TABLE 3.—*Monthly, seasonal, and annual precipitation at Lick Observatory, Mount Hamilton, Cal.*—Continued.

Season.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Seasonal.	Year.	Annual.
1903-04..	0	0	T.	0.37	7.67	1.39	1.98	9.53	8.06	4.38	0.45	0.03	33.86	1904	35.21
1904-05..	T.	0.05	2.33	2.51	2.05	3.84	4.04	3.89	5.91	1.36	2.27	0	28.25	1905	23.04
1905-06..	0	0	0.02	0	3.50	2.05	11.66	5.76	9.72	1.81	3.15	1.15	38.82	1906	45.76
1906-07..	0	T.	0.28	0.05	1.92	10.26	9.81	4.69	12.90	1.14	0.42	0.92	42.39	1907	39.47
1907-08..	T.	0	0.01	1.62	0.18	7.77	5.02	4.26	1.95	0.70	2.39	0.02	23.93	1908	21.30
1908-09..	0	0	0	1.37	2.63	2.96	18.18	9.49	4.05	0.03	0.13	0	38.84	1909	43.11
1909-10..	0	0	0	1.77	2.59	6.87	6.24	3.12	3.28	0.91	0.12	0.07	24.97	1910	17.70
1910-11..	0.04	0	0.25	1.06	0.94	1.77	15.76	4.37	7.00	1.35	0.75	0	33.29	1911	34.12
1911-12..	0	0	0	0.46	1.21	3.22	4.44	0.50	3.96	2.70	1.31	0.44	18.24	1912	20.92
1912-13..	0	0	2.01	0.94	2.34	2.28	5.42	0.48	3.40	0.94	1.60	0.07	19.48	1913	23.46
1913-14..	0.06	0.10	0	0	5.34	6.05	11.57	5.24	1.51	2.01	1.80	.....	.....	.....	.....
Averages	0.01	0.02	0.38	1.55	2.82	6.07	6.03	4.55	5.37	2.62	1.54	0.34	31.30	.....	.....

The temperature data for Mount Hamilton have been compiled in Table 4. The data since July, 1888, have been compared with those published by the Weather Bureau, and are in essential agreement with them; in the few cases of disagreement the data for the months have been computed from the original record and the means derived from the new computation entered in the table; all additions have been made by an adding machine. The averages have been determined from the means entered in the table. The extreme temperatures, presented in Table 5, have been compiled from the original records. Owing to the differences in the exposure conditions the extremes before October 1, 1885, have been separated from those observed since that date. This separation has not been made for the means, as it is probable that the difference between the older means and the true mean temperatures for those months is less than the error they introduce into the averages, and it is desired to show the complete record of the station.

TABLE 4.—*Monthly and seasonal mean temperatures at Lick Observatory, Mount Hamilton, Cal.* (°F.)

