Explorations in the Birusa Caves and Rock Shelters on the Yenisei River, Siberia; Development of the Child among the Negrito, the African Negro, the Eskimo, and Native Siberians.

10. *A Theory of Nerve-Conduction:* A. G. Mayer, Department of Marine Biology, Carnegie Institution of Washington.

The theory of nerve-conduction is based upon the phenomena of adsorption. The results lend no support to the theory that the velocity of propagation of nerve impulse is that of a shear in the substance of the nerve.

11. *Zuñi Culture Sequences:* A. L. Kroeber, Museum of the Affiliated Colleges, San Francisco.

The author gathered a large number of potsherds in and near Zuñi, and is able to make a tentative chronological classification of the objects.

12. *The Numerical Results of Diverse Systems of Breeding:* H. S. Jennings, Zoological Laboratory, Johns Hopkins University.

The proportions of the population which are found after n generations arising from continued breeding in various ways are tabulated for 24 different methods of mating.

13. *On the Effects of Feeding Pituitary Body (Anterior Lobe) Substance, and Corpus Luteum Substance to Growing Chicks:* Raymond Pearl, Biological Laboratory, Maine Agricultural Experiment Station.

The commencement of the laying period in pullets is neither retarded nor accelerated by feeding pituitary and corpus substance, but the body growth is retarded.

14. *A Preliminary Report on Further Experiments in Inheritance and Determination of Sex:* Richard Goldschmidt, Osborn Zoological Laboratory, Yale University.

The article states a number of new results found by the author in continuing his earlier work on the interbreeding of gypsy moths. Every gradation of intersexualism from a normal female to a normal male, and from a male three-fourths of the way toward the female has been obtained.

15. *On the Degree of Inbreeding which exists in American Jersey Cattle:* Raymond Pearl and S. W. Patterson, Biological Laboratory, Maine Agricultural Experiment Station.

American Jersey cattle are about one half as intensely inbred when eight generations are taken into account as would be the case if continued brother $\times$ sister breeding had been followed. In general, Register of Merit animals are *less* intensely inbred than the ordinary population.

16. *Upper Limit of the Degree of Transitivity of a Substitution Group:* G. A. Miller, Department of Mathematics, University of Illinois.

The degree of transitivity of a substitution group of degree n which does not include the alternating group of this degree is always less than $\frac{5}{2}\sqrt{n} - 1$.

17. *The Extension of the Montana Phosphate Deposits Northward into Canada:* F. D. Adams and W. J. Dick, Commission of Conservation of Canada.

An account of the explorations carried out to ascertain whether phosphate-bearing rocks extend northward from Utah, Idaho, and Montana into Canada. In some places such an extension has been found.

Edwin Bidwell Wilson
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NOTES ON METEOROLOGY AND CLIMATOLOGY

SNOWFALL AND SNOW COVER

The destructive snowstorm of December 13, 1915, in the vicinity of New York showed strikingly the ocean control on the depth of snowfall. While the precipitation (rain and melted snow) was heavy everywhere, the depth of snowfall, according to press reports, ranged from little or nothing in eastern Massachusetts to one foot between New York and New Haven and two feet near Albany. The warmth of the ocean effectively prevented snowfall where the winds blew off the water and made it sticky and dense near the coast, even though the surface wind was from the north. Not until February or March does heavy snowfall usually occur with winds from the ocean. A

discussion with maps of the snowfall of the eastern United States was published by C. F. Brooks in the *Monthly Weather Review*, June, 1914, and January, 1915.

Snowstorms of the eastern United States are difficult to forecast, because a sleet or ice storm frequently occurs instead. Professor H. C. Frankenfield, of the Weather Bureau, has recently made a study of the temperatures preceding sleet and snow storms.[1] Steep temperature gradients northward, and high temperatures over the Gulf and south Atlantic states are necessary for sleet formation and usually absent before and during heavy snows.

The heavy snowfall problem in mountains of the west is discussed by A. H. Palmer in a well-illustrated paper, "The Region of Greatest Snowfall in the United States."[2]

Tamarack, and Summit, California, have the greatest observed snowfall in the United States.

