

TABLE I.—Showing the fall of rain, in inches, at Jerusalem in every month in the years 1861 to 1892.

Months.	YEARS.																												Mean of 32 Years.				
	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.		1889.	1890.	1891.	1892.
January ...	9.66	12.41	9.11	6.89	4.54	5.06	9.25	3.57	7.72	1.24	2.94	3.11	0.13	8.43	6.79	3.42	1.60	13.39	0.98	6.00	1.28	3.03	10.93	6.09	7.79	6.55	12.45	4.63	6.13	11.59	10.23	7.42	6.38
February ...	6.50	2.27	2.40	1.50	5.08	3.18	6.07	10.93	3.27	0.69	4.42	5.25	6.03	7.22	4.09	4.14	8.75	11.49	2.27	4.04	4.43	12.59	3.79	8.26	2.90	9.51	4.16	1.25	0.83	4.18	6.22	4.09	5.06
March ...	2.40	0.63	3.70	1.08	0.42	3.46	2.14	3.29	1.95	3.99	6.75	1.43	1.94	10.02	10.52	2.27	0.89	2.35	7.52	5.64	4.36	0.97	5.74	3.75	5.47	5.09	3.78	2.03	3.21	1.87	3.38	1.73	3.56
April ...	0.32	1.00	2.11	1.65	0.77	0.29	2.01	1.93	2.36	3.72	1.10	0.42	0.89	0.13	1.04	1.97	0.21	0.51	1.52	2.07	2.21	3.65	0.85	2.08	6.52	1.34	0.85	4.74	0.74	4.41	0.25	1.78	1.71
May ...	0.48	0.00	0.00	0.00	0.37	0.00	0.73	0.14	0.40	0.00	0.19	0.11	0.01	0.00	0.23	0.35	0.00	0.65	0.00	0.10	0.07	0.57	0.00	0.62	0.24	0.43	1.25	0.23	0.00	0.00	0.35	1.04	0.27
June ...	0.00	0.00	0.00	0.00	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.01
July ...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
August ...	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00
September...	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.04
October ...	0.00	0.00	1.30	0.00	0.00	1.75	0.00	0.00	0.00	2.29	1.58	0.31	0.01	0.00	0.00	0.08	2.18	0.00	0.82	0.40	0.06	0.07	0.31	0.06	0.07	0.43	0.00	0.32	0.00	0.07	0.40	0.03	0.41
November ...	0.18	2.96	0.19	2.65	1.56	1.84	2.24	1.19	1.47	0.01	0.10	3.39	4.41	2.51	1.12	1.69	5.02	0.03	0.69	0.86	2.43	0.80	7.59	1.08	0.13	5.03	0.60	7.99	0.57	3.48	2.80	6.64	2.29
December ...	7.75	2.59	7.13	1.65	5.45	2.97	6.93	8.05	1.17	1.45	6.49	6.24	9.30	1.44	3.19	0.49	7.35	3.00	4.24	13.00	1.72	4.99	3.21	2.02	6.27	3.31	6.72	16.40	2.06	9.33	11.09	8.70	5.50
Sums ...	27.30	21.86	26.54	15.51	18.19	18.55	29.42	29.10	18.61	13.39	23.57	20.26	22.72	29.75	27.01	14.41	26.00	32.21	18.04	32.11	16.50	26.72	31.92	23.96	29.47	31.69	29.81	37.79	13.56	35.51	34.72	31.23	25.23

TABLE III.—Showing the number of days of rain in every month in the years 1861 to 1892.

Months.	YEARS.																												Mean of 32 Years.				
	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.		1889.	1890.	1891.	1892.
January ...	14	14	10	8	7	14	11	9	15	9	9	6	4	15	14	7	9	14	6	15	3	11	19	10	19	15	12	12	13	15	16	17	12
February ...	7	7	7	5	8	9	12	18	12	1	11	17	10	12	12	10	13	13	6	12	12	16	13	18	9	10	6	7	4	15	11	11	10
March ...	5	3	8	4	5	9	8	7	4	9	16	7	11	20	14	7	5	7	17	7	10	4	9	10	11	9	8	6	5	9	9	2	8
April ...	1	4	7	6	3	4	3	13	8	13	3	4	2	3	4	8	3	2	3	6	8	12	3	3	7	5	2	8	3	8	5	6	5
May ...	4	0	0	0	3	0	5	1	2	0	1	3	1	0	1	4	0	3	0	1	2	4	0	3	1	5	2	2	0	0	3	5	2
June ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0
July ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
August ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
September...	0	0	0	2	0	0	0	0	1	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
October ...	0	0	7	0	0	5	0	0	0	4	2	4	1	0	0	1	5	0	3	1	0	1	3	1	1	2	0	3	0	1	3	1	2
November ...	3	9	1	4	11	8	4	7	6	1	1	7	7	6	6	7	11	1	5	5	5	4	11	7	1	9	4	13	5	7	6	12	6
December ...	13	7	12	7	11	13	10	13	5	4	13	7	13	6	9	3	13	4	6	15	8	11	12	2	8	8	12	13	10	17	15	9	10
Sums ...	47	44	52	36	48	62	53	68	53	41	56	55	49	62	61	47	59	46	46	62	48	63	70	54	58	63	46	65	41	73	68	63	55

