Professor Udden estimates the load of sand and dust that may be carried by the atmosphere under different conditions as to wind and soil. His estimates vary from 0.0009 grams per cubic foot, or 160 tons per cubic mile, as appropriate to a thick haze up to 0.77 grams per cubic foot, or 126,000 tons per cubic mile in the case of the highest estimate based on the quantity of sand found in dwellings. He finds the quantity of work done by the atmosphere in transporting soil to be about $\frac{1}{880}$ of the work done by the Mississippi River and its tributaries over the area of its watershed.

Recently the newspapers and scientific periodicals have contained accounts of a remarkable storm with falls of red rain or snow and red dust throughout southern Europe.

The International Decade Report for the first ten days of March says:

On March 10 and accompanying a depression traveling from Algeria to Pomerania, there occurred a sirocco with red dust in the morning in Sicily, in the afternoon in southern Italy; on March 11 there fell red and yellow dust generally with snow northward in Brandenburg and Pomerania, with east wind by midday, and over the lower Elbe and Weser with north wind by the evening of the 11th.

Prof. A. W. Rücker, of England, who had been staying some time at Taormina in Sicily, communicates the following interesting report. (See Nature, March 28, 1901, page 514.)

On March 12 the sirocco was blowing and the hills were wrapped in mist, but the fog assumed a yellow hue, and the sun, which at times could be seen through it, was a bright blue; this was caused and accompanied by a copious fall of red dust. Some which I shook off my hat was quite dry, and on looking at it through a low power lens all the granules seemed to be spherical, except a very few grains which looked like quartz. Of course, the question was raised whether Etna was ejecting something which corresponded to the Krakotoa dust, but this was negatived by the fact that the Italian papers state that the dust fell also at Naples and Palermo in such quantities that the streets looked red and the people were frightened. I scraped some off a marble table which I send you.

Under the microscope this dust is seen to be mainly composed of inorganic particles, chips of quartz in small quantities being mingled with minute plates of various micaceous and other minerals. There is also a fair admixture of frustules of fresh water diatomaceæ, entire and in fragments. The number and variety of these diatomaceæ does not appear to be so striking as in some of the celebrated cases described by Ehrenberg, the organisms from which were figured by him in his Passant Staub und Blut Regen, 1847. There are, however, a very considerable number of species represented in these recent falls.

On March 20 Professor Rücker says:

At 7:30 this morning the sky was copper colored, and it was evident that another fall of dust was taking place. The sirocco had been blowing for two days and it was raining slightly. The sky ceased to be copper colored about 8 or 8:15 a. m.

Under these circumstances he measured the dust that accumulated on various flat surfaces during the hour. The measurements gave the following results:

(a) 0.0010 grams per square inch; (b) 0.0017 grams per square inch. The average of these 0.00135, or about five and one-half tons per square mile gives a fair idea of the density of the dust in the region of Taormina.

In the Meteorologische Zeitschrift for March, 1901, pages 137–139, is a preliminary report on the dust storms of March 10, 11, from which we take the following items: The chart shows that a depression passed from the Algerian coast across Sardinia, Corsica, and northern Italy in a northeastern direction, and on the morning of the 12th was over west Prussia. Attending this distribution of pressure strong sirocco and high temperatures prevailed on the morning of the 11th throughout the Adriatic Sea, and the phenomena of 1879, February 24–25, described by Hann in his Meteorological Atlas were now again repeated. On that occasion as well as on the 15th of October, 1885, when a storm center moved over the same path, dust fell over Italy and the southern Alps and red-colored snow was observed near Vienna.

The dust was examined by Professor Perhanz both microscopically and chemically, and was found to be perfectly similar to the sands of the Desert of Sahara, as described by many authors. In Palermo the sky was covered with dark, red clouds after 8 a. m. of the 10th. The whole city appeared bathed in red; at noon time the drops of heavy rain looked like blood. At Naples, about 5:45 p. m. of the 10th, the sky became bright yellow and afterwards fiery red. The clothing of those in the street was entirely covered with dust. It was difficult to keep the eyelids open. Nothing like it had been seen in Naples since the eruption of Vesuvius in 1872. The phenomenon lasted about three hours.

