SECTION I.—AEROLOGY.

SOLAR AND SKY RADIATION MEASUREMENTS DURING SEPTEMBER, 1916.

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[Dated: Washington, D. C., Oct. 28, 1916.]

For a description of instrumental exposures and an account of the methods of obtaining and reducing the measurements, the reader is referred to the REVIEW for January, April, and May, 1916, 44:2, 179–180, and 244, respectively.

The monthly means and departures from normal values given in Table 1 show that direct solar radiation intensities averaged above normal at all stations, the plus departures being most pronounced at Madison, Wis., and Lincoln, Nebr. At none of the stations did the maximum intensity for the month equal the highest recorded September intensity.

TABLE 1.—*Solar radiation intensities during September, 1916.*

Washington, D. C.

[Gram-calories per minute per square centimeter of normal surface.]

Date.	Sun's zenith distance.									
	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass.									
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
A. M.	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*
Sept. 1		0.88	0.77	0.67	0.56	0.51	0.49	0.46		
3	1.42	1.33	1.24	1.16	1.09	1.03				
4			1.02	0.90						
5		1.15								
7	1.22									
8	1.12	1.07	0.97	0.87	0.78	0.70	0.62	0.54	0.49	
9	1.44	1.28	1.13	1.02	0.91					
10	1.39	1.28	1.18	1.09	1.01	0.93				
11			1.19	1.10						
13	1.35									
16	1.33	1.22	1.14	1.02	0.84	0.73				
18	1.24	1.06	0.91							
19	1.49	1.38	1.26	1.17	1.11	1.05	0.98	0.93	0.88	0.84
20		1.25	1.07	0.97	0.88	0.80	0.73	0.68	0.63	0.58
21		1.31	1.15	1.05	0.99	0.95				
22		1.06	0.95	0.86	0.77	0.69	0.61	0.55		
23		1.25								
24		1.15	1.01	0.87	0.74	0.65				
25		1.20	0.97	0.84	0.77	0.70				
27		1.21	1.07							
30		1.43	1.32	1.22	1.15	1.10	1.03	0.98	0.93	0.89
Monthly means	**1.33**	**1.21**	**1.08**	**0.99**	**0.89**	**0.82**	**0.74**	**0.69**	**0.73**	**0.77**
Departure from 8-year normal	+0.02	+0.01	+0.01	+0.01	+0.01	+0.02	+0.05	+0.06	+0.06	+0.12
P. M.										
Sept. 16		0.88	0.79	0.58	0.48	0.39	0.33	0.27		
19		1.38	1.26	1.15	1.06	0.98	0.92	0.86	0.80	0.75
20		1.20	1.10	1.03	0.93	0.87	0.81	0.76	0.71	0.67
21		1.36	1.25	1.14	1.04	0.97	0.91	0.85	0.79	0.71
22		1.10	0.88	0.71	0.64	0.58				
27		1.26	1.12							
30		1.37	1.26	1.17	1.08	1.00	0.94	0.88	0.83	0.78
Monthly means		**1.22**	**1.09**	**0.96**	**0.87**	**0.80**	**0.78**	**0.72**	**0.78**	**0.73**
Departure from 8-year normal		+0.03	+0.03	+0.01	±0.00	+0.02	+0.05	−0.03	±0.00	±0.00

TABLE 1.—*Solar radiation intensities during September, 1916*—Contd

Madison, Wis.

Date.	Sun's zenith distance.									
	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass.									
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
A. M.	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*
Sept. 2	1.23	1.17								
8		1.26	1.19	1.11	1.04	0.97	0.91			
14				0.99	0.93	0.89	0.79			
18		1.34								
19		1.27		1.06						
21		1.25	1.10	0.98	0.88	0.80	0.74			
29		1.39	1.31	1.24	1.17	1.11	1.04			
Monthly means	**(1.23)**	**1.28**	**1.20**	**1.08**	**1.00**	**0.94**	**0.87**			
Departure from 7-year normal	+0.09	±0.00	+0.07	+0.05	+0.03	+0.02	+0.01			
P. M.										
Sept. 8		1.30	1.19	1.12						
18		1.33								
19		1.27	1.17	1.05						
Monthly means		**1.30**	**(1.18)**	**(1.08)**						
Departure from 7-year normal		+0.09	+0.09	+0.08						

Lincoln, Nebr.

