small; 29th, 2 groups, 24 spots, mostly very small, air very good; 30th, 1 group, 12 spots; 31st, 2 groups, 10 spots, a long narrow spot very close to E. edge, probably a very large one.

Mr. H. D. Gowey, at North Lewisburg, O., observed spots on the 7th, and from the 21st to the 26th, inclusive. They disappeared by solar rotation.

NOTES AND EXTRACTS.

[American Journal of Science, April, 1880, page 300.]

Observations on the Height of Land and Sea Breezes, taken at Coney Island, by O. T. Sherman.—The following observations were taken at Coney Island with the captive balloons of the American Aeronautic Society, S. A. King, aeronaut in charge. Captain Howgate furnished the observer.

With the exception of the hotels, no height rises to interrupt the flow of the wind. We might expect, therefore, to find the sea breeze and its counter current undisturbed. The standard thermometer employed was of the Signal Service pattern, made by James Green, and carefully tested by the observer. The aneroid barometers were kept compared with a standard mercurial instrument at the surface. The anememeter, of Robinson's pattern, furnished by James Green, was used to measure the velocity of the wind at the top of the ascent, and also at the bottom. In the other cases, the forces were estimated.

The record was commenced as the balloon left the earth and continued without interruption till the balloon attained its highest point. At the top, the velocity of the wind was recorded by a "five minute" observation. On the descent the same plan was followed.

From the barometric readings, reduced to the mercurial standard, the heights were reduced by Loomis' table as given by Guyot. A comparison of these heights with those deduced from the length of the rope in use showed a close agreement. The thermometric readings reduced to the standard thermometer were then plotted in a curve whose ordinates were heights, and the abscissas, the degrees of the thermometric scale. The ascent and descent giving somewhat discordant values, a free hand curve was drawn between them. The positions of the curve are given in the annexed table. The force of the wind was treated in a like manner. The observed directions were then plotted opposite the heights. When discordant at one height, they were referred to that one of the sixteen equal divisions of the compass which lay between them. The whole was then referred to the mean of the times of leaving and regaining the earth, an interval of about fifteen minutes. New York time was employed. The results are given in the following table:

Table showing the direction and force of wind and the temperature at heights from 0 to 1200 feet above the beach at Coney Island, New York.

The first line in the table gives the heights above the ground in feet. The upper numbers indicate the temperature in Fahrenheit degrees. The lower the direction and the velocity of the wind. —— indicates no record of direction, or rather a direction between two neighboring directions.

Day.	Hr.	0	100	200	300	400	500	600	700	800	900	1000	1100	1200
1879.	h m	78.5	76	74.8	74.0	73.5	73.3	73.3						
July 31	10 15	NE. 3	—— 2.3	N. 2	—— 2.1	NNW. 2.3	—— 2.4	NW. 3						
		79.0	77.2	77.0	77.2	77.7	78.2							
" 31	2 46	SW. 2.8	S. 2.6	S. 2.0	S. 1.8	—— 1.3	Calm.			NW *				
		74.0	73.4	73.5	71.0	74.2	75.0							
" 31	7 26	SSW. 2.8	—— 2.8	S. 3.0	—— 3.0	—— 2.8	SSE. 2.2							
		77.0	76.6	75.2	74.3	74.2	74.2							
Aug. 1	9 46	SSW. 3	—— 3	SW. 4	SW. 5.6	SW. 7	SW. 7.5							
		82.0	77.2	76.0	75.2	74.8	74.4							
" 1	10 54	SSW. 5	—— 5	SSW. 5.5	—— 6.0	—— 6.5	SSW. 6.5							
		76.8	75.0	75.2	75.8	76.0								
" 2	9 0	SW. 3	—— 6.3	WSW. 7.0	W. 6.8	W. 6.3								
		84.0	84.2	84.6	85.2	85.6	86.0	86.2	87.0					
" 2	1 55	SSE. 9.0	SSE. 7	S. 5.0	S. 4.5	——	SSW. 5.0	—— 4.5	SW. 4.5					
		70.5	68.2	67.6	67.3	67.0	67.0	66.4	66.2	66.0	65.6	65.3	65.0	64.7
" 10	1 19	NNE. 2.0	—— 5.0	—— 5.4	—— 5.4	N. 6.0	—— 7.5	—— 8.7	—— 8.0	—— 6.0	—— 4.5	—— 5.0	NNW. 5.2	NNW. 5.7
		73.3	72.7	72.2	71.8	70.8	69.5	68.8	68.0	68.0	68.0	67.6	67.2	66.8
" 10	3 10	NW. .3	—— 5.3	—— 7.5	—— 9.0	—— 11.0	—— 13.5	—— 16.5	—— 16.5	—— 14.0	—— 12.0	—— 11.5	—— 11.7	NNW. 12.0
		72.8	71.0	70.3	69.8	69.2	68.5	68.0	67.5	67.0	66.8	66.4	66.2	66.0
" 10	5 42	NW. .3	NW. 4	—— 4	—— 3	—— 3	—— 3.8	NW. 4	—— 4	NW. 4	—— 4.0	—— 4.0	—— 4.0	NW. 3.8
		79.0	74.8	73.9	73.0	72.4	71.7	71.2	70.6	70.6	70.5	70.4	70.0	
" 11	2 10	SSE. .8	SSE. 8.3	—— 9.3	S. 8.2	S. 7.0	SSW. 6	—— 5.5	SSW. 5.2	—— 5.0	—— 5.2	—— 7.5	SSW. 10.5	
		74.5	73.2	72.7	72.7	72.7	72.7	72.0	72.0	72.0	72.0	71.5	71.3	71.1
" 12	10 50	S. 5	—— 5	—— 4.5	SW. 4.5	SW. 4.5	SW. 4.5	WSW. 3.6	WSW. 4.0	W. 4.5	—— 5.0	WNW. 6	—— 6	NW. 6.3
		78.0	71.5	71.3	70.6	70.0	69.6	69.5	69.2	69.2	69.2	68.7	68.2	68.3
" 13	11 30	SSE. 7.5	SSE. 8.4	SSE. 8.4	S. 8.4	SSW. 7.6	—— 5.0	SW. 3.8	WSW. 4.2	W. 4.7	WNW. 5.8	WNW. 6.8	WNW. 10.5	WNW. 12
		80.3	80.0	79.2	78.7	78.2	77.8	77.4	77.8					
" 14	1 42	SSE. 7.2	—— 4	—— 4.5	S. 7.5	SW. 9.8	SW. 11	—— 11.5	W. 12					

