

the most intimate terms. But then, under these circumstances, they catch the disease. As there is no danger here of such identification of the two races, we need no protection from a board of health for our own persons; but if some restraint is not put upon the intercourse of the races future generations, even here, may have to pay for the imprudence of their fathers. It seems to me that it is the duty of our National Board of Health to send back to their own country the lepers who have it now in their power to poison several generations and to establish a horrible disease, to be exempted from which we have considered hitherto a precious privilege, and thanked God for it."

It follows from all that I have said that the danger from leprosy does not arise from any contagious action, but from the continual reintegration of the disease, which results from the intercourse of lepers with healthy individuals. Contrary-wise to what would happen in syphilis, this intercourse strengthens and perpetuates the evil. As a matter of fact, no greater difference can be imagined in the etiology of two diseases than that which exists between leprosy and syphilis. I may here call the attention of all dermatologists to the well-known Colles law. According to that law, a woman who bears a child to a syphilitic man acquires perfect immunity from syphilis. Now, nobody doubts, either in China or Japan, that a leprosy woman bearing a child to a healthy father acquires some measure of immunity; while the child receives and transmits the susceptibility. This is a fact diametrically opposed to those which are included in Colles law.

An assimilation, in whatever degree of leprosy and syphilis, has been made by many otherwise acute observers. Yet, what a difference in regard to contagiousness; for instance, there is in the fact that one disease, breaking out at the age of puberty, spares the race, while the other congenital, appearing with the appearance of the individual himself (both parents being supposed to be syphilitic) would destroy the race. In leprosy the intervention of pure blood acts as a nourishment to the disease; in syphilis, it attenuates the virus. The attenuation of germs, when they are allowed their regular course, seems to me to be of more general application. It is believed in Japan, that a child of parents who enjoy immunity from small-pox, by having had the disease, possesses itself a natural immunity (not a perfect immunity) transmitted to it. This was the greatest obstacle to the introduction of vaccination into Japan: artificial immunity of the parents, they said, would interfere with the natural power of resistance of the child. Variolization (if I may coin the word) and syphilization were always popular in Japan, in consequence of these same traditions. The complete devitalization of our introduced vaccine virus, after a certain series of inoculations, when a new virus had to be imported, proves that these Orientals were right. The devitalization of the germ of syphilis, which has occurred in Japan, after thirteen centuries of syphilitic inoculation, proves also that a natural immunity is acquired by the very transmission of the disease.

Let me say now what I believe must be rationally deduced from all I have said: What is generally called contagiousness does not essentially belong to the disease itself, it is entirely in the individual who contracts it. Its measure is that of the resistance of the individual or of the race. In four generations of lepers, regulated as I have said, the power of resistance becomes complete. In an unconscious, blundering, mediæval way, the resistance has been acquired by Europe. There is no place for the idea of contagion in these facts.

#### THE INFLUENCE OF THE MOON ON RAINFALL — A SYMPOSIUM.

I. — BY MANSFIELD MERRIMAN, PH.D., LEHIGH UNIVERSITY, SOUTH BETHLEHEM, PA.

THE widespread notion regarding the influence of the moon on the weather has probably some slight validity. The dispersion of clouds in mountainous regions under the influence of a full moon has been noted by several observers, as also the peculiar movement of thunder-storms. Yet little evidence, except of a negative character, has been derived by a discussion of rainfall statistics, although the rainfall is an element probably quite as

liable to be influenced by the moon's changes as other elements. A series of observations, suitable in all respects for such discussion, is indeed difficult to find. The mean daily rainfall for a locality of wide area is not adapted to this purpose, for the moon's influence cannot be supposed to be the same under different topographical conditions. Even the daily records of rainfall at a single station may not be good ones if changes occur from time to time in surrounding buildings and trees, or if the gauge is placed at different positions in different years.

The observations of rainfall, taken at Bethlehem, Pa., by Mr. F. E. Luckenbach, during 1881-1890, are selected as the basis of a brief discussion, and they are believed to be free from the objections above noted. The amount of rainfall in each year was obtained for the day of new moon and for each of the three days preceding and following, and also for the other quarters. For each year a curve of rainfall throughout a lunar month of 28 days could then be drawn, and these curves were combined in various ways to endeavor to ascertain the features common to all of them. The following conclusions were derived: First, the new moon is liable to be followed by an increase in rainfall; second, the full moon is liable to be followed by a decrease in rainfall; third, the wettest period is generally at and preceding the full moon; and, fourth, the driest period is generally at and preceding the first quarter. These conclusions are, in general, most plainly marked in the years of least rainfall.

