at the surface. But many Palæozoic or even later rock masses can now be examined which at a former period of their history have been buried beneath at least 10,000 feet of sediment ; yet the alteration of their constituents has been small ; only the more unstable minerals have been somewhat modified, the more refractory are unaffected. But for a limited period after the *consistentior status*, the increase of crust temperature in descending would be far more rapid ; when one-twenty-fifth of the whole period from that epoch to the present had elapsed, and this is no inconsiderable fraction, the rate of increase would be 1° for every 10 feet of descent. Suppose, for the sake of comparison, the surface temperature as before, the boiling-point of water would be reached at 1620 feet, and at 10,000 feet, instead of a temperature of 250° F., we should have one of 1050° F. But at the latter temperature many rock masses would not be perfectly solid.*

According to Sorby, the steam cavities in the Ponza trachyte must have formed, and thus the rock have been still plastic at so low a temperature as 680° F. At this period, then, the end of the fourth year of the geological century, whatever be its units, structural changes in igneous and chemical changes in sedimentary rocks must have occurred more readily than in any much later period in the world's history. A temperature of 2000° F., sufficient to melt silver—more than sufficient to melt many lavas—would have been reached at a depth of about 4 miles. It would now be necessary to descend for at least 20 miles in order to arrive at this zone. It, during the ninety-six years of the century, has been changing its position in the earth's crust, more slowly as time went on, from the one level to the other.

There is another consideration, too complicated for full discussion, too uncertain, perhaps, in its numerical results to be more than mentioned at present, which, however, seems to me important. It is this, that in very early times, as shown by Prof. Darwin and Mr. Davison, the zone in the earth's crust, at which lateral thrust ceases and tension begins, must have been situated much nearer to the surface than at present. If, now, at the end of the century, it is at the depth of 5 miles, it was, at the end of the fourth year, at a depth of only 1 mile. Then, a mass of rock, 10,000 feet below the surface, would be nearly a mile deep in the zone of tension. Possibly this may explain the mineral banding of much of our older granitoid rock, already mentioned, and the coincidence of foliation with what appears to be stratification in the later Archæan schists, as well as the certainly common coincidence of microfoliation with bedding in the oldest indubitable sediments.

Pressure, no doubt, has always been a most important factor in the metamorphism of rocks ; but there is, I think, at present some danger in over-estimating this, and representing a partial statement of truth as the whole truth. Geology, like many human beings, suffered from convulsions in its infancy ; now, in its later years, I apprehend an attack of pressure on the brain.

The first deposits on the solidified crust of the earth would obviously be igneous. As water condensed, denudation would begin, and stratified deposits, mechanical and chemical, become possible, in addition to detrital volcanic material. But at that time the crust itself, and even stratified deposits, would often be kept for a considerable period at a temperature similar to that afterwards produced by the invasion of an intrusive mass. Thus not only rocks of igneous origin (including volcanic ashes) would predominate in the lower foundation-stones, but also secondary changes would occur more readily, and even the sediments or precipitates should be greatly metamorphosed. Strains set up by a falling temperature would produce, in masses still plastic, banded structures, which, under the peculiar circumstances might occur in rocks now coarsely crystalline. As time went on, true sediments would predominate over extravasated materials, and these would be less and less affected by chemical changes, and would more and more retain their original character. Thus we should expect that as we retraced the earth's course through "the corridor of time," we should arrive at rocks which, though crystalline in structure, were evidently in great part sedimentary in origin, and should beyond them find rocks of more coarsely-crystalline texture and more dubious character, which, however, probably were in part of a like origin ; and should at last reach coarsely-crystalline rocks, in which, while occasional sediments would be possible, the majority were originally igneous, though modified at a very early period of their history. This corresponds with what we find in Nature, when we apply, cautiously and tentatively, the principles of interpretation which guide us in stratigraphical geology.

I have stated as briefly as possible what I believe to be facts. I have endeavored to treat these in accordance with the principles of inductive reasoning. I have deliberately abstained from invoking the aid of "deluges of water, floods of fire, boiling oceans, caustic rains, or acid-laden atmospheres," not because I hold it impossible that these can have occurred, but because I think that this epoch in the earth's history so remote and so unlike those which followed, that it is wiser to pass it by for the present. But unless we deny that any rocks formed anterior to or coæval with the first beginning of life on the globe can be preserved to the present time, or, at least, be capable of identification (an assumption which seems to me gratuitous and unphilosophical) then I do not see how we can avoid the conclusion to which we are led by a study of the foundation-stones of the earth's crust—namely, that these were formed under conditions and modified by environments which, during the later geological epochs, must have been of very exceptional occurrence. If, then, this conclusion accords with the results at which students of chemistry and students of physics have independently arrived, I do not think that we are justified in refusing to accept them, because they lack the attractive brilliancy of this or that hypothesis, or do not accord with the words in which a principle, sound in its essence, has been formulated. It is true in science, as in a yet more sacred thing, that "the letter killeth, the spirit giveth life."—*Nature.*

*The lowest temperature, which, so far as I know, has been observed in lava (basic) while still plastic, is 1228° F.

A NEW PLUMBERS' TRICK.

The *Sanitary News* describes a new plumbers' trick, which has been first discovered in Milwaukee, but may be known elsewhere, so that architects and inspectors will do well to be on their guard against it. In Milwaukee, as in many other towns, all soil pipes put up in dwelling-houses must be tested by filling them with water. A certain firm, knowing that a defective pipe had been used, contrived to plug it with clay, so that the water applied for testing it did not enter the pipe at all. It was not stated how the inspector happened to find out this ingenious deception, but plumbing inspectors become wonderfully expert in observing suspicious indications, and the offending firm was reported, and punished by having its license revoked until the defective pipe should be replaced by a new one. Most persons will say that the revocation of the license ought to have been made permanent.