

II. *An Account of the Evaporation of Water, as it was Experimented in Gresham Colledge in the Year 1693. With some Observations thereon.* By Edm. Halley.

IN order to explain the Circulation of Vapour Experimentally, I caused an Experiment of the Quantity of Vapour arising simply from the warmth of the Water, without being exposed either to Sun or Wind, to be made in *Gresham Colledge*, which has been performed with great Care and Accuracy by Mr. *Hunt*, Operator to the Society: Having added up into one Sum the Evaporations of the whole Year, I find that, from a Surface as near as could be measured of 8 Square Inches, there did Evaporate during the Year, 16292 Grains of Water, which is 64 Cube Inches of Water, and that divided by 8 Inches the Area of the Water's Surface, shews that the depth of Water evaporated in one Year amounts to 8 Inches. But this is much too little to answer to the Experiments of the *French*, who found that it rained 19 Inches Water in a Year at *Paris*. Or those of Mr. *Townley*, who by a long continued Series of Observations has sufficiently proved that, in *Lancashire* at the foot of the Hills, there falls above 40 Inches of Water in the Years time. Whence it is very obvious, that the Sun and Wind are much more the causes of Evaporation, than any internal heat, or agitation of the Water. The same Observations do likewise shew an odd quality in the Vapours of Water, which is that of adhering to the Surface that exhales them, which they cloath as it were with a Fleece of Vaporous Air, which once investing it, the Vapour rises afterwards in much less quantity: which was shewed by the small quantity of Water that was lost in 24 hours time,

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when the Air was very still from Wind, in proportion to what went away when there blew a strong gale, although the Experiment were made, as I said, in a place as close from the Wind as could well be contrived. For which reason I do not at all doubt, that had the Experiment been made where the Wind had come freely, it would have carried away at least three times as much as we found, without the assistance of the Sun, which might perhaps have doubled it. By the same Experiment it likewise appears, that the Evaporations in *May, June, July, and August*, which are nearly equal, are about three times as much as what evaporated in the four Months of *November, December, January, and February*, which are likewise nearly equal: *March and April* answering nearly to *September and October*. This Fleece of Vapour in still Weather hanging on the surface of the Water, is the occasion of very strange Appearances by the refraction of the said Vapours differing from that of the Common Air, whereby every thing appears raised; as Houses like Steeples, Ships as on Land above the Water, and the Land raised, and as it were lifted from the Sea, and many times seeming to over-hang. And this may give a tolerable Account of what I have heard of seeing the Cattle at *High-water-time* in the *Isle of Dogs* from *Greenwich*, when none are to be seen at *Low-water*, (which some have endeavoured to explain by supposing the *Isle of Dogs* to have been lifted by the *Tide* coming under it.) But the evaporous *effluvia* of Water, having a greater degree of refraction than the *Common Air*, may suffice to bring those Beams down to the Eye, which when the Water is retired, and the Vapours subsided with it, pass above, and consequently the Objects seen at the one time, may be conceived to disappear at the other.

A T A B L E shewing the Evaporations of Water, Anno 1693. with the heights of the Thermometer and Barometer at 8 of the Clock each Morning.