The first conclusion, that the rainfall is liable to increase after new moon, is perhaps the one most prominently observed in the curves for all the years. The frequency of rain, as shown by the number of days on which rainfall occurred, was also found to follow the same law. In the following table are given for each of the years the amount of rainfall on the two days before and on the two days after the day of new moon, as also the number of rainy days for each period. The number of new moons embraced in the table is 124, and in the last two columns are shown the number of times that this first conclusion was verified and the number of times that the opposite fact occurred. It is seen that every year except 1889 agrees with the conclusion as exhibited in the

*Rainfall for Two Days before and Two Days after New Moon.*

Year.	Inches of Rainfall.		Number of Rainy Days.		Conclusion Verified.	
	Before.	After.	Before	After.	Yes.	No.
1881	0.22	3.69	2	5	5	1
1882	1.51	2.24	2	4	3	2
1883	3.07	3.14	7	8	4	4
1884	1.28	4.66	5	6	6	5
1885	1.23	2.03	7	7	4	4
1886	2.83	3.03	5	10	7	3
1887	3.07	4.75	7	11	6	3
1888	1.58	1.68	5	8	6	3
1889	6.13	1.87	7	8	4	7
1890	3.05	6.91	6	7	6	2
1881-1890	23.97	33.87	53	74	51	34
Odd years	13.72	15.41	30	39	23	19
Even years	10.25	18.46	23	35	28	15
1881-1885	7.31	16.79	23	30	22	16
1886-1890	16.66	17.08	30	44	29	18

totals. The year 1889 was the one of heaviest rainfall, 57.68 inches, while 1881 had the least rainfall, 34.99 inches, the mean for the ten years being 45.68 inches. The probabilities of the respective occurrences, if based upon the totals for the ten years, are, hence,  $\frac{5}{124}$  that rainfall will increase after the new moon,  $\frac{3}{124}$  that it will decrease, and  $\frac{89}{124}$  that rain will not occur either in the two days before or in the two days after.

The conclusion that the full moon is generally followed by a decrease in rainfall is not as plainly marked as the above, but the following are the total amounts in inches for the two days before and the two days after full moon:—

	Before.	After.
1881-1890	36.21	27.00
Odd years	14.76	12.51
Even years	21.45	14.49
1881-1885	16.31	10.54
1886-1890	19.90	16.46

The third and fourth conclusions, that the wettest period in the lunar month is near and before full moon, and that the driest period is near and before first quarter, are distinctly marked in the several mean curves. The mean result for the ten years is that 6.1 per cent of the rainfall occurred on the day of the first quarter and the two days before, while 13.3 per cent occurred on the day of the full moon and the two days before. In inches of rainfall the results for these two periods for several groups of years are as follows:—

	Day of Full Moon and two days before.	Day of First Quarter and two days before.
1881-1890	60.80	31.78
Odd years	23.64	13.76
Even years	37.16	18.02
1881-1885	20.76	12.65
1886-1890	40.04	19.13

The distribution of rainfall at and around the time of the changes of the moon has been the element most generally studied in connection with this question. In order that the records now under review may be compared with others, the following are given for periods of one day, three days, and five days respectively. These are for the ten years 1881-1890 and in inches of rainfall.

	Day of change.	Day of change and one day before and after.	Day of change and two days be- fore and after.
New Moon	14.62	41.77	72.69
First Quarter	9.61	32.20	60.70
Full Moon	24.59	53.43	87.80
Last Quarter	21.34	49.67	73.29

These figures, like those previously given, indicate that the maximum rainfall occurs near full moon, and the minimum near the first quarter. It is impossible indeed to avoid the conclusion that at Bethlehem, Pa., during the years 1881-1890, the distribution of the mean rainfall seems to have been arranged with respect to the changes of the moon. If the moon really influences the weather it is to be expected that a connection will also be observed in other records, but it cannot be expected that the maximum and minimum rainfall in the lunar month will be similarly situated in all cases with respect to the times of change. I venture further the suggestion that, if the moon affects the rainfall, the greatest influence will probably be found in connection with thunder storms and local showers.