Date.	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
A. M.										
Sept. 13		1.39	1.27	1.17	1.08					
16		1.41	1.30	1.19	1.10	1.01				
21		1.32	1.25	1.18	1.11	1.05	1.00	0.91		
23		1.43	1.24		1.02	0.93	0.84			
25		1.38			1.17		1.02			
30		1.40	1.29							
Monthly means		**1.39**	**1.27**	**1.18**	**1.10**	**1.00**	**0.95**	**(0.91)**		
Departure from 2-year normal		+0.10	+0.12	+0.16	+0.12	+0.13	+0.19	+0.26		
P. M.										
Sept. 8	1.41	1.26	1.17	1.10	1.01	0.92	0.83	0.75	0.70	0.65
13	1.47	1.36	1.25	1.16	1.07	0.99	0.92	0.85	0.79	
14		1.40	1.30	1.24	1.15	1.06	1.01	0.97	0.83	
15		1.41								
18		1.34								
19		1.25	1.16	1.07	1.00	0.92	0.84	0.78		
20		1.28	1.13							
21		1.32								
22		1.31	1.20	1.09	1.01	0.94	0.87	0.81	0.75	0.70
30		1.34	1.18	1.04						
Monthly means	**(1.44)**	**1.33**	**1.20**	**1.12**	**1.05**	**0.97**	**0.89**	**0.83**	**0.77**	**(0.68)**
Departure from 2-year normal	+0.09	+0.03	+0.03	+0.04	+0.08	+0.05	+0.03	+0.06	+0.06	−0.02

Santa Fe, N. Mex.

Date.	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
A. M.										
Sept. 2			1.26	1.19	1.12	1.06	0.99	0.93	0.89	0.86
7	1.47	1.37	1.26	1.23	1.18	1.11	1.06	1.03	1.01	
8		1.44	1.30			1.11	1.05	1.00	0.93	0.87
13	1.53	1.45	1.39	1.27	1.16	1.18	1.14	1.07		0.94
14	1.50		1.31	1.24	1.16		1.04	1.02	1.00	0.96
15					1.10	1.07	1.04	1.01	0.97	0.89
26				1.27	1.24	1.21	1.16	1.10	1.02	0.99
27	1.53	1.47	1.40	1.33	1.24	1.16	1.10	1.06	1.03	1.01
29		1.45	1.39	1.32	1.27	1.22	1.18	1.14	1.08	
Monthly means	**1.51**	**1.44**	**1.33**	**1.26**	**1.18**	**1.14**	**1.08**	**1.04**	**0.99**	**0.93**
Departure from 4-year normal	−0.01	+0.02	+0.01	±0.00	±0.00	±0.00	+0.01	+0.01	+0.01	±0.00
P. M.										
Sept. 12		1.46	1.36		1.20	1.15	1.10	1.04	1.00	0.97
13		1.44	1.33	1.25	1.18	1.11	1.05	1.00	0.95	0.91
Monthly means		**(1.45)**	**(1.34)**	**(1.25)**	**(1.19)**	**(1.14)**	**(1.08)**	**(1.02)**	**(0.98)**	**(0.94)**

Skylight polarization measurements made at Washington on 11 days, with the sun at zenith distance 60°, give a mean of 56 per cent, with a maximum of 65 per cent on the 19th. This latter is 7 per cent less than the highest September polarization measurement previously obtained at Washington.

TABLE 2.—*Vapor pressures at pyrheliometric stations on days when solar radiation intensities were measured.*

Washington, D. C.			Madison, Wis.			Lincoln, Nebr.			Santa Fe, N. Mex.		
Date.	8 a.m.	8 p.m.	Date.	8 a.m.	8 p.m.	Date.	8 a.m.	8 p.m.	Date.	8 a.m.	8 p.m.
1916.	*Mm.*	*Mm.*	1916.	*Mm.*	*Mm.*	1916.	*Mm.*	*Mm.*	1916.	*Mm.*	*Mm.*
Sept. 1	16.20	14.60	Sept. 2	8.81	6.02	Sept. 8	10.97	18.59	Sept. 2	7.87	8.48
3	6.02	8.18	8	11.38	10.21	13	8.81	10.97	7	9.83	7.57
4	10.97	13.13	14	9.83	7.87	14	3.30	4.57	8	9.83	7.57
5	16.20	16.79	18	4.17	4.37	15	4.37	4.95	13	6.02	6.91
7	17.37	18.59	19	5.36	6.76	16	5.79	7.04	14	5.36	6.27
8	17.37	18.59	21	7.04	6.02	18	5.16	7.57	15	5.79	5.16
9	12.28	9.83	29	4.17	4.75	19	7.29	10.97	26	3.99	2.74
10	7.29	8.48				20	9.83	5.79	27	4.37	3.00
11	9.83	9.14				21	5.16	4.95	29	4.57	4.37
13	14.10	17.37				22	5.16	7.57			
16	8.48	9.14				23	5.36	8.48			
18	9.83	13.13				25	11.81	10.97			
19	5.79	7.29				30	3.30	4.75			
20	7.29	8.18									
21	8.81	10.20									
22	11.38	13.61									
23	12.68	7.87									
24	7.57	10.59									
25	8.48	10.59									
27	10.97	11.81									
30	5.16	6.50									

Table 3 shows an excess of radiation as compared with the September average, amounting to 8.1 per cent for Washington, 2.9 per cent for Madison, and 7.4 per cent for Lincoln.

TABLE 3.—*Daily totals and departures of solar and sky radiation during September, 1916.*

[Gram-calories per square centimeter of horizontal surface.]