Season.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	Seasonal means.
1880-1881.....	.....	.....	65.9	61.6	48.7	43.0	42.5	44.0	46.4	54.6	59.0	62.2	.....
1881-1882.....	69.4	66.7	62.2	45.6	38.4	42.8	35.8	35.4	41.7	46.2	63.4	63.2	50.9
1882-1883.....	72.5	73.3	68.0	50.6	44.1	47.2	45.2	39.2	51.0	43.6	53.0	67.8	54.6
1883-1884.....	74.0	70.0	69.6	50.8	50.0	46.4	46.0	40.0	39.2	43.6	54.4	55.4	53.3
1884-1885.....	62.4	72.8	60.6	56.2	52.5	41.0	49.0	47.1	51.9	50.0	57.6	58.8	55.0
1885-1886.....	68.4	75.0	66.4	61.5	.....	.....	.....	49.4	41.2	46.6	55.1	65.2	.....
1886-1887.....	46.2	.....	.....	51.3	48.3	50.4	43.6	33.0	51.4	46.9	53.8	61.3	.....
1887-1888.....	.....	69.0	67.2	59.2	53.4	40.6	35.6	44.6	41.9	54.6	53.8	55.6	.....
1888-1889.....	68.8	73.8	72.5	59.4	48.2	46.2	41.1	45.6	46.1	50.3	54.4	68.8	56.3
1889-1890.....	72.3	72.6	68.6	53.7	49.9	34.8	30.6	36.6	41.3	48.0	46.6	58.2	51.1
1890-1891.....	70.2	70.5	67.4	58.8	56.5	46.6	42.0	35.8	41.4	44.7	52.0	55.2	53.4
1891-1892.....	71.4	72.6	60.7	59.1	52.1	35.8	44.1	42.4	42.6	42.8	52.6	57.2	52.8
1892-1893.....	67.0	71.9	63.4	54.8	51.8	42.1	51.3	39.9	37.2	41.0	51.6	58.8	52.6
1893-1894.....	67.9	71.8	55.4	51.0	46.9	44.8	35.9	35.6	40.4	49.4	51.6	52.6	50.3
1894-1895.....	71.3	71.6	63.5	55.5	57.6	37.2	36.4	45.6	42.8	47.2	52.2	65.2	53.8
1895-1896.....	67.2	70.4	59.0	59.9	47.9	41.4	45.2	46.5	43.4	37.6	46.6	64.6	52.5
1896-1897.....	73.2	67.8	61.7	57.8	44.8	45.4	41.5	36.3	32.8	51.0	58.0	57.8	52.2
1897-1898.....	70.8	71.5	60.4	51.7	46.3	43.0	35.8	42.8	39.1	50.8	47.9	62.0	51.8
1898-1899.....	71.4	71.2	61.8	56.0	46.5	43.1	42.5	41.0	39.6	47.6	46.3	63.7	52.6
1899-1900.....	71.6	61.3	69.8	52.7	46.9	45.6	47.5	43.0	48.1	43.0	52.8	63.8	53.8
1900-1901.....	71.6	62.0	56.2	57.2	51.0	47.2	39.7	40.4	44.0	44.8	50.1	59.8	52.0
1901-1902.....	69.9	69.4	58.8	56.5	50.4	46.6	40.9	39.0	36.6	41.3	46.4	58.4	51.2
1902-1903.....	66.7	66.9	68.2	53.0	41.6	41.8	43.7	34.9	40.0	43.7	54.0	61.6	51.3
1903-1904.....	64.0	67.4	63.6	59.8	48.2	47.2	41.4	39.6	38.7	45.6	56.6	65.0	53.2
1904-1905.....	66.0	72.4	65.0	55.6	51.0	43.0	43.4	43.1	44.4	47.2	45.9	59.6	53.0
1905-1906.....	71.3	70.2	62.2	56.4	46.2	41.6	43.3	43.6	40.2	45.6	48.6	56.4	52.1
1906-1907.....	75.2	71.8	63.4	58.6	43.7	42.2	34.2	48.2	37.4	49.2	51.4	57.6	52.7
1907-1908.....	67.1	66.4	57.5	54.5	49.6	42.4	40.1	38.9	44.6	50.7	46.9	58.1	51.4
1908-1909.....	74.4	70.2	62.8	51.6	50.7	40.6	39.2	36.8	37.4	50.6	51.6	60.6	52.2
1909-1910.....	65.7	69.8	64.1	55.3	44.4	38.0	35.6	38.3	47.0	50.9	57.0	57.6	52.0
1910-1911.....	70.5	72.0	62.4	58.2	48.0	44.7	38.9	32.9	44.0	44.6	48.4	62.4	52.2
1911-1912.....	73.4	66.9	56.0	53.8	48.6	39.0	42.8	43.3	37.3	40.0	51.6	59.2	51.0
1912-1913.....	65.5	64.6	60.4	50.1	49.8	40.4	37.6	39.7	41.2	43.8	53.8	55.2	50.2
1913-1914.....	67.0	69.5	66.0	58.0	43.8	39.0	39.6	42.8	49.9	45.8	54.6	.....	.....
Averages....	68.9	69.8	63.4	55.5	48.2	42.8	41.0	40.7	42.4	47.2	52.3	60.9	52.5

TABLE 5.—*Extreme temperatures at Lick Observatory, Mount Hamilton, Cal., from Sept. 11, 1880, to May 31, 1914* (°F.).