ON THE FALL OF RAIN AT JERUSALEM IN THE
32 YEARS FROM 1861 TO 1892.

By JAMES GLAISHER, F.R.S.

THE series of daily observations of rain was begun by Dr. Chaplin in the year 1861, and was continued by him for the long period of 22 years till the end of 1882: they have since 1883 been continued under the auspices of the Palestine Exploration Fund.

The rain gauge used during the first six years was a float gauge by Newman, and since then a certified 8-inch gauge by Negretti and Zambra. During four years the gauges were placed side by side; the float gauge registered during these four years 88·83 inches, and Negretti and Zambra's gauge 93·25 inches, and the readings by Newman's gauge have been corrected so as to give results in accordance with the 8-inch gauge.

Dr. Chaplin says the position of the gauges was in a garden within the city, about 2,500 feet above the level of the Mediterranean, open on all sides, the houses which bound it on the south and west, being too far removed to influence the fall of rain on the pluviometer.

The results of the observations during the 22 years ending in 1882 have been discussed by Dr. Chaplin in seasons, and the results were published in the *Quarterly Statement* of the Palestine Exploration Fund for January, 1883.

The observations since 1883 have all been made by the 8-inch gauge and in the same position as that adopted by Dr. Chaplin.

Table I shows the fall of rain in every month during the 32 years ending with 1892.

In looking over the table the first thing noticeable is the very great difference in every month of the rainy season, between the falls in the same month in different years; for instance, in January the fall in the year 1873 was 0·13 inch, whilst in 1878 it was 13·39 inches.

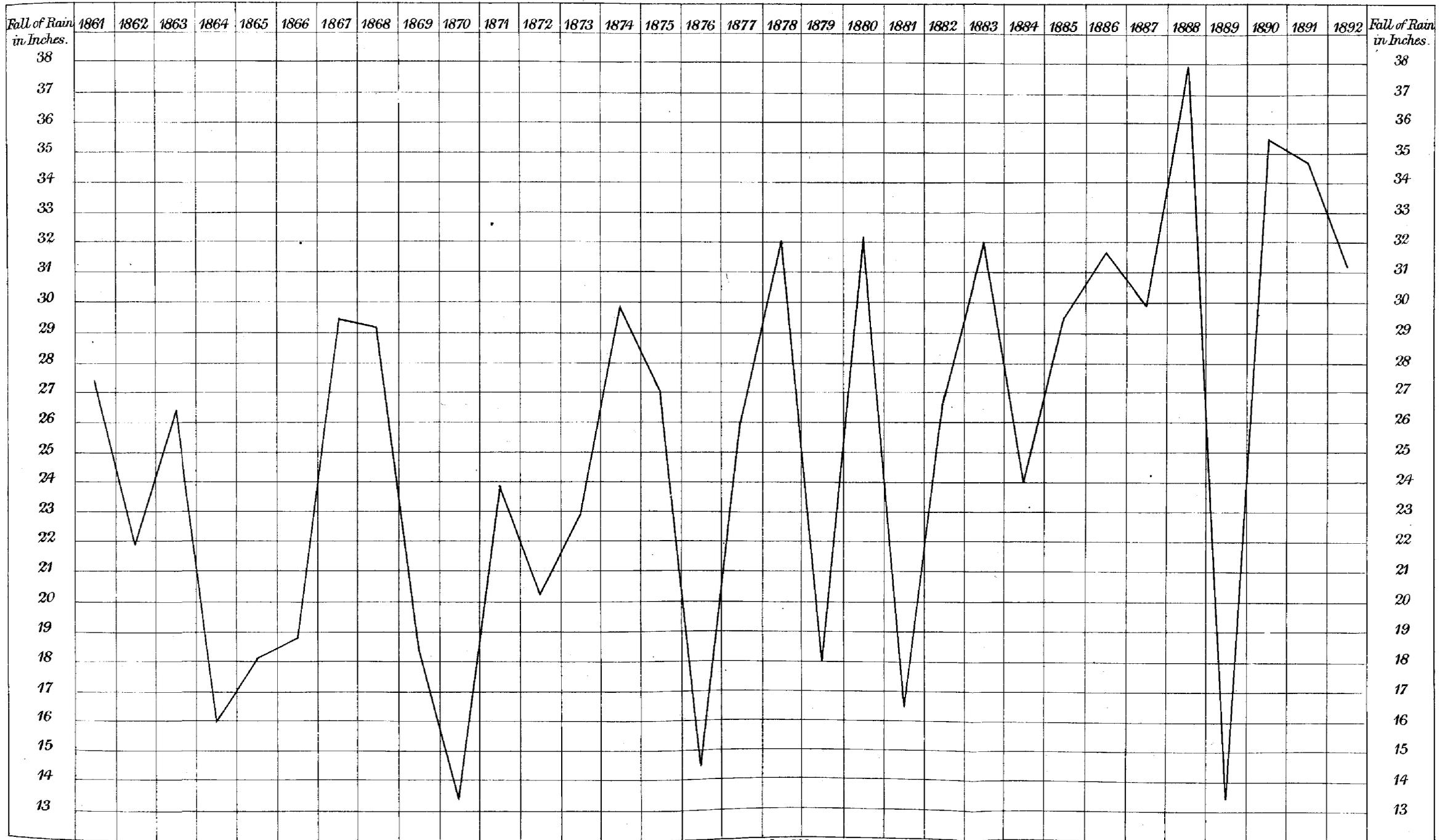
Table II (*see next page*) shows the three heaviest and the three lightest falls of rain in every month excepting June, July, and August in the 32 years:—