On March 11 similar dust rains, or blood rains, prevailed over northern Germany. More complete reports are promised by Hann and Hellmann. One can easily see that we have here to do with a severe storm in the Sahara region, and by the attending winds the finer dust was raised and transported northward. Professor Salcher states that the dust is sirocco sand. Although the microscopic study of the dust in Germany has, so far as noted, revealed only mineral dusts, yet the Editor can not doubt that eventually diatom dust will also be found, similar to that which occurs when the harmattan carries the dust of the Sahara toward the west and southwest over the Atlantic Ocean. These diatoms are characteristic of the fresh-water marshes and ponds off the Sahara Desert.

This is the first time that Sahara dust has been known to be carried to England. The black rains of April, 1887, in Ireland, were undoubtedly due to the soot dust of soft-coal fires.

In January or February, 1890, the steamship *Queensmore*, arriving at Baltimore from England, reported red rain and red dust off the coast of Newfoundland. It would be very remarkable if this was Sahara dust.

THE PERMANENCE OF CLIMATE.

We quote the following excellent paragraph from a lecture recently delivered by Mr. A. F. Sims, Local Forecast Official, at Albany, N. Y., entitled "Some musings of a meteorologist."

Climate is a product of certain elements and properties of the atmosphere and physical features of the earth's surface. As these elements and conditions are substantially permanent, we have ample assurance of the stability of climate. The sun's energy is a physical constant producing in earth and air the results termed heat, light, and electricity, and causing the varied phenomena of evaporation and precipitation, wind movements, storms, etc. Nature gives us a warranty that the climate of a section will be practically unchanged so long as the continents and seas abide in their present forms and bounds and the mountains remain in place. All climatic records attest this fact of permanence. The student of climatology may find in the constituents of the soil ample proofs as to the weather conditions existing many thousands of years prior to the historic age, in like manner as the skilled geologist reads in the rocks the graphic story of nature's processes in world building, in the more distant epochs of the past. One of the obvious facts as to the climate of this section is the wide range of extremes and the marked variableness of the seasons as compared with the normal. This does not contravene the theory of the permanence of climate, but it simply implies that one of the permanent features of daily and seasonable weather is this tendency toward variations. Every season illustrates the fact that the law of variety holds sway in relation to the weather, as in all of nature's operations. One season is notable as a record breaker, in respect to sustained high temperatures, for many days during the summer; and the next season breaks the record for continued low temperature in the winter. So with substantial unity and stability, we note perpetual variety and changefulness in respect to the weather; irregularity is the thing to be expected. If a year should be strictly normal from first to last it would take rank as a phenomenal exception among all the years of record. Thus we reach the apparently paradoxical conclusion that in weather, the exceptional condition is the rule, and some measure of departure from the normal is the normal state of things.

THE MOON AND THE WEATHER.

The relations between the moon and various meteorological phenomena have been studied for a century past with great diligence, but hitherto nothing has been discovered to con-

firm the popular belief that the weather has a dependence upon or even an indirect relation with the condition of the moon. The origin of this belief in the lunar influence can be traced back to Arabia and the astronomers of Assyria and Chaldea, and it is maintained in various forms by all peoples that use the Arabic language or inherit the old Arabic folk lore. We know of no recent investigation into the connection between the moon and the Arabian weather, but all studies bearing on European or American weather show that the lunar influence is inappreciable. We believe that the only plausible exception to this statement is to be found in the studies of Mons. A. Poincaré (an engineer and meteorologist of Paris, and not to be confounded with Prof. H. Poincaré, the eminent mathematician). His study of the international daily charts of the Northern Hemisphere, published by the United States Signal Service, seems to indicate that when the moon is far south of the equator it has an appreciable influence in causing a general movement of the atmosphere southward, and vice versa when she is north of the equator; but this movement is only appreciable when we take the average barometric pressure for several days or a week; it is essentially a fortnightly tidal wave, and is not known to have any apparent influence upon the temperature, cloudiness, rainfall, or wind. It can not, then, be spoken of as an influence of the moon upon the weather.

