terrestrial only remain. This shows that at this location the sun-spot influence is represented by $\pm\sqrt{(0.449)^2-(0.430)^2}=\pm0.129°$ R., whence we infer that the solar influences are to the terrestrial influences as $(0.129)^2$ is to $(0.430)^2$ or as 0.0167 is to 0.1849, or very nearly as 1 to 11. A similar computation is still more instructive if we use not the mean daily temperatures for each year, but the annual means of the temperatures observed at 2 p. m., which may be supposed to show the direct heating power of the sun with especial clearness. In this case the variation of any annual mean is $\pm0.489°$ R. when both terrestrial and solar variations are included, but $\pm0.465°$ R. when sun-spot variations are excluded, thus leaving $\pm0.151°$ R. as the result of the sun-spot disturbances, and making the midday or maximum solar influence to be to the terrestrial influences very nearly as $(0.151)^2$ is to $(0.465)^2$ or as 0.0229 to 0.2162 or as 1 to 10.

THE NOISES MADE BY PROJECTILES AND METEORS.

The existence of the atmosphere at great heights above the ground is usually said to be demonstrated by the fact that meteors or shooting stars are heated by the compression of the air in front of them as they rush along at the rate of from 10 to 30 miles per second. The heat is sufficient to burn off the surface of the meteor, making a bright light and oftentimes leaving a trail behind. The altitudes of such meteors vary between 10 and 100 miles, as shown by satisfactory observations for parallax, made by observers many miles apart.

At this great altitude the air is probably very rare; it may even be questioned whether it is dense enough to produce any great heating effect at an altitude of 100 miles. We are inclined to suspect that there may be clouds of fine solid particles revolving about the earth in this region rather than a gaseous atmosphere. The zodiacal light may be explained as the light from either a gaseous ring or a stream of particles as fine as sand surrounding the earth. A gas under no external pressure will not stay in one location; it either diffuses or else becomes a ring of independent particles.

There has been some discussion as to the ultimate origin of the noise that proceeds from a large meteor as it rushes through the atmosphere. Most observers describe the noise as similar to that of the discharge of a cannon, but followed by a long rumble like that of thunder or perhaps the rattle of musketry. The meteor moves so rapidly that we have, as it were, a straight line many miles long and a hundred miles distant from the observer which becomes the source of sound waves starting almost simultaneously from the whole length of the path. The concentration of these waves at the observer's station explains the explosive noise and the subsequent rattling, but what makes the original violent sound waves? There are four ideas as to this, all of which may be true:

1.—The meteor strikes the air so violently as to produce the same effect as when it strikes a liquid or a solid.

2.—The rapid movement of the meteor leaves a long vacuous trail, into which the surrounding air rushes and the impact of air on air starts the sound wave.

3.—The meteor revolving rapidly on its axis, striking the air a myriad of times on all sides and in all directions, produces a rapid succession of waves.

4.—The meteor is so heated by the compression of air in front that it burns and cracks, and there is a continuous sputtering as its surface particles burn up, split off, and flow away.

What are the phenomena of sound observed a short distance from the path of a projectile when going past the observer at the greatest possible speed? Can any plausible explanation of the noises that attend meteors be given, taking into consideration the fact that the greater part of their path is at such a high elevation that atmospheric pressure or density is not the thousandth part of what prevails at the earth's surface? I have heard the whistling of bullets as they passed over my head, but these do not move much faster than the waves of sound, whereas a meteor frequently moves 20 miles per second, or 100 times the velocity of sound and the noises starting simultaneously from the 20 miles of its path that is nearest to the observer, must reach his ear as one concussion.

On this subject Prof. Philip A. Alger of the United States Naval Academy, of Annapolis, Md., writes as follows:

Although I have witnessed the firing of thousands of rounds from all sorts of guns, I can not distinctly recall the sound made by projectiles in flight as heard by one near the guns. I suppose the attention is distracted by the louder sound of the discharge; and I have never been near the path of a projectile and at the same time far from the gun itself. The sound made by a piece of shell, such as often glances from an armor plate and flies to a considerable distance, is like a shrill whistle, as I remember it; and the sound made by a large shell which for some reason has not sufficient rotation to travel smoothly point first and therefore wabbles and finally tumbles end over end, is as Lieutenant Strauss describes it.