TABLE II.

Showing the three heaviest falls of rain at Jerusalem in each month in the years 1861 to 1892 inclusive.		Showing the three lightest falls of rain at Jerusalem in each month in the years 1861 to 1892 inclusive.	
January	.. 13·39 inches in 1878	January	.. 0·13 inch in 1873
"	.. 12·45 " 1887	"	.. 0·98 " 1879
"	.. 12·41 " 1862	"	.. 1·24 " 1870
February	.. 12·59 " 1882	February	.. 0·69 " 1870
"	.. 11·49 " 1878	"	.. 0·83 " 1889
"	.. 10·93 " 1868	"	.. 1·25 " 1888
March	.. 10·52 " 1875	March	.. 0·42 " 1865
"	.. 10·02 " 1874	"	.. 0·63 " 1862
"	.. 7·52 " 1879	"	.. 0·89 " 1877
April	.. 6·52 " 1885	April	.. 0·13 " 1874
"	.. 4·74 " 1888	"	.. 0·21 " 1877
"	.. 4·41 " 1890	"	.. 0·25 " 1891
May	.. 1·25 inch in 1887	May.	No rain fell in this month in 11 different years.
"	.. 1·04 " 1892		
"	.. 0·73 " 1867		
June	.. 0·20 " 1888	June.	No rain fell in this month in the remaining 30 years.
"	.. 0·08 " 1885		
July.	No rain fell in this month during the 32 years.		
August, 0·08 inch in 1890, and no	31		
September	.. 0·79 inch in 1878	September.	No rain fell in this month in 27 out of the 29 remaining years.
"	.. 0·27 " 1869		
"	.. 0·09 " 1864		
October	.. 2·29 inches in 1870	October.	No rain fell in this month in 13 different years.
"	.. 2·18 " 1877		
"	.. 1·90 " 1863		
November	.. 7·99 " 1888	November	.. 0·01 inch in 1870
"	.. 7·59 " 1883	"	.. 0·03 " 1878
"	.. 6·64 " 1892	"	.. 0·10 " 1871
December	.. 16·40 " 1888	December	.. 0·49 " 1876
"	.. 13·00 " 1880	"	.. 1·17 " 1869
"	.. 11·09 " 1891	"	.. 1·44 " 1874

These differences are remarkable, and it will be noticed that in every month of the rainy season there are instances of the fall being less than one inch. These cases in the autumnal months must be very serious for the husbandmen, for the ground cannot be in a fit state for the reception of seed. Whilst in the same months in other years the falls have been large, in one case, December, 1888, as large as 16·40 inches, this is the largest fall in one month in the 32 years; the next in order are:—

DIAGRAM SHOWING THE FALL OF RAIN AT JERUSALEM IN INCHES IN EVERY YEAR FROM 1861 TO 1892.