The students of lunar influences are at present rejoicing in the patronage of a wealthy Russian railroad engineer, Mr. Nicolai Demtschinsky, of Torbino, Russia, who has flooded the scientific world with his prospectus and the first few sample numbers of a journal devoted to the exact prediction of the weather by means of the lunar influences.

The study of the influence of the moon on the atmosphere is certainly legitimate, but the study of the influence of the sun is also important, and it would be suicidal to neglect it. At the present time the trend of modern physics is to show that the sun's radiation produces all the thermal and most of the electric and optic phenomena of the atmosphere and that the modification introduced by the moon is scarcely worthy of consideration. The new journal states that—

> It aims to be the depository for all information upon the question of atmospheric ebb and tide, including therein, first, the influence of the moon on the atmosphere, and, second, the investigation of the upper strata of the atmosphere.

But, of course, every scientific journal is willing to publish investigations on these subjects. Investigations conducted by rational methods are precisely what is meant by science. All that has hitherto been found out about lunar influences and the upper strata of the atmosphere has already been published in scientific journals and memoirs. If any one in the United States has anything worthy of publication on this subject, he can make it known in the columns of the MONTHLY WEATHER REVIEW or the American Journal of Science even more easily than by sending it to Torbino, Russia. In fact, we can not but suspect that most of the articles published in a miscellaneous way had already been rejected by the editors of recognized scientific journals as containing assumptions and statements directly contrary to the known laws of nature. One may have the best of observational data, and yet go far astray when he attempts to reason upon it. The data that has been furnished to Mr. Demtschinsky by the Chief of the Weather Bureau during the past few years, and which is now quoted in his monthly journal, was communicated for his information, and the reader should not infer from the text of the journal that the Weather Bureau has any reason to adopt new doctrines that are contrary to observed facts and scientific principles.

ERRATA.

The following corrections should be made in the MONTHLY WEATHER REVIEW for 1898, Vol. XXVI:

Page 359, column 2, lines 12 and 13, after v in the formulæ insert the minus (—) sign.

Page 410, column 1, line 32, for XVI read XVII.

January, 1901, REVIEW, page 6, column 2, line 27 from bottom, for 460° F. read 492° F.; line 25 from bottom, for 530° read 562°.

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Professor of Meteorology.

CHARACTERISTICS OF THE WEATHER FOR MARCH.

March, 1901, was characterized by the rapid movement eastward and northeastward of lows, many of which divided after crossing the Appalachians, and by the complete reversal of the conditions which obtained in the previous month as regards pressure distribution and movement of storms. About 70 per cent of the highs moved eastward along the Gulf coast and passed over the Atlantic in the neighborhood of the Carolinas. Temperature was above the average, except in the eastern Gulf States, Florida Peninsula, and the southern Plateau, and precipitation was irregularly distributed, but on the whole fairly abundant.

PRESSURE.

The distribution of monthly mean pressure is graphically shown on Chart IV and the numerical values are given in Tables I and VI.

The most noteworthy feature in the distribution of monthly mean pressure was the breaking up of the ridge of high pressure which in an average month stretches from Florida northwestward to the Dakotas. Mean pressure in the interior of the country was everywhere below normal by about the same amount as it was above normal in the preceding month. It will be remembered that during February, 1901, pressure was remarkably low over the North Atlantic and New England and high in the interior of the country. These conditions are reversed in the current month.

TEMPERATURE OF THE AIR.

The distribution of monthly mean surface temperature, as deduced from the records of about 1,000 stations, is shown on Chart VI.

The month as a whole was warmer than usual. In the eastern Gulf States and on the Florida Peninsula, also in the Southwest, including Nevada and Colorado, temperature was below normal, ranging from 2° to 3°. In all other parts of the country, however, the temperature ranged from 3° to 6° above the seasonal average. Maximum temperatures of 100° and over were registered in the Rio Grande Valley, and maximum temperatures above 80° were quite general in southern Georgia, Florida, in the lower Mississippi Valley, the western