* Shown by a toy balloon as compared with the captive.

A slight inspection of the return rates of change shows that the return current has influenced the temperature of the air around it to a noticeable extent.

We may consider the observed wind as composed of the wind produced by a great storm in progress, and the sea or land breeze. The sea breeze blows perpendicular to the coast, or about southeast. To obtain the storm wind, I examined the 7:35 A. M. maps of the Signal Service, but since the observations were taken almost directly under areas of maximum pressure, the examination gave no useful results. I therefore adopted a method based upon the following considerations. Of all those directions and velocities which combined with the direction of the sea breeze can produce

the resultant, the storm breeze is that which remains when the sea breeze vanishes; the fact that the sea breeze vanishes is shown by the other component remaining undisturbed. For example, on August 13, the observed wind was SSE., velocity 7.5 miles. This might be produced either by S. 4.5, SE.; SSW., 4, SE., SW., 3, SE., etc., but of these SW., 3 most nearly satisfies the condition that it shall be observed by itself. The surface breeze therefore ends at about 650 feet from the surface of the sea, while above 700 feet a current from the land evidently deflects the breeze toward the northwest. Proceeding with each of the other cases in the same way a mean may be taken. In this manner we have drawn up the following table. The values, though necessarily approximate, gain much from our inability to launch the ballon save on calm days. The sign < implies that the given value is probably too high.

Day.	Hour.		Surface breeze ends.	Return breeze begins.	Return breeze ends.
1879.	h.	m.			
July 31	10	15 A. M.	<175 feet.	<400 feet.	
	2	46 P. M.	<500 feet.	About 750.	
	7	26 P. M.	<375 feet.	<400 feet.	
August 1	9	46 A. M.	200? feet.	<308? feet.	
	10	54 A. M.	Above.	the highest	point reached.
2	9	0 A. M.	<200 feet.	<250 feet.	
	1	55 P. M.	<200 feet.	<600 feet.	
10	1	19 P. M.	<400 feet.	<500 feet.	< 900 feet.
	3	10 P. M.	<500 feet.	500 feet.	<1100 feet.
	5	42 P. M.	None.	None.	
11	2	10 P. M.	<825 feet.	<900 feet.	
12	10	50 A. M.	<600 feet.	<800 feet.	
13	11	50 A. M.	<650 feet.	<700 feet.	1050 feet.
14	1	42 P. M.	<300 feet.	<400 feet.	

It becomes evident that both current and counter current are low in the atmosphere. They will perhaps serve to explain a fact often noticed, that though we could plainly see the steam from the locomotives as they whistled, yet could hear no sound though nearly above the track.

[Popular Science Monthly, July, 1880, page 421.]

Efficiency of Lightning-Conductors.—Direct evidence as to the efficiency of lightning-conductors is afforded in a government report from Schleswig-Holstein, which is referred to in a recent work on the subject by Mr. Richard Anderson. Thunder-storms are said to be more numerous in Schleswig-Holstein than in any other part of central or northern Europe, and the danger from lightning is correspondingly increased. The attention of the government insurance-office was called to the fact that, in four out of 552 cases of claims on account of damage from lightning, arising in eight years, conductors of approved design had been in use, and an expert, Dr. Holtz, of Greifswald, was appointed to inquire into the causes of failure. He found that, in every case where a building provided with a conductor had been struck by lightning, the conductor was not in an efficient state. Sometimes the point of the rod was needlessly ornamented with gilding, while the underground connection with the earth, the very element of safety, was neglected. In the absence of a proper ground connection, the lightning-rod, instead of being a protection, may prove the means of attracting the discharge into the building. A measure for the periodical testing of conductors is suggested, for the detection of defective constructions, interruptions of conductivity by rusting or displacement, or of other faults that may arise from time to time.

[Science, July 3, 1880, page 11.]

The Telegraph and Earthquakes.—A recent letter from Mr. W. A. Goodyear, now director of the governmental mining and geological survey of San Salvador, states that more than 600 shocks of earthquakes were felt there during the last ten days of 1879. They were heaviest about Lake Ilopango, where a shock occurred on the 23rd of December, which broke the telegraph wire asunder and "made the ground on which we stood a perfect network of cracks, opened new springs of water, increased the rivulets in the vicinity to ten times their usual volume, muddied the waters of the lake in many places, and rolled hundreds of thousands of tons of rocks down the steep hills in the form of land-slides." As a sequel to these earthquakes, came the irruption of a volcano in the middle of Lake Ilopango on the night of January 20th to 21st. The volcanic island resulting now measures over five acres in extent, and shoots up a column of steam into the air over 1000 feet in height. This is the first instance we have heard of earthquakes interrupting land telegraph lines, though there are cases on record of their interrupting cables.

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Albert J. Myer

Brigadier General, Chief Signal Officer, U. S. A.

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