Month.	From September 11, 1880.				From October 1, 1885.			
	Max.	Date.	Min.	Date.	Max.	Date.	Min.	Date.
	°F.		°F.		°F.		°F.	
July.....	97	14, 1886	30	3, 1902	97	14, 1886	30	3, 1902
August....	96	17, 1885	34	16, 1902	93	23, 1888	34	16, 1902
September	93	1, 1882	30	25, 1901	91	9, 1888 18, 1913	30	25, 1901
October...	90	12, 1901	28	29, 1901	90	12, 1901	28	29, 1901
November.	88	12, 13, 1892	13	19, 23, 1900	88	12, 13, 1892	13	19, 23, 1900
December.	72	23, 1899 6, 1900	17	25, 1899 20, 1911	72	23, 1899 6, 1900	17	25, 1899 20, 1911
January...	74	6, 1893	6	14, 1888	74	6, 1893	6	14, 1888
February..	74	18, 1893	12	12, 1884	74	18, 1893	13	4, 1899
March.....	80	29, 1881	18	14, 1881	76	26, 1887	19	29, 1897
April.....	82	27, 1881	21	13, 1883	80	13, 1888	22	12, 1911
May.....	90	19, 1881	21	1, 1901	88	31, 1910	21	1, 1901
June.....	92	6, 1883	29	3, 1902	90	23, 1895	29	3, 1902
Year.	97	July 14/86	6	Jan. 14/88	97	July 14/86	6	Jan. 14/88

NOTE.—Since October 1, 1885, the exposure has been the same, 7 feet above the ground between the north walls of the Meridian Circle House. Before October 1, 1885, the exposure was in a box in the saddle about 200 yards northeast of Observatory Peak and about 70 feet lower.

CONCLUSION.

The meteorological record at Mount Hamilton has been kept continuously for nearly 34 years; during the last 28½ years the exposure of the instruments, except the anemometer and vane, has been unchanged; and during the last 26 years the administration and the routine have remained unchanged. The record, therefore, furnishes a considerable body of data for a study of the mountain climatology of central California. It is especially fortunate that a regular station of the Weather Bureau is situated at San Jose in the Santa Clara Valley, near the foot of the mountain; there are, consequently, available records of undoubted value for a comparison of the climate of the mountain with that of the valley below. Such a study is now contemplated by the University of California and it is hoped that the results of the study will furnish a better understanding of the climatology of the Coast Range region of this portion of the State than has been possible heretofore.

THE NEGLECT OF ATMOSPHERICS.

The great neglect of the study of the atmosphere, both by students and teachers in universities and colleges, as compared to the study of other subjects that are less important to the human race, is common both to Europe and America. It can only be explained by a recognition of the fact that the study of the atmosphere in general has not yet been pushed to such a degree as to have attained great practical importance in the business interests of the world. We have not yet learned to control the storms or to make detailed, accurate long-range predictions of wind and weather. But the rapid approach of this desirable attainment will be greatly facilitated and indeed absolutely assured, when the study is taken up in earnest from the point of view of the experimental physicist rather than that of merely observational climatology. The mind, the brain, the intellect, not brawn and muscle, are the powers that Man must use in his search for the keys that will open the flood gates of the clouds and the winds.

The rapid progress of our knowledge of the upper atmosphere, experimental work with balloons, the prog-

ress in aeronautics, all point to the fact that the scientific study of the atmosphere needs to be rapidly advanced in order to keep up with the branches of practical work and the business enterprises that these have instigated.—[C. A.]

THE WEATHER VERSUS COAL-MINE DISASTERS.

The great loss of life attending the operation of our mines many years ago led to the appointment of commissions to see what could be done to diminish or prevent such accidents, which were said to be due to the sudden exhalation of gases within the mines and their explosion by contact with the miners' lamps. It was even thought that forecasts of low atmospheric pressure might be made useful to the miners.

The present state of our knowledge of this subject is shown by the following extracts from letters communicated by the Acting Director of Mines, at Washington, D. C.:

The matter of the possibility of giving warning to mine managers at times of low barometer has been carefully considered by the staff of the Bureau. The investigations both in this country and abroad do not justify the belief that any particular relation can be established between explosions of fire damp and the low barometric conditions. It is believed that those are in error who think that the contrary has long been recognized. The Royal Commission on Explosions in Mines deprecated the issuance of colliery warnings by the Meteorological Service of Great Britain. Compilations of statistics of explosions have shown no increased dangers from low barometric conditions; in fact, in some cases the opposite has been indicated, but this seems probably a matter of chance.

It is true that if gas is allowed to accumulate in the open workings of mines it will tend to come out when there is low atmospheric pressure, but the accumulation of fire damp in old workings is not usual in the mines of this country. On the other hand, in active workings where gas is encountered, in almost all cases it issues at a vastly greater pressure than atmospheric; sometimes it will be several times atmospheric pressure, and, therefore, any slight differences in the atmospheric pressure could not possibly affect its issuance.

As far as the Dr. Haber fire-damp signal is concerned, that is not for forecasting, but it is to make known when there is a dangerous accumulation of fire damp. It depends upon the difference of density of fire damp as compared with air, which is manifested through a difference in tone of two whistles. In correspondence it does not appear that the device has reached a stage where it can be considered practicable; nor does Dr. Haber claim that it will show less than 1 or 2 per cent, which is shown by the ordinary safety lamp.

