

our note in *Current Science*.<sup>1</sup> The author of this letter would have found all the answers to the points raised by him in the full paper which has been accepted for publication in the *Indian Journal of Medical Research*, 1942.

(1) Regarding the 'priority' question, the idea of combining thromboplastin and calcium in the same solution was evolved in the Biochemical Standardisation Laboratory and actual solutions were supplied to Dr. Das Gupta to enable him to carry out routine prothrombin determinations on a large scale. Our idea was to collect sufficient data before actually claiming the advantages of our method over other methods already in existence. In the paper by Napier and Das Gupta referred to by the author, the name of one of us (N. K. I.) actually occurs (*I.M.G.*, Vol. 76, p. 232).

(2) Regarding the question of 'speeding-up' of the reaction, the author seems to have the impression that the "prothrombin time" is reduced from 18 secs. to 8 secs. By employing Fullerton's technique and using a solution of Russell viper venom available in this Laboratory (and not 'Rus-Ven' of 'Boots' or 'Stypven' of B.W. & Co.), the prothrombin time has been found to be 11-14 seconds. Using the same venom solution and combining it with calcium the 'prothrombin-time' was found to be 8-10 secs. The reaction time is therefore speeded up only to this extent, and not from 18 secs. to

8 secs. as probably inferred by the author. In the complete paper submitted for publication, comparative figures of prothrombin-time of normal human plasma, as determined by the two methods (Fullerton's and ours) are given.

(3) Regarding the end-point determination, Fullerton suggested that 'first appearance of the fibrin web' was a good criterion. Employing this criterion, it was found that the results were more reproducible. There is a certain amount of lag between the *first appearance of fibrin web* and the *final setting* of the clot. It is advisable to watch for the first appearance of the process of clotting when it is possible to do so, as in this particular solution. Rabbit's brain extract, as originally used by Quick, would be so opaque as not to permit the observation of this rather fine criterion. This is probably the reason why Quick has not mentioned this as the criterion.

The author has not stated the *positive side* of his investigation, *i.e.*, the actual 'prothrombin time' obtained by using our technique. It would have been easier for us to estimate the divergence of results if this information was supplied. We shall be glad to send the venom used by us for any further work that the author wishes to do to settle these points.

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<sup>1</sup> *Curr. Sci.*, 1941, 10, 326.

## RAINFALL FREQUENCY AT PATIALA

BY

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SOME years ago, Mr. L. J. Sedgwick,<sup>1</sup> I.C.S., of Bombay, studied "the frequency of rainfall at five stations in the south of the Bombay Presidency" and deduced certain results regarding the variations of rainfall in those regions. In the present note, the frequencies of rainfall at Patiala which lies in the south of the Punjab have been studied in a similar manner.

The frequencies have been broken up into a number of classes and each class covers a range of 0.20 inches. The classes are arranged in groups, each having five classes and covering a range of 1.00 inch. For detailed and more accurate study, the rainfall from 0.01 to 1.00 inch (group 1) has also been divided into ten equal sub-classes, each covering a range of 0.10 inch (Table I).

The rainy days having rain less than 0.01

<sup>1</sup> L. J. Sedgwick. *Memoirs of the India Meteorological Dept.*, Poona, 23, Part 8,

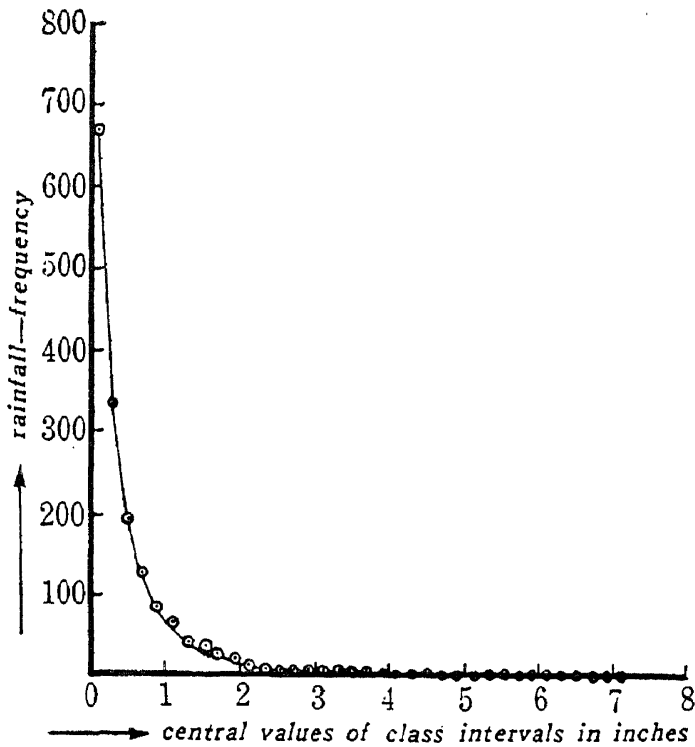
TABLE I  
Table of Rainfall Frequencies, Patiala (South Punjab)

