the figure-piece of the bull-tamer, leaping upon the back of the beast in full career, displays! The beautiful frieze made of slabs of alabaster, decorated with sculptured ornaments and inlaid with pieces of dark blue smalt, is most interesting, not only for its intrinsic elegance, but for the confirmation it has given to a conjecture of Helbig in explanation of one of the Homeric puzzles, the nature of the frieze of *kyanos*, which adorned the palace of Alkinòos (Odyssey, vii. 86). This is the substance which Mr. Gladstone supposed to have been bronze, and which Mr. Evans, following the general opinion, has reluctantly conceded to have been dark blue steel, but which we now have every reason to believe to have been a blue glass paste. Another surprising discovery was the bath-room, containing a fragment of a bathing-tub, made of thick terra-cotta, and resembling in form similar articles in use to-day. After such a substantiation as this, of the numerous instances in the Homeric poems where mention is made of the 'well-polished bathing-tubs,' we may perhaps feel warranted in believing that in the heroic age sometimes these were actually made of silver, like the two which 'Polybus, who dwelt in Thebes in Egypt,' gave to Menelaus (Odyssey, iv. 128).

Reluctantly we lay aside this interesting volume, fully sharing in the regret expressed by Dr. Dörpfeld at the fate that must speedily overtake much of what has thus been brought to light after its sleep of centuries in the lap of mother-earth. He says that it is doomed to certain destruction, although the Greek government intends to do all in its power to protect the palace with a roof and in other ways (p. 250). But even if the material parts must perish, its teachings have been embalmed forever for posterity in this noble volume, which, as we said at the outset, we owe to the liberality and enthusiasm of Dr. Schliemann.

WINTER ON MOUNT WASHINGTON.

THERE are three distinct types of winter weather on Mount Washington that offer good illustration of the control of wind over temperature. The most common, and certainly the one most frequently associated with the popular estimation of the mountain's weather, appears with the westerly or north-westerly winds of considerable strength that blow between a centre of low barometric pressure lingering over the provinces or in the Gulf of St. Lawrence, and a centre of high pressure on the lakes or in the Ohio valley. The sky is clear or fair, the wind blows fifty to eighty or more miles an hour, and the temperature falls to a point worthy of newspaper items. This is the time of hardship for the observers in the signal-service station: clearing the anemometer cups of the frost-work that forms on them is then no pleasant task; but, if not cleared, the frost-work fills the cups, and prevents their proper turning, or they become so heavy that the centrifugal force of their rapid whirling may tear them from the axle. The cold is so intense and penetrating with the high wind, that the stoves have to do their utmost to keep the station habitable. A conflagration at such a time would be almost certain death to the men, for they could not descend the mountain in such weather.

On the 29th of last January there was a sample of this type: a storm-centre had passed the day before; the wind shifted from south to north-west, and rose to one hundred miles an hour, — if the records in recurring round numbers can be accepted as precise, — and at seven o'clock in the morning the temperature was — 32°. At the same time, the temperature at Boston was 0°; at Portland, 2°; and at Montreal, — 9°. The cause of the extreme cold on the mountain is, first, that its winds come rapidly from the cold north-west, without having time to warm up very much on the way; and, second, that they are forced to rise more or less in passing over the mountain, and thus are cooled by expansion about half a degree for every hundred feet of ascent. In other words, the cold is chiefly imported, but is partly a home product. The temperature is not excessively low: it is higher than the records give for the far north-west, and much higher than the minima known in Siberia; but it is harder to bear on account of the terrific winds that accompany it. Residents in Montana and Siberia unite in having a good word for the calm, dry cold of their frigid winters, but no word of praise for the windy cold on Mount Washington appears in the signal-service reports. Other examples of this type, illustrated in the old reports and maps, are Dec. 30, 1873; Jan. 16, 17, 25, 26, 1874.