Station	County	Watershed	Altitude (Feet)	Length of Record (Years)	Annual Snowfall (Inches)			Total Rain and Melted Snow (Inches)
					Average	Max.	Min.	
Tamarack.....	Alpine	San Joaquin	8,000	8	521	757	.....	57.5
Summit.....	Placer	Sacramento	7,017	44	420	783 776	154	48.1

During heavy snowfall the wind is usually relatively light, in marked contrast to the windy snowstorms of the east. The pressure of the snow on any raised objects becomes very great. A fence made of two-inch boiler flues has been bent; the snow sheds, even where built of twelve- by fourteen-inch timbers occasionally collapse, and the gables of the houses are steep to prevent similar crushing.[3] For thirty-two miles, from Blue Canyon to Truckee, expensive snow sheds are required to protect the Southern Pacific tracks from the snowfall and avalanches.

DEPTH OF SNOW ON GROUND (9-YEAR AVERAGE) (INCHES)

	Dec. 1	Jan. 1	Feb. 1	Mar. 1	Mar. 15	Mar. 31
T	19	62	165	183	194	192
S	9	44	122	127	140	118

Mountain snowfall is of immense value for water power and for irrigation; and to some extent this value is controlled by the rate of melting. Messrs. A. J. Jaenicke and M. H. Foerster have written an article on "The Influence of a Western Yellow Pine Forest on the Accumulation and Melting of Snow."[4] Five years of records near Flagstaff, Arizona, indicate that the snowfall in the forest and adjacent grass and farm land park is same; but that the rate of melting is different. In the park the minimum temperatures are lower and the maxima are higher than those in the forest. Thus the soil in the park is generally frozen before the winter snow cover is established, while in the forest the soil may freeze only in a few spots. Any water from melting snow in winter forms an ice layer at the base of the snow cover in the park, but sinks into the ground in the forest. In winter on account of the generally higher temperatures and the heating of the local bare spots and trees, the snow melts more rapidly in the forest than in the park. In spring, on the contrary, the formation of slush, the strong sunshine, and higher wind velocity in the park cause the snow to melt a week, or even more than two weeks, before the last drifts of snow in the forest. The frozen soil and the basal ice layer in the park allow the water to run off very rapidly, while only occasionally is there any surface run-off in the forest. The value of open forest for water conservation is evident.

[1] "Sleet and Ice Storms in the United States," Second Pan-American Scientific Congress.

[2] *Mo. Weather Rev.*, May, 1915. See map of the snowfall of the United States by C. F. Brooks, *Quar. Jour. Roy. Meteorological Soc.*, April, 1913.

[3] Note the destructive effect of the heavy snowfall at Flagstaff, Arizona, December 29–31, 1915.

[4] *Mo. Weather Rev.*, March, 1915.

In order to estimate the water from mountain snowfall which will become available in summer, snow surveys are made every spring in the mountains of the west. Type watersheds are surveyed; and the snow is estimated on adjacent ones. The use of a snow sampler gives best results. Several sections of tubing of small diameter are used to cut vertical snow cylinders. This is done at a great many points; and the water content of the snow determined by weight.[5]

WEST INDIA HURRICANES

Two very intense tropical cyclones visited the gulf coast in August and September, 1915, the first taking its greatest toll of life in Texas and the second in Louisiana. The 1915 Galveston storm made its appearance the morning of August 10 between Dominica and the Windward Islands of Barbados. The storm on passing Haiti, Jamaica and Cape San Antonio, Cuba, did immense damage to the banana and sugar crops; and sank one large steamer. In Texas the loss of life was 275; and in the severe floods occasioned as far as the Ohio Valley 30 were drowned. The cyclone passed out the St. Lawrence Valley August 23. The lowest pressure reading (reduced to sea level) was 28.20 inches (955.6 kb. or mb.) at Houston; the highest wind velocity for five minutes was 93 miles per hour, at Galveston. While the high tide at Galveston was about the same as in 1900, less damage resulted owing to the protection afforded by the sea wall and the elevation of part of the city.

