

sations of heat and cold are due not merely to the temperature of the air, but also to the direct solar radiation and the wind's velocity. Upon this basis, Mr. J. Vincent, the Belgian meteorologist, as we learn from *Engineering*, has experimented on the temperature of the exposed surface of the human body, as the hands and face, and given an account of his investigation in *Ciel et Terre* under the title "Climatological Temperature." A long series of observations has conducted him to the formula, adapted to Fahrenheit's thermometer, $\frac{99.7 - A}{S - A} = 1.42$, whence $S = 70.3 + 0.3 A$, where 99.7° is the interior temperature of the human body; A , the temperature of the air; S , the temperature of the exposed skin when in shaded and calm air. Let E be the excess of solar radiation above the temperature of the air, V the velocity of the wind in miles per hour; then C , the climatological temperature, or the temperature of the skin, as influenced by A , E , and V , is

$$C = 70.3 + 0.3 A + 0.2 E - \sqrt{4.34 V}.$$

Thus, if $A = 48^\circ$, $E = 4^\circ$, $V = 20$ miles, then $C = 76.3^\circ$, and this is the temperature of the exposed skin; whereas in calm air it would have been 85.5° , and in calm and shaded air 84.7° . Here the effect of sunshine is very small. It is often very considerable. Observations carried out in this manner during December, 1889, show that the thermometrical coldest day, 20.8° , was the 3d; the warmest, 48° , the 24th; whereas the greatest sensation of cold, 71.4° , was due to the 9th; of heat, 88.8° , to the 15th. Although the air was not so cold on the 9th as on the 3d, it felt colder because there was no wind; and although the 24th was much warmer than the 15th, the 15th felt warmer because there was much less wind and powerful sunshine. The observations were made at noon. The investigation is exceedingly curious and interesting; gives a direct utility to observations of solar radiation; and, without doubt, ought to enlist the attention of meteorologists, and be carried out more extensively, for which purpose the original memoir must of course be consulted.

Probably it will be found that these relations are only tolerably identical in healthy subjects; for physiological and pathological influences, as well as those of the weather, determine the bodily sensations. This investigation, however, clearly makes manifest that our individual bodily experience is in several respects quite a different meteorological indicator to the unsentimental thermometer.

KILIMA NJARO.

THIS mountain, as is well known, consists of two summits, the Kibo and the Kimawenzi, connected by a saddle studded with hills of lava. From this saddle Dr. Meyer tried, in 1887, to scale the Kibo (*Scottish Geographical Magazine*), but had to give up the attempt on account of the weather. Last October he pitched his tent on the saddle, at an elevation of over 14,000 feet, and on the 3d of the month set forth at half-past two in the morning, accompanied by Herr Purtscheller, and provided with the usual equipment of the Alpine climber. During the darkness they made their way to the glacier valley which descends from the flanks of Kibo in a south-easterly direction, and at dawn stood on the rocky northern boundary, looking down into the valley nearly 500 feet below. Crossing this valley, the climbers reached the ridge of lava forming its southern boundary, up which they purposed to make their way to the summit of Kibo. Here they met with the first patches of snow, lying under the protection of the rocks at an elevation of 14,400 feet.

Their route now led over blocks of stone and heaps of *débris*, up the steep lava ridge,—a toilsome way,—where they had to make frequent halts to recover their breath, for the rarity of the atmosphere became more and more perceptible. Shortly before ten o'clock they came to the lower edge of the icy mantle which encircles the summit and conceals it from view. The height of this spot was about 18,270 feet. The rocky declivity over which the climbers had ascended had an inclination of 30° ; the icy wall which rose above it, 35° . Dr. Meyer and his companion found it very exhausting work to scale this slope, cutting steps, as they advanced, in the ice, which, far from being

firm at the bottom, became still more unsound and uneven as they ascended. At length the crevasses were crossed, the highest undulation of the ice visible below was surmounted, and at a quarter to two o'clock the climbers stood on the edge of the crater. Here they perceived that the highest point of the crater wall lay about one and a half hours' march to their left on the southern side. Weary as they were, they did not venture to run the risk of being caught in a fog, or of being obliged to bivouac on the mountain-side without any protection against the cold. They therefore turned back, and, after a day of sixteen hours, reached their camp on the saddle, congratulating themselves that at any rate the true nature of the summit had been discovered. Three days later they again went forth, and passed the night in a cave they had remarked in the right side of the glacier valley, whither Dr. Meyer's negro follower carried their blankets, etc. No fuel could be procured; but, considering the elevation, 15,150 feet, the night was mild (10.5° F.), for their bivouac was sheltered from the wind blowing over the glacier. Starting at three o'clock, the climbers reached the point where they turned back on the former occasion, at a quarter to nine. Its elevation above the sea-level was 19,220 feet. Beyond this point no great difficulties were encountered.

The edge of ice which runs round the crater slopes gradually up towards the south, where it is pierced by three peaks. It was impossible for the eye to decide which of these three was the highest, and therefore Dr. Meyer ascended all three, and found that the middle one was 50 to 65 feet higher than the others. This, the highest point in German territory, being somewhere about 19,680 feet above the sea-level, he named "Kaiser Wilhelm Spitze." From this position the crater could be well observed. Its diameter is about 6,500 feet, and it sinks to a depth of 650 feet. On the north and east the ice descends from the edge inwards in steep terraces, while on the west and south lava precipices take its place. A little to the north of the centre a slightly arched eruptive cone, composed of dark-brown ashes, rises to a height of 490 feet above the crater bottom. Its upper portion is bare, but its base is covered by a mighty glacier which escapes from the crater through a cleft in its western side.

About a fortnight later Dr. Meyer visited the northern side of the mountain, where he found the ice mantle much narrower than on the other side, beginning at an elevation of 18,820 feet, but so steep and hard that only experienced mountaineers would be able to cross it. He also descended through the great eastern cleft into the crater itself. Dr. Meyer also made several expeditions up Mawenzi, or Kimawenzi. It is evident that a much longer period has elapsed since this crater became extinct, for the whole mountain is riven, eroded, and degraded in a marvellous manner, so that it is both difficult and dangerous to climb over its rocks. Dr. Meyer considered it vain for two men to attempt the ascent of the highest pinnacle, but he reached the top of another not much lower, which he found to have a height of 17,250 feet. Towards the east the flanks of the mountains sink precipitously. The lava is so friable, and has been so much denuded by wind and rain, that the mountain is reduced to a mouldering skeleton. It is a mass of turrets, pinnacles, pyramids, and battlements, intermingled with heaps of detritus.

BOOK-REVIEWS.

Sound-English. A Language for the World. By AUGUSTIN KNOFLACH. New York, Stechert. 12° . 25 cents.

THIS is another attempt at spelling-reform. The author justly holds that the English language, by its simple structure and its extensive and rapidly increasing prevalence, is entitled to become the universal language for international communication. But the present orthography of English is an insuperable obstacle to its adoption as the world-language, and this obstacle can only be removed by a phonetic spelling. Apparently, also, he is not satisfied with the phonetic systems that others have proposed, though he offers no criticism of them. His own system has three essential points, though some of them are not peculiar to it. He