No.	Class	1901-10	1911-20	1921-30	1931-40	Totals 1901-40	Group totals	Rainfall due to each class in inches
1	0.01-0.10	121	58	103	52	334	1415	66.5
	0.11-0.20	77	89	87	78	331		
2	0.21-0.30	45	51	54	43	193		
	0.31-0.40	36	37	42	30	145		
3	0.41-0.50	28	27	35	29	119		
	0.51-0.60	23	23	16	16	78	130	91.0
4	0.61-0.70	20	17	15	21	73		
	0.71-0.80	14	12	14	17	57		
5	0.81-0.90	14	9	10	11	44		
	0.91-1.00	11	13	14	3	41		
6	1.01-1.20	21	15	15	16	67	202	73.7
7	1.21-1.40	10	14	5	15	44		
8	1.41-1.60	9	10	13	8	40		
9	1.61-1.80	11	7	3	8	29		
10	1.81-2.00	3	8	5	6	22		
11	2.01-2.20	11	2	0	2	15	53	31.5
12	2.21-2.40	1	4	2	2	9		
13	2.41-2.60	3	1	4	4	12		
14	2.61-2.80	1	3	3	3	10		
15	2.81-3.00	2	1	2	2	7		
16	3.01-3.20	2	1	3	1	7	27	21.7
17	3.21-3.40	1	5	1	2	9		
18	3.41-3.60	0	2	2	2	6		
19	3.61-3.80	1	1	1	0	3		
20	3.81-4.00	1	0	0	1	2		
21	4.01-4.20	0	0	0	0	0	5	0.0
22	4.21-4.40	0	0	1	1	2		
23	4.41-4.60	0	0	0	0	0		
24	4.61-4.80	0	1	0	1	2		
25	4.81-5.00	1	0	0	0	1		
26	5.01-5.20	0	0	0	0	0	5	0.0
27	5.21-5.40	1	0	0	1	2		
28	5.41-5.60	0	0	0	0	0		
29	5.61-5.80	0	1	0	0	1		
30	5.81-6.00	0	1	0	1	2		
31	6.01-6.21	0	0	0	0	0	2	0.0
32	6.21-6.40	0	1	0	0	1		
33	6.41-6.60	1	0	0	0	1		
34	6.61-6.80	0	0	0	0	0		
35	6.81-7.00	0	0	0	0	0		
36	Above 7.00	0	0	0	0	0	0	0.0
Totals		469	414	450	376	1709	1709	1000.5
Mean Annual Rainfall ..		26.00	26.69	22.89	24.98	25.29	Average heaviness	0.58

inch are counted as rainless days in the table. The data which are used in the table have been collected from various sources. They extend from 1901 to 1940. The frequencies are

given for each ten years period as well as for the whole period. The last two rows give the totals of frequencies and the mean annual rainfall for each decade.

A curve has been drawn (Fig. 1) representing the relation between frequencies (totals of frequencies for the whole period) and the central values of the class intervals. It is almost L-shaped, *i.e.*, the frequencies fall very



rapidly with the increase of rainfall amount, but for high classes they become almost constant and are very very low. This curve agrees with those of Mr. Blanford obtained for a few stations and used in his book on "Climates and Weather of India", and also with those obtained by Mr. L. J. Sedgwick for a few stations in the south of the Bombay Presidency and used in his paper on "the rainfall frequencies at five stations in the south of the Bombay Presidency".

The comparison of frequencies given in Table I clearly indicates that the light showers of the middle value 0.10 inch and range 0.01 to 0.20 inch (class 1) are more common than the showers of higher middle values (higher classes), and the comparison of frequencies of the sub-classes in group I shows that the showers of the first two lowest ranges 0.01 to 0.10 inch and 0.11 to 0.20 inch have very high and almost equal frequencies. The table

also indicates that the frequency decreases with the rise of class very rapidly.

The last column in the table gives the approximate total rainfall yielded by each class during the whole period of forty years. It shows that the greatest amount of rainfall is contributed by falls of about 0.30 inch middle value and next to it (nearly the same) by falls of about 0.50 inch middle value. The average heaviness of the rainfall, *i.e.*, the average rainfall for each rainy day is 0.58 inch. Thus the greatest quantity of rain is yielded by falls not differing much from those of average heaviness which confirms Blanford's statement.

The other point of interest is a marked diminution in the number of falls of the lowest value class in the second and the fourth decades which is indicated by the values given in class 1. The value is the lowest in the last decade which shows a possible decline in the frequency of the lowest class. But such change is not visible in the higher classes.

Moreover, it also shows that on the whole the frequency of rainfall is decreasing with time which is indicated by the totals of frequencies for each decade. The comparison of frequencies and the mean annual rainfall for each decade indicates that the latter does not merely depend upon the former. There had been never any rainfall of value higher than 6.60 inches during the last forty years.

Besides, the examination of annual rainfall<sup>2</sup> of the last forty years indicates that on the whole the annual rainfall is decreasing irregularly with the years.

The author is indebted to His Highness' Government, Patiala, for providing facilities to carry out the above work in the Research Laboratory of Mahendra College, Patiala.

<sup>2</sup> A separate paper is being published on this subject by the author.