II.—BY H. A. HAZEN,<sup>1</sup> WASHINGTON, D. C.

THERE is hardly an idea regarding the weather so firmly rooted and so widespread as this, that the moon has a rather marked effect in bringing about its changes. This paper by Professor Merriman is a very interesting contribution to the subject. I desire to add a little to what he says, as his conclusions are not the same as those reached by myself. This matter has been thoroughly investigated in England and Europe with a negative result, except that there seems to be a slight influence of the moon, or perhaps the tide, on the occurrence of thunder-storms, and that the full moon seems to have power to drive away clouds. All the feasts and festivals in Germany are at the time of full moon. This, however, may be as much for the benefit of the light as the lack of rain. In the U. S. Monthly Weather Review for October,

<sup>1</sup> As Prof. Merriman's paper has not been seen, this must be regarded as an independent discussion of the subject and not a reply to that.—H. A. H.

1885, there is a short paper, in which it is shown that over this country as a whole there is a preponderance of thunder-storms during the new moon. While in New Haven, Conn., special research on this question showed that in that place there was, from 1873 to 1880, nearly a half more rain just before and after new moon than full moon. A farther investigation for this whole country, also for 100 years at London, England, gave a negative result; that is, no effect from the phases of the moon. In 1889 an investigation on the lower California coast gave a preponderance of rain during full moon.

It has occurred to me that it would be advisable to calculate the data at Philadelphia, Pa., which is not far from Bethlehem, for this question. I first computed the data for fifteen years, 1871-1885, and afterward for the ten years 1882-1891, with the result given in the accompanying table:—

	Amount of rain day of and one day before and after.		Amount of rain day of and two days before and after.	
	1871-85	1882-91	1871-85	1882-91
New Moon	66.66	42.03	108.38	74.31
First Quarter	59.38	29.09	102.26	50.63
Full Moon	60.36	44.12	94.60	60.80
Last Quarter	55.72	47.59	101.06	64.03

It will be seen that in the first period of fifteen years there is a preponderance of rain at the time of new moon, which corroborates the result previously obtained at New Haven. In the second period, for the three days about each phase the result is similar to that of Professor Merriman, though the difference of two inches between new and full moon is very slight. When we take the five days about each phase, however, we see that the new moon has 13.5 inches more rain than the full. I do not advance these figures as proving any influence whatever. It must be almost inappreciable if there is any at all.

A word may be added regarding the influence of the moon in driving away clouds. I have detected this apparent influence many times by closely watching the moon. Of course, if this is a fact, it would show that there must be a tendency to less rain at the time of full moon. It should be borne in mind, however, that the minimum of cloudiness occurs in the evening or before midnight, and this complicates the phenomenon.

#### RECENT BOTANICAL EXPLORATIONS IN IDAHO.

BY D. T. MACDOUGAL, LAFAYETTE, IND.

IN various parts of the region occupied by the ranges, spurs and foot-hills of the Rocky Mountains are large areas which have never been explored by the naturalist. The species of the flora and fauna of such regions can, to a great extent, be approximated by a knowledge of the contiguous territory, especially if a similarity of climate prevails, but in all cases every natural area of land, such as a river, valley, or mountain range, gives to its forms of plant and animal life certain differences from all forms found in other localities. If the differences are of sufficient importance, they will constitute new species, and in many cases whole groups or genera peculiar to a certain region are found.

The exploration of certain areas invariably brings to light numerous undescribed forms of both plants and animals besides affording valuable information on the distribution and variations of known forms.

At various times collections and observations on the flora of the Rocky Mountains have been made by attachés of geographical and geological surveys, and by the various parties engaged in the exploration and survey of railroad routes across the continent, by individual workers under the direction of the several divisions of the U. S. Department of Agriculture, by representatives of various scientific societies, and by collectors working entirely independently.

The amount accomplished in this way cannot easily be estimated, but it may be suggestive to know that "The Systematic and Alphabetic Index of New Species of North American Phanerogams and Pteridophytes," published in 1891 by Josephine A. Clark, "Contributions from U. S. National Herbarium," Vol. I.,