Day of month.	Daily totals.			Departures from normal.			Excess or deficiency since first of month.		
	Washington.	Madison.	Lincoln.	Washington.	Madison.	Lincoln.	Washington.	Madison.	Lincoln.
1916.	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*
Sept. 1	480	328	290	63	− 64	−152	63	− 64	−152
2	362	518	457	− 53	129	17	10	65	−135
3	580	423	443	167	37	6	177	102	−129
4	573	299	530	161	− 83	95	338	19	− 34
5	525	244	452	115	−135	20	453	−116	− 14
6	230	506	435	−178	131	5	275	15	− 9
7	321	329	354	− 85	− 42	− 73	190	− 27	− 82
8	408	504	532	4	136	107	194	109	25
9	554	482	426	152	118	4	346	227	29
10	533	119	301	133	−241	−119	479	− 14	− 90
11	402	413	127	4	57	−290	483	43	−380
12	377	180	427	− 18	−173	12	465	−130	−368
13	410	346	551	17	− 3	139	482	−133	−229
14	231	223	539	−160	−122	129	322	−255	−100
15	126	236	506	−263	−105	99	59	−360	− 1
16	498	201	494	112	−136	90	171	−496	89
17	459	466	544	75	132	142	246	−364	231
18	454	498	516	73	168	117	319	−196	348
19	542	489	468	163	163	72	482	− 33	420
20	499	444	482	123	121	88	605	88	508
Decade departure							126	102	508
Sept. 21	542	378	505	168	59	114	773	147	622
22	474	301	498	103	− 14	110	876	133	732
23	358	430	483	− 10	119	97	866	252	829
24	374	447	382	8	139	− 1	874	391	828
25	397	355	423	34	51	43	908	442	871
26	414	200	139	54	−101	−238	962	341	633
27	473	119	422	116	−178	48	1,078	163	681
28	348	164	511	−6	−130	139	1,072	33	820
29	58	421	376	−293	130	7	779	163	827
30	504	423	448	156	135	82	935	298	909
Decade departure							330	210	311
Excess or deficiency since first of year: Gr.-cal.							−5,519	+3,003	
Per cent							− 5.1	+ 2.8	

SHADING EFFECT OF WIRE INSECT CAGES.

By HERBERT H. KIMBALL, Professor of Meteorology.

[Dated Weather Bureau, October 26, 1916.]

In the departmental experiments designed to discover methods for protecting plants from insect enemies some plants are wholly inclosed by a "cage" or framework covered with wire window screening. Such a screen of course intercepts a certain amount of the solar energy otherwise supplied to the plant, and it was desired to determine this screening effect as exactly as possible, since the screen must be left over the plant for a considerable period of its growth in order to give effective protection against insects.

The tests here described were made with a wire insect cage submitted by Dr. B. R. Coad, Bureau of Entomology, United States Department of Agriculture, in charge Delta Laboratory, Tallulah, La. The cage is made of 16-mesh wire cloth, the diameter of the wire measuring 0.011 + in. It is therefore presumed to be No. 29 wire, American gage, with a diameter of 0.011257 in. The wires of the woof are straight. Those of the warp are bent in crossing the woof, at an angle whose sine is 225.14/625 = 0.3602, or 21° 7′. The wires of the warp run vertically in the sides of the cage, and if the side containing the door is on the north side they run north and south in the top of the cage.

In measuring the transmission of the wire cloth a Smithsonian silver disk pyrheliometer was read inside the cage, while at the same time the total radiation was measured by means of a Marvin pyrheliometer exposed near by. At intervals the two instruments were compared by exposing both to the total solar radiation, and the results are summarized in Table 1.

TABLE 1.—*Summary of comparisons of Marvin and Smithsonian pyrheliometers.*

[Radiation in gram-calories per min., per sq. cm.]

Date and time. (75th mer.)	Number of readings.	Radiation.		Ratio: Smithsonian / Marvin.
		Marvin.	Smithsonian.	
1916.		*Gr.-cal.*	*Gr.-cal.*	
Aug. 14, 10:35 a. m.	7	1.389	1.405	1.012
14, 1:45 p. m.	7	1.377	1.369	0.994
18, 11:05 a. m.	9	1.051	1.076	1.022
22, 11:06 a. m.	9	1.160	1.178	1.016

In the first transmission tests made the top or a side of the cage was kept normal to the incident solar rays, this adjustment being maintained by watching the shadow cast by the frame. When thus adjusted the bent wires of the warp cast no more shadow than the straight wires of the woof.

The entire area of a unit square of the wire cloth, which is comprised between the axes of the bounding wires, equals $(0.0625 \text{ in.})^2$, or 0.003906 sq. in. The area of the clear space which transmits radiation equals $(0.0625 \text{ in.} - 0.011257 \text{ in.})^2$, or 0.002626 sq. in. The proportional part of the radiation transmitted should therefore be 2626/3906 = 0.672, and the part cut off by shading = 0.328. The measurements summarized in Table 2 give a somewhat greater shading effect than the above.