature increased month by month to the maximum in August, then decreased month by month to the end of the year. At Jerusalem the mean temperature increased month by month to the maximum in September, then decreased month by month to the end of the year. At Tiberias the yearly value was 73°·9; at Jerusalem it was 62°·9.

The numbers in the 15th and 16th columns are the mean readings of a dry and wet-bulb thermometer, taken daily at 8 a.m. If those in column 15 be compared with those in column 14, it will be seen that those in column 15 were a little higher in January, February, March, and April, and a little lower in the remaining months. The mean reading of the dry-bulb for the year was 73°·8, and that of the mean temperature, 73°·9, and therefore the mean temperature of the year may be approximately determined by a single reading of the thermometer taken daily at 8 a.m.

The numbers in the 17th column are the 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 15 was 9°·6, in February, and the largest 20°·3, in May.

The numbers in column 18 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 0·302 inch, in January, and the largest 0·694 inch, in August.

In column 19 the weight in grains of the water in a cubic foot of air is shown, it was as small as 3·4 grains in January, and as large as 7·3 grains in July.

In column 20 the additional quantity of vapour required to saturate a cubic foot of air is shown; it was as small as 1·7 grains in both January and February, and as large as 6·3 grains in September.

The numbers in column 21 show the degree of humidity of the air, saturation being represented by 100; the largest number is 71, in February, and the smallest 50, in each of the months of May, June, and October.

The numbers in column 22 show the weight in grains of a cubic foot of air, under the mean atmospheric pressure, temperature, and humidity of the air; the largest number was in January, decreasing to the smallest in both July and August, then increasing again to the end of the year.

In columns 23 and 24 are the mean readings of a dry and wet-bulb thermometer taken daily at 4 p.m. By comparing the numbers in column 15 with those in column 23, the increase of temperature from 8 a.m. to 4 p.m. is shown; in January the increase was only 3°·0, and in May it was as much as 10°·3.

In column 25 the temperature of the dew-point at 4 p.m. is shown. By comparing these numbers with those in column 17, it will be seen that the temperature of the dew-point in the months of January, February, March, November, and December was higher than at 8 a.m., and lower than at 8 a.m. in all other months. The numbers in this column are smaller than those in column 23 by 10°·7 in January, increasing to 35° in May, then decreasing to 15°·3 in December; these differences between the temperature of the air and that of the dew-point are very much larger than those at 8 a.m., being in some months more than twice as large.

On several days during the months of April, May, June, July, August, September, and October, at 4 p.m., the reading of the dry-bulb thermometer exceeded that of the wet by 25° or more, and the temperature of the dew-point was from 39°·0 to 53°·5 lower than the temperature of the air as shown by the following table:—

Month and Day.	Reading of		Temperature of the Dew-Point.	Temperature of the Dew-Point below Dry.
	Dry.	Wet.		
	°	°	°	°
April 16	91·0	66·0	50·5	40·5
17	93·0	67·0	50·1	42·9
18	91·0	66·0	50·5	40·5
21 .. .	94·0	69·0	54·0	40·0
May 9	100·0	70·0	52·9	47·1
10	100·0	70·0	52·9	47·1
11	98·0	68·0	50·6	47·4
12	96·0	71·0	56·2	39·8
14	91·0	65·0	48·9	42·1
18	89·0	64·0	48·3	40·7
19	95·0	64·0	45·4	49·6
26	102·0	72·0	55·2	46·8
27	105·0	71·0	52·3	52·7
28	102·0	77·0	63·0	39·0
June 10	93·0	67·0	52·1	40·9
19	97·0	69·0	57·0	40·0
20	101·0	73·0	57·0	44·0
23	101·0	75·0	60·2	40·8
24	109·0	74·0	55·5	53·5
25	101·0	70·0	52·3	48·7
July 2	99·0	69·0	51·6	47·4
6	99·0	74·0	59·5	39·5
13	95·0	70·0	55·0	40·0
Aug. 29	99·0	73·0	57·9	41·1
Sept. 20	103·0	71·0	53·0	50·0
22	97·0	72·0	57·2	39·8
Oct. 4	98·0	73·0	58·5	39·5
6	98·0	71·0	55·3	42·7

In column 26 the elastic force of vapour is shown, and by comparing the values with those in the same month at 8 a.m., we find that it was smaller at 4 p.m. in the months of April, May, June, July, August, September, and October, and larger than at 8 a.m. in the remaining months.

In column 27 the amount of water in a cubic foot of air at 4 p.m. is shown; the amount was less than at 8 a.m. in the months from April to October, and larger than at 8 a.m. in the remaining months.

In column 28 the amount of water required to saturate a cubic foot of air was as large as 11 grains in July, and as small as 1·8 grain in January.

In column 29 the degree of humidity is shown; the driest

months are April to October, the value for these months varying from 31 in May to 40 in April.

In column 30 the weight of a cubic foot of air is shown; the smallest was 500 grains, in June, and the largest 548 grains, in January.

In column 31 are given the number of days of rain in each month; the greatest number was 13, in December. The total number in the year was 51. At Jerusalem rain fell on 59 days.

In column 32 the monthly fall of rain is given. The heaviest fall of rain on one day in the months from January to March was 1·10 inch, on January 14th, and the next in order, 0·95 inch, on February 6th. No rain fell from May 17th till October 22nd, making a period of 157 consecutive days without rain. The fall of rain on December 25th was 1·62 inch, and on the 23rd 1·02 inch fell. The heaviest monthly fall in the year was 6·64 inches, in December, and the next in order 4·16 inches, in January. The total fall for the year was 17·10 inches; at Jerusalem the total fall for the year was 22·43 inches.

RESULTS OF METEOROLOGICAL OBSERVATIONS TAKEN AT JERUSALEM IN THE YEAR 1899.

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 27·690 inches, in January, and the next in order 27·619 inches, in November. The highest reading in the preceding 38 years, viz., 1861 to 1898 inclusive, was 27·816 inches, in December, 1879, and the next in order 27·800 inches, in November, 1870.

In column 2 the lowest reading of the barometer in each month is shown; the minimum for the year was 27·152 inches, in February. At Tiberias the reading on this day at 8 a.m. was 30·455 inches. The next in order at Jerusalem were 27·171 inches, in December, and 27·179 inches, in August. The lowest reading in the preceding 38 years was 26·860 inches, in March, 1898, and the next in order 26·970 inches, in March, 1896.