Many of the projectiles to which the inclosed letters refer have velocities as high as 2900 and 3000 feet per second.

As far as meteors are concerned, it seems to me unlikely that their impact upon the atmosphere can make a sound in the way that would happen if they struck a solid or liquid. There can be no line of demarcation between the atmosphere and surrounding space, it seems to me, and the meteor will pass by insensible gradations from a vacuum into air of measurable density.

I imagine the other three causes you name, and especially the rushing of the air into the vacuum formed in the meteor's path, are the true explanations.

Lieut. A. C. Diffenbach writes:

In reply to yours of the 4th, the consensus of opinion seems to be that the nearest approach to description of the noise of the shell in flight is that of a railway train when a little distance off, so as not to hear the clatter of the rails, but simply a roar. It is very difficult to describe. It seems a little bit like some one holding a tube to your ear and giving a prolonged shout or roar into it. Of course, it has the fading away due to distance.

Lieut. John Strauss writes:

While in the office at the Naval Proving Ground I have, of course, frequently heard the sound of passing projectiles. As the disturbed air wave reaches you, a sound is made that is about half way between a boom and a crack, and then a moment later comes the boom of the discharge. The crack is almost as loud as the boom and perhaps a little more annoying.

When a large shot tumbles, the rumble sounds to those near the trajectory like that of a railroad train.

CLIMATE AND MANKIND.

Prof. R. E. Dodge, of Teachers' College, Columbia University, has written a pamphlet of 18 pages, entitled a "Syllabus of a Course of Six Lectures on Climate and Mankind."

1. Climate and Mankind: Introduction. 2. Life in Deserts. 3. Life in Temperate Lands. 4. Life in Tropical Forests. 5. Mountains and People. 6. Plains and People.

As many of the readers of the MONTHLY WEATHER REVIEW are engaged in lecturing and teaching on these subjects, we can not do better than to recommend that they send ten cents to the Teachers' College of Columbia University, New York City, and obtain a copy of this syllabus, as it certainly contains many excellent suggestions for the use of teachers of geography, among whom Professor Dodge is a leading authority.

RELIABILITY OF HIGH WIND RECORDS.

In reply to a question as to the highest recorded velocity and pressure of the wind, it may be said that it has long been recognized that the devices that were used in 1870 and earlier for measuring the force of the wind by means of the pressure on moving plates, etc., are likely to yield quite inaccurate results, especially with respect to the maximum gusts. This is owing to the unavoidable effects of the inertia of the moving systems involved in the registration. It is quite improbable, for example, that the pressure of 90 pounds per square foot reported to have been indicated by the Osler's pressure gage at Bidston, Liverpool, March 9, 1871, was an accurate record of the force of the wind at that time and place.

Even at the present time there is a great deal of uncertainty not only as to the velocity of the wind in those cases where our instruments indicate velocities of from 50 to 100 miles per hour, but also as to the relations between velocity and pressure under these extreme conditions. This is owing to the difficulty and expense surrounding reliable experimental investigations of this problem, and also to the considerable discordance that exists between the results of the investigations that have been attempted.

The question was quite extensively studied in England by the Wind Force Committee of the Royal Meteorological Society, and numerous papers on the subject will be found in the "Quarterly Journal of the Royal Meteorological Society," since about 1888. Notes of exceptionally high wind pressures, as deduced from the results of the investigations referred to, will also be found in the recent numbers of "Symons's Meteorological Magazine."

In regard to the highest wind velocity records in the United States, it may be stated that records by the Weather Bureau type of Robinson anemometer used on Mount Washington, N. H., have frequently shown velocities ranging from 100 to 120 miles per hour. There is one doubtful record of a velocity of 186 miles per hour, but we have authentic records of 150 miles per hour. We have also a perfect record from our station at Point Reyes Light, Cal., of a long sustained velocity exceeding 90 miles per hour, with an extreme velocity of 120 miles per hour.[1] It must be confessed that we are unable to accurately interpret the indications of our anemometers at these very high velocities.

The size and inertia of the Robinson anemometer affect its records, and that too differently in gusts and in steady winds. The Weather Bureau pattern has been tested up to 60 miles per hour only, and the resulting table for converting recorded into true velocities is as follows:

Indicated velocity.	Correct velocity.
5	5.1
10	9.6
20	17.8
30	25.7
40	33.3
50	40.8
60	48.0
70	55.2
80	62.2
90	69.2

All velocities above the 60-mile limit must remain hypothetical until the apparatus has been properly standardized.