A later note from the Acting Director states:

It may be further mentioned that, while the engineers of the Bureau do not believe that it is wise to attach too much importance to the effect of low barometer, yet they are by no means neglecting to obtain the records in every case, after a mine explosion, from the Weather Bureau, supplemented by local records where such are to be had and, further, they are continuing to study this situation in gaseous mines whenever opportunity presents. Therefore the opinions expressed in the letter above mentioned must be considered tentative.

THE ULTIMATE CAUSE OF OUR WEATHER.

During the past two centuries meteorology has become a mass of observational data. From this we have compiled numerous statistical averages of the data in reference to time, locations, the position of the sun, and numerous other interesting and instructive relations. Everything seems tending toward the realization of man's hopes, viz, the determination of the reasons for the existence of this variable weather and its eventual forecasting. Our hypotheses and theories are plausible and rational, but we are still almost as far from the goal as our colleagues the magneticians.

In a recent lecture by Dr. L. A. Bauer, he concludes by some remarks:

THE CAUSE OF THE EARTH'S MAGNETISM.

Possibly by this time, if not before, you may have said to yourselves: "Granted that the compass needle points north and south because the earth itself is a magnet, what, in turn, causes the earth's magnetism, why are the magnetic poles not only not situated at the geographical poles, but not even diametrically opposite one another; or why, instead of wandering to and fro with the lapse of time, do not the magnetic poles remain fixed in position?" Lest any of these questions should cause you sleepless nights, let me say that, for the present at least, it would appear the better policy to confess ignorance. We may also take comfort in the fact that if the student of the earth's magnetism has not yet discovered the true cause of his science, neither has the investigator of magnetism, in general, been able as yet to answer the question: "What is a magnet?"

The most famous astronomer of his time, Simon Newcomb, one day entered the office of the associate editor of the Standard Dictionary, expressing his dissatisfaction with the tentative definitions for the words "magnet" and "magnetism," as based, in the absence of authoritative knowledge of the causes, simply upon the properties manifested. He was promptly requested to try his own hand. After writing and erasing alternately for an hour or more, he finally, with a hearty laugh, submitted the following pair of definitions: "Magnet, a body capable of exerting magnetic force." "Magnetic force, the force exerted by a magnet." Equivalent definitions will be found in Ambrose Bierce's "Devil's Dictionary" and, in explanation, the author cynically remarks that they were "condensed from the works of 1,000 scientists who have illuminated the subject with a great white light, to the inexpressible advancement of human knowledge."

But after all, it would seem that it is not so much the Why and Wherefore as the Therefore by which human progress is most advanced. Man, as the astronomer Littrow jokingly remarked, is "das Ursachen-Thier" who is ever incited and stimulated by his inquisitiveness as to the *cause* of things. Though he may never determine the "Endursachen" or ultimate causes, his inquiries lead him to acquire a vast amount of data with the aid of which he at least finds out the laws governing the phenomena under investigation.

The accumulation of data must at present be the chief aim of the student of the earth's magnetism. Perhaps no other subject can furnish more instances that, while theories as to the Why and Wherefore, though propounded by the most enlightened of the age, are short lived, the facts accumulated by observation and experience remain as permanent acquisitions to the storehouse of human knowledge.

THE PLANETS AND THE WEATHER.

By W. J. HUMPHREYS, Professor of Meteorological Physics.

[Dated, U. S. Weather Bureau, Washington, July 9, 1914.]

The weather and all its endless and manifold changes ultimately depend upon the reception and emission of radiant energy by the atmosphere and the surface of the earth. It is the eternal ebb and flow and ceaseless readjustment to equality of these two streams of energy that determine the temperatures of the atmosphere and establish its every temperature gradient. It is these, in turn, temperature and temperature differences, that give us evaporation, condensation, pressure gradients, wind velocities, and all or nearly all other elements of weather and weather changes.

Hence, nothing can influence the weather that has no effect on either of these energy streams. Conversely, everything that does modify these streams, either generally or locally, has a corresponding control over all weather elements and the climates of all places.

Do the planets, then, in any way affect the amount or distribution of radiant energy received by or lost from the earth? If they do, in that proportion, and in no greater, they obviously determine the weather and control its changes.

Now, there are just two known ways by which the planets can change the amount, but not the distribution,