The second type appears when the mountain stands a moderate distance from a storm-centre, generally to the east or north of it. The temperature is then relatively high, and the weather cloudy or rainy. Jan. 16, 1885, will serve for an example of this. The storm-centre was then to the west of the mountain, but not far away, as the wind was from the south, sixty miles an hour. It was snowing, and the air was nearly 'saturated' with vapor; the air temperature at 7 A.M. being 29°, and the dew-point 28°. At the same time, the temperature at Boston was only 32°, while that at Portland was 24°. Montreal failed to report that morning, but was undoubtedly colder still. Now, if there is any propriety in averages, Mount Washington ought to be in win-

ter fifteen or sixteen degrees colder than its neighboring sea-level stations. Here it is as much too warm as it was too cold in the first type. Although it is near the storm-centre, where the winds are supposed to ascend obliquely, the air on the mountain is evidently not derived from the low-level stations near by; for, independently of the evidence furnished by the wind's direction and velocity against such a conclusion, the temperatures disprove it. If a current of air ascend from sea-level to the top of Mount Washington, its temperature must fall at least eleven degrees, even if the cooling from expansion were retarded by condensation of vapor through the whole ascent. The surface source of the wind, if it come from the surface at all, must therefore be sought many miles south of New England, in the southern states or on the Gulf Stream, where the temperature is fifteen or twenty degrees higher than in Mount Washington latitudes. Then, as in the first case, the temperature on the mountain is largely a matter of importation; but now the cooling by ascent abruptly up the mountain sides, or gradually in the cyclonic whirl, acts to destroy the imported characteristics of the wind, instead of to confirm them, as before. In the pronounced examples of this type, when it is warmer on Mount Washington than at Boston, we find illustration of the inversion of temperature, that is generally held to be peculiar to anticyclonic weather, as will be explained below; and although such cases are not, so far as I know, characteristic of other mountain stations, they are not rare on Mount Washington. Examples may be found on the old maps for Dec. 3, 27, 1873; Jan. 7, 8, 27, 28, 1874. The warm waters of the Gulf Stream, and the rapid decrease of temperature with latitude along our eastern coast, must be chiefly responsible for this. Another factor of hardly less importance is the fivefold greater velocity of the winds at the height of Mount Washington over those at the earth's surface. As a storm-centre draws near, the winds on the mountain may be derived from a source four or five times as distant to the south as that which supplies the low-level stations. Thus the ordinary decrease of temperature with height is overcome. Montreal is decidedly colder than the three other stations at such times; for it is well to the north of the storm-centre, and draws its winds from northerly sources.

The third type is one that has attracted much attention in Europe of late years, on account of the very abnormal temperatures that accompany it. It appears when a centre of high pressure — an anticyclone — passes over the mountain, and, when fully developed, it causes a remarkable inversion of weather elements. We are accustomed to see mountain-tops cold and cloudy, while the valleys about them are warmer and clear; but anticyclonic weather places the cold and the clouds in the valleys, while the peaks rise into brilliantly clear, warm, dry air. Dr. Hann was the first to give a full explanation of the facts, in 1876, and I follow him in this statement. In an anticyclone, the few lofty clouds that are observed generally move towards its centre; the surface winds move outwards to all sides; with converging currents above, and diverging below, there must be a descending current about the centre; the descent is probably slow, but it undoubtedly exists. This type, therefore, involves the consideration of the temperature of air derived from regions of the atmosphere far above the mountain-tops. The first opinion that one would have of such temperature would probably be to place it well below freezing, for we are all familiar with the excessive cold experienced in very lofty mountain ascents and balloon voyages. But this is wrong. Although undoubtedly cold while up aloft, air that descends from the upper regions is compressed as it comes under greater atmospheric weight near sea-level, and it is thereby warmed. A current coming down from a moderate altitude in summer might be cooler than the surface air; but in winter it would be in practically all cases decidedly warmer. The statement of this fact is not particularly new, but its recognition and general application are a recent progress in meteorology. More than forty years ago, Arago, Pouillet, and Babinet reported to the French academy that "it is proved by the investigations of Mr. Espy that one should not hereafter attempt to adduce, in the mean state of the atmosphere, a descending current of air as a cause of cold."