1878, January	....	....	....	....	13·39 inches.
1880, December	....	....	....	....	13·00 "
1882, February	....	....	....	....	12·59 "
1887, January	....	....	....	....	12·45 "
1862, January	....	....	....	....	12·41 "
1890, January	....	....	....	....	11·59 "
1878, February	....	....	....	....	11·49 "
1891, December	....	....	....	....	11·09 "
1868, February	....	....	....	....	10·93 "
1875, March	....	....	....	....	10·52 "
1891, January	....	....	....	....	10·23 "
1874, March	....	....	....	....	10·02 "

Of these heavy falls five were in January, three in February, two in March, and three in December; the fall of rain in every other month was less than 10 inches.

There were, however, a good many other heavy falls; there were six exceeding 9 inches, of which three were in January in the years 1861, 1863, and 1867; one in February, 1886, and two in December in the years 1873 and 1890; five exceeding 8 inches, one in January, 1874, two in February in the years 1877 and 1884, and two in December in 1868 and 1892; there were 10 exceeding 7 inches, all between November and January, 18 exceeding 6 inches, 9 exceeding 5 inches, 16 exceeding 4 inches, and 23 exceeding 3 inches.

The largest fall of rain in three consecutive months was 32·23 inches, ending February, 1878; the next in order was 30·52 inches, ending January, 1889; the smallest in three consecutive months was 3·10 inches, ending February, 1870; and the next in order was 3·88 inches, ending January, 1870.

The numbers in the last column of Table I shows the average fall of rain in every month; the largest is in January, the next in order December, then March and April. The number at the foot of each column shows the fall of rain in the year; the three smallest are 13·39 inches in 1870, 13·56 inches in 1889, and 14·41 inches in 1876. The three greatest are 37·79 inches in 1888, 35·51 inches in 1890, and 34·72 inches in 1891. The mean of the three lowest was 11·44 inches below the average; and the three highest was 10·78 inches above the average.

It is remarkable that the fall of rain in the years 1864, 1870, 1876, and 1889 were all less than the fall in the month of December, 1888, and that the fall in the year 1881 was only 0·1 inch larger. It may also be noticed that the fall in the month of January, 1878, was the same in amount with the fall in the year 1870.

The average annual fall of rain is shown at the foot of the last column and is 25·23 inches, being very nearly the same as in London, but how differently distributed! By laying the annual falls down as a diagram the results can be seen at once. The first thing to be noticed is the evident increase of the fall of rain in the later years of the series, and the

next, that up to 1878 no fall of rain had reached 30 inches, the nearest approach being 29.75 inches in 1874; but on the diagram in eight years, viz., 1878, 1880, 1883, 1886, 1888, 1890, 1891, and 1892, the points are all well above 30 inches. It is remarkable that the largest fall of all, in 1888, should be followed in 1889 by one so small as 13.56 inches, being, in fact, the lowest but one in the 32 years.

By taking the means of the annual falls in two equal periods of 16 years, the first in the years 1861 to 1876, the mean is 22.26, and in the second, in the years 1877 to 1892, the mean is 28.20; therefore, the mean annual fall in the second half of the series is 5.94 inches greater than in the first half. This is very remarkable.

By comparing the average rainfall for each month, as shown in the last column of Table I, with the monthly fall of the same month in every year it will be seen that in every month, for three, four, or five successive years, the fall has been either above or below the mean; and—

In January in 16 years the fall was above and in 16 years below the mean.

In February in 13 years the fall was above and in 19 years below the mean.

In March in 13 years the fall was above and in 19 years below the mean.

In April in 13 years the fall was above and in 19 years below the mean.

In October in 7 years the fall was above and in 25 years below the mean.

In November in 13 years the fall was above and in 19 years below the mean.

In December in 15 years the fall was above and in 17 years below the mean.

In January of those above the mean there were four successive years, viz., 1861, 1862, 1863, and 1864, and two groups of three each, in 1885, 1886, and 1887, and 1890, 1891, and 1892. Of those below the mean there were two groups of four each, viz., 1870 to 1873 and 1879 to 1882.

In February above the mean there was only one group of three, in the years 1872, 1873, and 1874; of those below the mean there were three groups of three and one of four, viz., in the years 1862, 1863, and 1864; 1869, 1870, and 1871; 1879, 1880, and 1881, and 1887, 1888, 1889, and 1890.

In March of those above the mean there were two groups, one of three and one of five, viz., in the years 1879, 1880, and 1881, and 1883 to 1887. Of those below the mean there were three groups, of six, three, and five years, viz., 1864 to 1869, 1876 to 1878, and 1888 to 1892.