THE PHILIPPINE WEATHER BUREAU.

The Annual Report of the Director of the Philippine Weather Bureau for the year ending August 1, 1902, is addressed to the Hon. Dean C. Worcester, Secretary of the Interior, P. I., and was printed as Appendix P, pp. 663–677, of the Report of the Philippine Commission to the President of the United States. Although printed at Washington in 1902, this report reached the U. S. Weather Bureau, via Manila, only in July, 1903.

The publications of the Philippine Weather Bureau, so far as we have received them, may be classified as—

(*a*) The Annual Report of the Director to the Philippine Commission. Published in octavo as an official document of the United States Senate, at Washington, and also to be had as a separate from the Annual Report of the Bureau of Insular Affairs, under the Secretary of War.

[1] See Monthly Weather Review, February, 1903, pp. 64–68.

(*b*) A series of bulletins of information printed in Manila by the Bureau of Public Printing, on behalf of the Manila Central Observatory. This series is a continuation of an earlier series, alternately 8vo and 4to, dealing with seismology and the seismic service of the archipelago. The first five are in Spanish; the sixth is by the Assistant Director of the Philippine Weather Bureau, M. Saderra Masó, S. J., entitled: Report on the Seismic and Volcanic Centers of the Philippine Archipelago. Manila, 1902. The preface is dated September, 1901. This pamphlet of 26 pages, with several maps, gives an admirable summary of our knowledge of Philippine vulcanology. On page 20 is given a table showing the monthly frequency of earthquakes during eighteen years. Nine hundred and sixty-two shocks are recorded, being an average of fifty-three earthquake days for last year, or 4.5 per month. An earthquake day is the date of the main shock, and does not include the subsequent shocks. The maximum frequency occurred in 1881 and again in 1897 and the minimum in 1886. The annual variation is such that we apparently have a minimum in March, a maximum in February, and a principal maximum in September; but these annual and monthly maxima are not sufficiently well marked to justify the conclusion that they represent normal periodicities. They will probably be changed by increasing the number of observers and the number of years of record, and, especially, by the substitution of seismographs for personal observations. In this same series of bulletins of information we must include the publications bearing on terrestrial magnetism, which began with the magnetic observations at Paragua, Jolo, and Mindanao in the year 1888: this subject includes five pamphlets, the last one being, The Magnetic Dip and Declination in the Philippine Islands. In this series, also, we include the publications bearing on meteorology proper. These begin with the pamphlet by Father Faura, On the Cyclones of October 20 and November 5, 1882, and include twenty-five pamphlets, of which the latest is by Father Algué, Observations of Soil Temperatures at Manila, 1896–1902. One of the most elaborate papers in this series is the Climatologia de Filipinas, which is a large collection of data and maps, 265 pages and 64 plates, printed at Washington in 1900.

(*c*) The third class of publications includes the regular monthly and annual volumes of data published in quarto. This series begins with the monthly bulletin in Spanish from 1865 to 1901, which contains the tables of meteorological, magnetic, and seismic observations; since 1901 agricultural data have been added. The monthly bulletin has gone through several slight changes as to its name and contents, but is sufficiently described by its title. The annual volumes begin with the Report of the Director of the Philippine Weather Bureau for 1901–2. This includes: Part 1. The Climate of Baguio (Beguet). Manila, 1902. Part 2. Report of the Director of the Philippine Weather Bureau, 1902. Meteorological Service of the Philippine Islands. Manila, 1903. Part 3. Hourly Observations of Atmospheric Phenomena at the Manila Central Observatory, 1902. Manila, 1903.

It is probable that these three parts, although they receive independent paginations, are intended to form one volume and there is nothing to indicate but that a fourth part will be necessary in order to complete the volume for the official year 1901–2. This first volume, therefore, as far as received, consists of 74 pages devoted to the climate of Baguio; 68 pages devoted to the history of the meteorological service of the Philippine Islands from its establishment in 1865, under the Spanish Government, to its organization in May, 1901, under the Government of the United States, concluding with the legislation of 1902; and 147 pages devoted to the complete record of hourly observations taken during the year 1902 at the Central Observatory of Manila.

Such a complete publication as this of records for Manila and