It is, then, to the descent of air from aloft that we are to look for the abnormal warmth and dryness of mountain-tops in anticyclones. It remains to account for the extreme cold that prevails at the same time in the neighboring valleys. An illustration of the contrast is given by Professor Upton in the second Bulletin of the New England meteorological society. On the morning of Dec. 27, 1884, when the winds were everywhere light, and the pressure higher than on the days before or after, the temperature on Mount Washington was $+16°$; at the low-level stations north of Massachusetts, it was $-10°$, or colder. On consulting the records, I find Grafton and Littleton, N.H., $-18°$; Hanover, N.H., and Newport, Vt., $-20°$; Woodstock, Vt., $-27°$; Portland, Me., $+7°$. The lower cold must therefore be in spite of, not on account of, the down-cast current; and we are forced to believe that it is caused by rapid cooling of the ground, and of the air close to it, by

radiation through the clear, dry air above. It is not at first apparent why the ground should cool to an excessively low temperature, while the air above it remains comparatively warm: it is because solids can cool by radiation, just as they can warm by absorption, much more quickly than gases. For this reason, the upper air changes its temperature but little from day to night; while the ground, and to a certain extent the air near it, have a large diurnal range. Now, during an anticyclone, radiation from the ground is rapid through the clear, dry air; thus the temperature falls very low, and the air on or near the earth's surface is greatly cooled. If the descent of the air were rapid, radiation would not have time to overcome the warmth gained by compression; and it is known, that, when the surface wind springs up in an anticyclonic centre, the temperature rises with it. But generally the descent is slow; and, when near the ground, the down-current turns aside as a slow horizontal outflow; it becomes heavy as it is chilled, and tends to collect and stagnate in depressions. Ground fogs form when the dew-point is reached, and then the contrast is complete between the clear, pleasant weather on the peaks, and the cold, damp air in the valleys. In the first and second types the temperature is chiefly imported; in the third it is essentially of local origin over the mountains. December, 1879, gave a famous example of an inversion on a large scale in Europe, and much was written about it. An enterprising mountain-climber ascended a peak in the Alps east of Lake Geneva on Christmas day, and was rewarded by rising above the dense clouds that covered the lake and filled the cold valleys, and finding fine, clear, relatively warm weather on the mountain-top. A few examples of such inversions must make our observers wish they were in a region of permanent high pressure, instead of in one of the stormiest countries of the world. W. M. D.

JAPANESE HOUSES.

THE opening of the empire of Japan to foreign intercourse has furnished more subjects of inquiry to the student of human development than any event of recent times. Here is a nation which has been secluded for centuries from all except the most insignificant external influences. During this seclusion, modern European civilization, with its science and arts, its comforts and refinements, has virtually come into existence. In the mean time, the secluded nation, mainly without help or hindrance from its neighbors, has been engaged in working out the problem of its national life in its own way. Suddenly the curtain is raised, and we are permitted to look in upon the spectacle so long in preparation. For a quarter of a century we have been studying the scenes thus revealed to us, and have not yet fully succeeded in making out their meaning.

That the Japanese race is one possessed of native vigor and resources is shown by the outcome of this long experiment of isolation. With all the disadvantages arising from the want of free foreign intercourse, they have made such progress in the arts of civilization as to challenge our admiration. In intellectual activity, in warlike and chivalric achievement, in gentle and amiable manners, in the refinements and amenities of life, they may certainly bear favorable comparison with the most cultured races. They present to us a strange mixture of excellences and defects. While as a nation they are conspicuously brave and warlike, they have devised and developed few formidable implements of war. They have built great cities, and conduct a vast system of trade; and yet their ships and warehouses, and public and private buildings, seem, by the side of ours, fragile and temporary. They manufacture the most exquisite and tasteful fabrics and wares, and yet the mechanical appliances of their arts are rudimentary.

We are thankful to any one who will help us to gain some insight into the character and life of such an interesting people. It was a most happy thought of Professor Morse to make a careful study of the Japanese house. Nothing can aid us more in understanding the life of the occupant than to describe his dwelling-place and the implements and furniture which he gathers into it. Fortunately for us, the author of this book combined in himself the faculty of the scientific observer and the skill of the artist. We may safely say that here, for the first time, we have intelligible sketches of the Japanese dwelling-house, and intelligible explanations of the uses and arrangement of its furniture. Heretofore we have had chiefly photographs of exteriors and gateways and street scenes, or, instead of that, we have been treated to reproductions of native Japanese drawings by engravers who did not understand the drawings. It is the experience of every stranger visiting this country, that, notwithstanding all that he has tried to learn from books about Japan, he is as much amazed at the real Japanese house and surroundings as if he had never seen an illustration of them. Professor Morse, on the contrary, has gone about with eyes in his head and a pencil in his hand. The minuteness and

Japanese homes and their surroundings. By EDWARD S. MORSE, with illustrations by the author. Boston, *Ticknor*, 1886 [1885]. 8°.