January.				February.			
D.	Grain.	Ther	Barometer.	D.	Grain.	Ther	Barometer.
1	31 $\frac{1}{2}$	5	29, 7 Frost.	1	36	29	30, 0
2	21	14	29, 7 some Ra.	2	27	26	30, 2
3	21	12	29, 7	3	33	25	30, 2
4	23 $\frac{1}{2}$	8	29, 7	4	48	16	29, 9
5	23 $\frac{1}{2}$	8	30, 1	5	30 $\frac{1}{2}$	20	29, 9 some Ra.
6	26 $\frac{1}{2}$	1	30, 5 Frost.	6	26	16	29, 9 small Ra.
7	31	3	30, 5 Frost.	7	26	17	29, 8
8	25	5	30, 4 Frost.	8	28	11	29, 9 a Fogg.
9	23	3	30, 4 Frost.	9	23	16	30, 0
10	18	0	30, 4	10	26	20	30, 0
11	18	0	30, 4	11	39	8	30, 0
12	18	0	30, 4	12	40	5	29, 8
13	22	6	30, 3 Frost.	13	52	1	29, 4 high Wi.
14	20 $\frac{1}{2}$	7	30, 3 Frost.	14	35	6	29, 2
15	21 $\frac{1}{4}$	10	30, 3 Frost.	15	35	11	29, 4 some Ra.
16	24	15	30, 4 Frost.	16	24	20	29, 2 Rain.
17	18	13	30, 3 $\frac{1}{2}$ Frost.	17	39	20	29, 5 Rain.
18	18	11	30, 2 Frost.	18	39	19	29, 8
19	14	10	30, 1 Frost.	19	35 $\frac{1}{2}$	17	29, 7
20	14	3	29, 6	20	35 $\frac{1}{2}$	16	29, 3
21	21	0	29, 9	21	35	17	29, 0 Rain.
22	18	2	29, 9	22	29	10	29, 2
23	18 $\frac{1}{2}$	0	30, 0 Frost.	23	35	5	29, 3
24	18 $\frac{1}{2}$	3	30, 0 Frost.	24	37	1	29, 2
25	14 $\frac{1}{2}$	9	29, 9	25	35	5	29, 4
26	14 $\frac{1}{2}$	14	29, 7	26	23 $\frac{1}{2}$	8	29, 0 Snow.
27	20	17	29, 2	27	21	11	29, 4 Frost.
28	36	10	29, 7	28	24	14	29, 3 Frost.
29	27 $\frac{1}{2}$	15	29, 5 some Ra.	690 $\frac{1}{2}$ Grains.			
30	27 $\frac{1}{2}$	15	29, 7				
31	27	27	29, 6				

675 Grains.

March.

March.

April.

D.	Grain.	Ther	Barometer.	D.	Grain.	Ther	Barometer.
1	25	—12	29, 2 Frost.	1	32	15	29, 4
2	31 $\frac{1}{2}$	—12	29, 1 Snow.	2	39	15	29, 5
3	28	—13	29, 3 Sno.Frost.	3	37 $\frac{1}{2}$	14	29, 7
4	28	—12	29, 6 Frost.	4	37	23	29, 6 $\frac{1}{2}$
5	28	— 8	29, 3 Frost.	5	38	29	29, 2
6	20	— 1	29, 7	6	29	32	29, 2
7	35 $\frac{1}{2}$	— 5	29, 3 Rain.	7	32	33	29, 3
8	39	— 9	29, 7	8	32	35	29, 4
9	42 $\frac{1}{2}$	— 8	30, 0	9	28 $\frac{1}{2}$	40	29, 2
10	39	14	30, 0	10	35	33	29, 4
11	33	21	30, 0	11	37	33	29, 4
12	42	21	29, 8	12	34	37	28, 9
13	42	22	29, 6 $\frac{1}{2}$	13	39	32	29, 4
14	46	23	29, 4	14	39	33	29, 5
15	62 $\frac{1}{2}$	14	29, 6	15	39	29	29, 7
16	41	19	29, 5	16	35	30	29, 8
17	42 $\frac{1}{2}$	12	29, 4	17	37	31	29, 6 $\frac{1}{2}$
18	50	10	28, 9	18	36 $\frac{1}{2}$	36	29, 4
19	51 $\frac{1}{2}$	7	29, 2	19	33 $\frac{1}{2}$	36	29, 3 $\frac{1}{2}$
20	45	8	29, 2	20	36	32	29, 3
21	41	7	29, 0	21	39	37	29, 2
22	50	8	29, 4	22	46	55	29, 4
23	37	10	29, 5	23	42 $\frac{1}{2}$	35	29, 5
24	33 $\frac{1}{2}$	6	29, 4	24	52	35	29, 2
25	27 $\frac{1}{2}$	7	29, 3	25	50	35	29, 3 $\frac{1}{2}$
26	30	11	29, 4	26	95	36	29, 7
27	57	9	29, 6	27	38	44	29, 5
28	38	4	29, 6	28	43	46	29, 7 $\frac{1}{2}$
29	30	17	29, 5	29	40	49	29, 6
30	30	20	29, 4 $\frac{1}{2}$	30	52	42	29, 9
31	20	24	29, 3				

1166 Grains.

1203 Grains.

May.

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May.

June.