The land winds on the coast of southern Texas brought on the highest temperatures ever recorded at Brownsville (104° F.), and Corpus Christi (100° F.). In Texas the central calm of the cyclone was about 6 miles in diameter, and its forward movement was 15 miles per hour.[6]

One of the most thorough studies ever made of a tropical cyclone was that conducted by Dr. I. M. Cline of the Weather Bureau at New Orleans, September 29, 1915.[7] The storm originated near 64° W. longitude in the Caribbean Sea September 23 and passed over New Orleans six day later. The sea level pressure minimum of 28.11 inches (952.5 kb. or mb.) at New Orleans established a new low record for the United States; and the winds attained tremendous velocities. At New Orleans the maximum for 5 minues was 86 miles per hour, and for half a minute, 130. At Burrwood, Louisiana, where the wind had an unobstructed sweep, the average velocity for 3 hours was 103 miles per hour, reaching 116 for 20 minutes, 124 for 5 minutes, and for about half a minute the rate of 140 miles per hour. While there may be doubt as to the accuracy of the cup anemometer, these figures give some quantitative measurement of the tremendous violence of the wind. The wind is described as coming in a series of puffs of a few seconds' duration. The wind did not veer gradually but changed suddenly from one point to the next; and just before each change the rainfall was intense. So violent was the wind that probably no house in New Orleans escaped damage. The total rainfall at New Orleans was 8.20 inches, but was as high as 14.43 in Washington County. Fifty miles west of the center the rainfall was negligible. The pressure gradient was 1 inch (33.9 kb. or mb.) in 50 miles. The central calm was about 8 miles and the whole storm (pressure below 29.50 (999.3 kb. or mb.)) 250–300 miles in diameter; and it progressed at about 12 miles an hour. The high tide overtopped the levees south of New Orleans and on the north overflowed from Lake Ponchartrain into the western part of the city. The loss of life was probably 275, and of property $13,000,000, of which a third was in New Orleans. The westerly course of both hurricanes was due apparently to the presence of high pressure areas in the east central United States. The relatively small loss of life in two such intense hurricanes is due largely to the ample warnings given by the United States Weather Bureau.

The weather immediately preceding the formation of a West India hurricane is usually hot, damp and calm. The region of origin is

[5] Professor J. E. Church, University of Nevada, Second Pan-American Scientific Congress.

[6] See *Mo. Weather Review*, August, 1915.

[7] See *Mo. Weather Rev.*, September, 1915.

generally in the west early and in the east in the middle of the season. According to Sr. J. C. Millas (Second Pan-American Scientific Congress) the original impulse which sets the air in rotation may come from winds at the level of the intermediate clouds. Thus the cyclones are probably largely convectional in origin but to some extent dynamical.

CLIMATIC SUBDIVISIONS OF THE UNITED STATES[8]

PROFESSOR R. DEC. WARD, after treating earlier and present climate subdivisions of the United States, proposes a new scheme based on the following principles:

> . . . the subdivisions should be chosen because of their special relations to cyclonic and anticyclonic tracks and movement; to local and characteristic weather distribution around lows and highs; to cyclonic and anticyclonic winds; and because of general similarity of weather types over each province. Finally, the districts should, as far as possible, be the same as those which have been officially adopted in the publication of the meteorological and climatic data of the region.

He makes eight provinces. The Eastern Province includes all the eastern United States except for the Gulf Province, a strip along the southern coasts extending inland about 200 miles from the Gulf of Mexico. The two Plains provinces have their eastern boundary roughly set at the 100th meridian—more exactly on the 2,000-foot contour. The two Plateau provinces begin at the main crest of the Rockies and the two Pacific provinces occupy the region west of the crests of the Sierra Nevadas and Cascades. The line dividing the northern from the southern Pacific, Plateau and Plains provinces follows in general the southern boundaries of Oregon, Idaho, Wyoming and Nebraska. These serviceable subdivisions not only follow Professor Ward's specifications, but also can be easily remembered.

NOTES

THE *Monthly Weather Review* under the acting editorship of Professor Cleveland Abbe, Jr., has become a comprehensive meteorological magazine international in scope. It contains in addition to direct meteorological contributions from Americans and foreigners many reprints and abstracts of important meteorological papers which have appeared elsewhere. The Weather Bureau library under the direction of Professor C. F. Talman contributes not only its monthly list of publications received and of papers bearing on meteorology, but also notes of general interest.

"A LIST of Meteorological Isograms," is the title of one such note by Professor Talman.[9]

> The term "Isogram" was suggested by Francis Galton in 1889 as a convenient generic designation for lines, on a chart or diagram indicating equality of some physical condition or quantity. . . . The largest number of those to which particular names have been assigned belong to meteorology.

The list of 90 such isograms includes the author of each term and the earliest instance of its use, so far as this information could be obtained by the compiler. Most of the terms are rarely used.