In April above the mean there were two groups, one of four and one of three years, viz., 1867 to 1870, and 1880 to 1882; below the

mean there were three groups, two of three and one of five years, viz., 1864 to 1866, 1871 to 1875, and 1877 to 1879.

In November above the mean there were two groups of three, viz., 1872 to 1874, and 1890 to 1892; below the mean there were two groups, one of seven and the other of three years, viz., 1865 to 1871, and 1878 to 1880.

In December above the mean there were two groups of three, viz., 1871 to 1873, and 1890 to 1892; below the mean there were three groups, two of three and one of four successive years, viz., 1864 to 1866, 1874 to 1876, and 1881 to 1884.

Therefore, in every month of the rainy season the fall has been above the mean for three or four years in succession; once in March it was above for five years. The fall also has been below the mean for three or four years consecutively; once, both in March and April, it extended to five years, and once, also in March, to six years, and in November there were seven in succession below the mean.

Comparing the yearly falls with the average, viz., 25.23 inches, the first group of three below the mean was in the years 1864, 1865, and 1866. The next is a group of five years, viz., from 1869 to 1873, and besides these there are no two years in succession below the mean.

The first two years in succession above the mean was in 1867 and 1868; the next two years, 1874 and 1875, the next 1882 and 1883; then four years, 1885 to 1888, and three years, 1890, 1891, and 1892.

From the long group of five years of deficient rainfall, ending in 1873, no two dry years have come together, and five years only out of the subsequent 19 have been below the average, and the remaining 14 above, made up of three instances of two successive years of excess, one of four, and one of three. From the five dry years, ending 1873, there has been a gradual increase of rain, and future observations will be looked forward to with very great interest indeed, for it is not possible to infer whether the years ending 1873 were the lowest in a cycle of years, or whether the climate is changing.

From Table III it appears that the number of rainy days has varied—

In January	from 3 in 1881 to 19 in 1883 and 1888.
February	„ 1 „ 1870 „ 18 „ 1868 and 1884.
March	„ 2 „ 1892 „ 20 „ 1874.
April	„ 1 „ 1861 „ 13 „ 1868 and 1870.
May	„ 0 „ several years to 5 in 1867, 1886, and 1892.
September	from none in several years to 2 in 1864 and 1878.
October	„ „ „ 7 „ 1863.
November	„ 1 in several years to 13 in 1888.
December	„ 2 in 1884 to 17 in 1890.

In the months of the rainy season the days of rain have been as few as 1, 2, or 3 in some years, and as many as 17 to 20 in other years.

Also from the table it appears that in June rain fell on one day in the years 1885 and 1888, and that in August it fell on one day in the year 1890.

From the numbers in the last column of Table III (*see* p. 39), showing the average number of days of rain, it appears that January has the greatest number, 12, and the next in order are February and December, each 10, then in order March, 8, November, 6, April, 5, and May and October 2 each.

The sum at the foot of each column shows the number of days of rain in that year; the numbers vary from 36 in the year 1864 to 73 in the year 1890.

By taking the means of the first half, *viz.*, from 1861 to 1876, the average value is 52, and of the second half, *viz.*, from 1877 to 1892, the average value is 58. The mean number of days for the whole period is 55.

CROYDON, *November*, 1893.

METEOROLOGICAL REPORT FROM JERUSALEM FOR YEAR 1884.

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 appear in the winter, and the lowest in the summer months; the maximum for the year is 27·668 inches in January. In column 2 the lowest in each month are shown; the minimum is 26·997 inches in April. The range of readings in the year was 0·671 inch. The numbers in the 3rd column show the extreme range of readings in each month; the smallest, 0·144 inch, is in August, and the largest, 0·531 inch, in January. The numbers in the 4th column show the mean monthly pressure of the atmosphere; the highest, 27·486 inches, is in December, and the lowest, 27·285 inches, in July. The mean pressure for the year was 27·380 inches; at Saronā the mean pressure for the year was 29·859 inches.

The highest temperature of the air in each month is shown in column 5. The highest in the year was 105° on both the 6th and 9th of August; at Saronā the maximum temperature on these days was 88° and 89° respectively. The first day in the year the temperature reached 90° was on May 29th, and the temperature reached or exceeded 90° on two other days in this month. In June there were 8 days when the temperature reached or exceeded 90°; in July, on 7 days; in August, on 10 days; in September, on 1 day; and in October, on 4 days. Therefore the temperature reached or exceeded 90° on 33 days in the year. At Saronā the temperature reached 90° as early as April 13th, and reached or exceeded 90° on only 14 days in the year; the highest in the year at Saronā,