D.	Grain.	Ther	Barometer.
1	56	36	30, 1
2	61	26	30, 0
3	66	21	30, 1
4	61	19	30, 1
5	52	31	30, 1
6	48	45	29, 8
7	59 ^{1/2}	35	29, 8
8	51	34	29, 7
9	51	31	29, 6
10	43	35	29, 5
11	49	30	29, 5
12	54	32	29, 6
13	59	26	29, 7
14	59	32	29, 7 ^{1/2}
15	46 ^{1/2}	35	29, 7
16	46 ^{1/2}	34	29, 8 ^{1/2}
17	56	36	30, 1
18	70 ^{1/2}	36	30, 3
19	58 ^{1/2}	47	30, 1
20	76	50	30, 0
21	62	52	30, 1
22	73	64	30, 1
23	78 ^{1/2}	64	30, 1
24	90	62	29, 9 ^{1/2}
25	61	74	29, 9
26	67 ^{1/2}	68	29, 9 ^{1/2}
27	64	75	29, 9 ^{1/2}
28	71	67	30, 1
29	80	69	30, 2
30	89 ^{1/2}	70	30, 2
31	106	68	29, 9

1968 Grains.

D.	Grain.	Ther	Barometer.
1	78	65	29, 9
2	85	62	30, 0
3	95	54	30, 2
4	77	52	30, 1 ^{1/2}
5	63	50	29, 9
6	49	60	29, 7 ^{1/2}
7	46	67	29, 7
8	63	63	29, 7
9	63	69	29, 8
10	63	71	29, 8
11	55	70	29, 8 ^{1/2}
12	58	87	29, 8
13	59	75	29, 9
14	86	72	29, 7
15	63	79	29, 8
16	58	78	29, 9
17	86	79	30, 0
18	81	66	30, 0
19	92	57	30, 1
20	81	60	30, 0
21	80	71	29, 9
22	76	67	29, 8
23	63	69	29, 7
24	63	62	29, 6
25	57	65	29, 8
26	46	70	30, 0
27	49 ^{1/2}	68	30, 0
28	52	74	30, 0
29	59	68	30, 2
30	62	69	30, 2

2008 ^{1/2} Grains.

July.

<i>July.</i>				<i>August.</i>			
D.	Grain.	Ther	Barometer.	D.	Grain.	Ther	Barometer.
1	75	67	30, 0	1	80	71	29, 5
2	75	67	30, 0	2	77	73	29, 6
3	63	62	30, 0	3	77	63	29, 8
4	62	61	30, 1	4	78	64	29, 9
5	60	63	30, 1	5	79	73	29, 9
6	74	65	30, 0	6	81	70	29, 9
7	61	65	30, 0	7	94	83	29, 6
8	51	65	30, 0	8	79	86	29, 6
9	46	74	29, 9	9	68	82	29, 7
10	52	77	29, 9	10	70	83	29, 8
11	72	74	29, 8	11	92	85	29, 8 $\frac{1}{2}$
12	74	82	29, 4	12	70	80	30, 0
13	88	75	29, 7	13	81	73	29, 9
14	83	62	29, 9	14	68	75	29, 7
15	84	65	30, 1	15	69	74	29, 9
16	84	68	29, 8	16	77	72	29, 8
17	71	58	30, 1	17	77	77	29, 7
18	77	65	30, 2	18	84	77	29, 7
19	66	78	30, 1 $\frac{1}{2}$	19	86	64	29, 5
20	71	78	30, 1	20	78	68	30, 0
21	72	82	30, 0	21	68	67	29, 7
22	90	74	30, 0	22	71	65	29, 7
23	99	68	30, 0	23	75	55	29, 9
24	85	71	30, 0	24	64	54	29, 5
25	85	81	29, 9	25	63	57	29, 5
26	94	75	29, 9 $\frac{1}{2}$	26	58	59	29, 4
27	97	70	29, 8	27	60	55	26, 5
28	81	78	29, 7	28	53	55	29, 9
29	87	67	29, 9	29	53	58	29, 7
30	78	64	29, 9	30	53	56	29, 7
31	78	79	29, 3 $\frac{1}{2}$	31	63	48	29, 7

2335 Grains.

2246 Grains.

September.

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September.

October.