MISS E. BUYNITZKY, of the library, has contributed a "Tentative Classification for Meteorological Literature."[10] This is based on schedule F of the International Catalogue of Scientific Literature, but in general form is like the Dewey decimal system. The main divisions are as follows:

00 General Works.
10 Observatories. Methods of observation.
20 Instruments.
30 Physics of the atmosphere. Cosmical relations. Aerology.
40 Pressure.
50 Temperature. Radiation.
60 Atmospheric moisture.
70 Circulation of the atmosphere.
80 Atmospheric electricity.
90 Climate and weather.

There are 81 main heads and 71 subheads; and it is easy to add more. A few minor rearrange-

[8] *Bulletin of the Am. Geog. Soc.*, September, 1915, pp. 672–680. Condensed in *Mo. Weather Rev.*, September, 1915, pp. 467–468.

[9] *Mo. Weather Rev.*, April, 1915, pp. 195–198.

[10] *Mo. Weather Rev.*, September, 1915, pp. 362–364.

ments might be made to advantage; for instance, ice storms should be associated with sleet instead of with dew and frost; and percolation perhaps belongs with the relations of precipitation and vegetation to water supply and stream flow, rather than to the section of atmospheric precipitation. This classification is less complete, but more easily remembered than the International; and, being more recent than either the International or the Dewey systems, it meets in a satisfactory way the general requirements of modern meteorological literature.

MR. ROBERT SEYBOTH has compiled a valuable list of the "Serial Numbers of Weather Bureau Publications."[11] The numbers begin with 60 in 1895 and end with 560, the *Monthly Weather Review* for July, 1915. The list embraces the vast majority of Weather Bureau publications, and, in addition, the important unnumbered publications are mentioned.

PROFESSOR A. J. HERBERTSON died July 30, 1915, at the age of 50 years. He is noted in meteorology particularly for his contribution, "The Distribution of Rainfall Over the Land," compiled for the Royal Geographical Society in 1900, and for his editorship of the Oxford Wall Maps.

MR. WALTER G. DAVIS, director of the Oficina Meteorologica Argentina for more than 30 years, has retired on a pension. Mr. George Wiggin, a native of New Hampshire, for 21 years assistant director, is now acting director.

CHARLES F. BROOKS

YALE UNIVERSITY,
January 3, 1915

SPECIAL ARTICLES

THE DEVELOPMENT OF THE PHYLLOXERA VASATRIX LEAF GALL

IN Bulletin 209, recently issued by the United States Department of Agriculture, entitled "Testing Grape Varieties in the Vinifera Regions of the United States," Husmann makes the following statements, p. 12:

> The number of swellings, nodosities and tuberosities from insect punctures and the rotting of the root occasioned by them progress more or less rapidly and deeply in accordance with the texture and character of the root attacked. The weakening and ultimate death of the vine are determined by the extent of the punctures and the progress of the rot upon the roots.

Although Cook suggested that puncturing may be the stimulus for the gall production occasioned by the aphids, no evidence has ever been presented to confirm this theory. To the contrary, after intensive study of the grape-vine leaf gall produced by this insect, the writer has gathered evidence showing that so little puncturing is done by the insect that, as a gall-producing stimulus traumatic puncturing may be regarded as playing a very minor part. Histological sections of leaves attacked by *Phylloxera* readily reveal the actual puncturing done by the insect. This manifests itself in the broken-up condition of the epidermal and mesophyll cells through which the proboscis has passed. In a considerable number of slides, microscopic examination shows the proboscis itself passing through the punctured and broken-up cells. The writer has never found more than two or three epidermal cells and as many mesophyll cells thus ruptured. So slight a disturbance can not be looked upon as the main cause of such large hyperplastic growths as are produced on the leaves of the vine or on the roots of the vine. This view is substantiated by Cornu's excellent work upon the root swellings induced by the attacks of this insect.

The one thing that is definitely certain about the work of *Phylloxera* is the fact that it obtains its food by means of a sucking action. This action usually continues for about 12 to 15 days at one particular point on the leaf, and around this point, which may be called the sucking center, the gall develops. During this time the insect has obtained enough food to enable it to sustain itself, to increase its bulk considerably, and to produce several hundred eggs. The withdrawal of so much food at one point from tender growing leaves, the subsequent changes in tension and pressure at this point, and certain structural peculiarities of the gall itself, all suggest the

[11] *Mo. Weather Rev.*, July, 1915, pp. 346–350.