D.	Grain.	Ther	Barometer.
1	53	53	29, 7
2	55	50	29, 6
3	61	50	29, 7
4	61	48	29, 7
5	63	44	29, 8
6	74	40	29, 7
7	62	39	29, 6
8	59	49	29, 5
9	40	52	29, 5
10	50	48	29, 6 $\frac{1}{2}$
11	46	41	29, 7
12	48	43	28, 8
13	46	53	29, 7
14	43	57	29, 5
15	46	70	29, 2
16	49	54	29, 3
17	46	52	29, 1
18	52	45	29, 0
19	48	45	29, 3
20	50	44	29, 6
21	43	42	29, 9
22	41	51	29, 5
23	46	45	29, 9
24	44	52	29, 7
25	41	47	29, 8
26	43	47	29, 6
27	46	45	29, 7
28	47	40	29, 9
29	50	44	29, 8
30	40	42	29, 5

1495 Grains.

D.	Grain.	Ther	Barometer.
1	40	35	29, 9
2	37	41	29, 6
3	41	35	29, 7
4	27	49	29, 6
5	29	48	30, 0
6	31	49	30, 2
7	29	58	30, 0
8	37	60	30, 0
9	39	59	30, 2
10	37	55	30, 1
11	34	55	29, 9
12	38	55	29, 8
13	39	42	30, 0
14	49	38	29, 8
15	44	28	29, 7
16	44	19	29, 7
17	35	23	29, 1
18	34	24	29, 2
19	34	20	29, 2
20	35	21	29, 5
21	35	17	29, 9
22	24	28	29, 7
23	28	25	29, 7
24	39	20	30, 0
25	41	13	30, 0
26	34	16	29, 9
27	35	13	30, 0
28	32	18	29, 8
29	33	10	29, 8
30	35	5	29, 7
31	28	7	29, 4

1095 Grains.

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November.

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November.				December			
D.	Grain.	Ther.	Barometer.	D.	Grain.	Ther.	Barometer.
1	18	22	29, 6	1	34 $\frac{1}{2}$	-15	30, 0 Frost.
2	15	30	29, 7	2	16 $\frac{1}{4}$	-10	30, 0 Rain.
3	24	34	29, 6	3	12	0	29, 9
4	26	30	29, 7	4	12	7	29, 4 some Ra.
5	33	21	29, 8	5	17 $\frac{1}{2}$	10	29, 2
6	33	10	29, 8	6	33	15	29, 4 some Ra.
7	29	9	29, 7	7	19 $\frac{1}{2}$	15	29, 1 $\frac{1}{2}$ (wind.
8	20	23	29, 5	8	13	20	29, 0 R & much
9	21	21	29, 9	9	13	27	28, 6 $\frac{1}{2}$ R. & stor.
10	21	30	29, 7	10	25	16	28, 9 some Ra.
11	32	27	29, 7	11	28 $\frac{3}{4}$	13	29, 6
12	22 $\frac{1}{2}$	34	29, 5	12	28	9	29, 5
13	31 $\frac{1}{2}$	23	29, 4	13	25	14	29, 2
14	25 $\frac{1}{4}$	15	28, 9	14	15	20	29, 2 some Ra.
15	27	10	29, 4	15	19	20	29, 5
16	25 $\frac{1}{2}$	3	29, 6	16	22 $\frac{1}{2}$	15	29, 5
17	26	—	7 29, 5	17	17 $\frac{1}{2}$	20	29, 5
18	21	—	1 29, 5 great fog.	18	21 $\frac{1}{2}$	10	30, 1
19	21	—	2 29, 5 great fog.	19	22	3	30, 0
20	19	2	29, 6	20	16	6	29, 8
21	15	5	29, 8 Fog.	21	14 $\frac{1}{2}$	9	29, 6
22	11 $\frac{1}{2}$	12	29, 7 some Ra.	22	16 $\frac{1}{2}$	14	29, 3
23	20 $\frac{1}{2}$	14	29, 7	23	22	11	28, 5 Stormy.
24	24 $\frac{1}{2}$	8	29, 8	24	23	4	29, 0
25	24 $\frac{1}{2}$	5	29, 9	25	22	0	29, 5 Frost.
26	33	-12	29, 9 Frost.	26	22	5	29, 2, Rain.
27	33 $\frac{1}{2}$	-12 $\frac{1}{2}$	29, 9 Frost.	27	16	10	29, 3
28	27	-14	29, 8 Frost.	28	20	6	29, 0
29	42	-16	29, 8 $\frac{1}{2}$ water	29	25 $\frac{1}{2}$	0	29, 2 Frost.
30	42	-17	29, 9 $\frac{1}{2}$ frozen.	30	19 $\frac{1}{2}$	5	28, 6 Stormy.
				31	24	7	29, 2

764 Grains.

646 Grains.

Note, That in the Column of the Thermometer, — denotes degrees of Cold below the freezing Point; and that from the 10th. of November to the end belong to the foregoing Year 1692.