

wards to the most recent period of which we have a record. In pursuance of this plan, it will be necessary to direct our attention, first, to the igneous, and next, to the stratified rocks, to the former of which, therefore, we would now turn.

The igneous rocks have been divided by Lyell into two great classes, the plutonic, which are those crystallized under great pressure, and the volcanic, which have been crystallized under comparatively less. And here we may remark, that their crystallization is one of the characteristics of this family of rocks, though that which distinguishes them from all others is the absence in them of stratification. None of them can be split into thin leaves, which can always be done with those deposited in water. The plutonic rocks include the various kinds of granite, and the volcanic rocks; whinstone and basalt, may be taken as examples. Both divisions, though destitute of organic remains, with which we do not meet till after we ascend much higher in the geological scale, are of great interest in the partial light they throw on the condition of the earth, before the commencement of the present cycle of creations, and also in some measure since.

The fact that the solid crust of our globe rests on such rocks, seems to point to a time when the whole mass which now forms such a delightful residence for man was in a state of fusion. The shape of the earth also strengthens this view, which is now generally received, for it is exactly that which a fluid mass would assume by rotation on its axis during the period of refrigeration. The polar diameter of the earth is shorter than the equatorial by about 26 miles, a difference which centrifugal force would necessarily cause, constantly maintained, as it must have been, by the diurnal revolution of the mass. By some, however, it is thought that even a perfect sphere of solid matter might gradually become thus flattened at the poles by the wearing down of land on the surface, and the removal of the larger proportion of the debris by currents to the equator. This it is believed the centrifugal force would have caused. But all the evidence we have is against this hypothesis, which has not to our knowledge become popular.

That granite and its cognates have been derived from the crystallization of fused matter, we have many proofs, among which we may notice the alteration they make on stratified rocks when they have been intruded among them. Granite, when it comes in contact with sandstone, changes it into quartz, and when it meets limestone, changes it into marble. Other forms of igneous rock, which imperceptibly pass into granite, but which penetrate into higher strata, have like effects; chalk being converted by them into a rock like statuary marble, clay into quartz, and coal into coke. The entire absence of stratification is another convincing proof, and of itself would seem to be sufficient to settle the origin of this class of rocks.

Assuming it, then, to be admitted, which it generally is, that they were originally fluid, what a wondrous passage in the history of our globe is brought before us. We are called to the contemplation of a time when the wide world was one molten mass, shedding a lurid day from its candescent surface through the darkness of night. The water that now forms our oceans, if then created, must have hung high overhead in clouds of vapour, and there would be no atmosphere around, but such a void as there is now in some of the other planets. Human imagination fails to grasp such a vision, and is awed into reverence of the Almighty power by which so wondrous a scene was caused. Were these fires the grand inauguration of our earth in its place among already created worlds, or the agents in the destruction of a previous creation which its maker had willed should be no longer? Whatever end they may have served in the purposes of God, they eloquently point us to that day, spoken of in the Book which cannot err, when our heavens and our earth, these very heavens on which we look, and this earth on which we tread, shall pass away, forming for themselves their own far-blazing funeral pyre.

From the strong evidence we have in support of the universal fusion of the primeval solid matter of the globe, a doctrine has originated of the existence even now of an intense central heat, by which the nucleus of the earth is kept in a liquid state. From experiments on the increase of temperature as we descend in mines, it has been estimated that at the centre it would be at least 450,000 deg. Fahrenheit; but the data on which this computation is based seem to us unsound. It may be that at a certain depth, say 60 miles, beneath us the hardest minerals and metals are fused, but no clear and unchallenged evidence has been brought forward to render this probable. The heat of mines

seems to be derived rather from the condensation of currents of air passing through them, than from a gradually increasing temperature in the body of the earth. All substances, when compressed, give out heat, as we see in the case of iron, which, when beaten into smaller bulk, becomes red hot; and hence an amount steadily increasing with the depth of the workings, and the extent of their ventilation, would be evolved by the constant stream of condensed air with which they are supplied for the dissipation of noxious vapours, and the respiration of the workmen. The deeper the air descended, the greater would be its condensation.

Even though this theory, which has been propounded by many eminent men, be incorrect, there are various objections to that which derives the doctrine of great internal heat from the phenomena observed in mines. Thus we do not find that the heat increases in proportion as we come near the centre of the earth. The increase of temperature in Dalcoath mines in Cornwall is no greater than that exhibited in the mines of Guanaxato in South America, though the former are many thousand feet nearer the centre than the latter. It has also been shown on indisputable evidence, that the increase of heat in any mine ceases if the workings are closed, and that the temperature gradually becomes that which it would be if it received all its heat from the sun. It falls till it has reached the mean temperature of the district in which it is situated.

But there are other grounds for supposing that a very high temperature obtains in the central parts of the earth; as, among others, the fact we have noticed above, of the evolution of heat by all bodies when under pressure, from which it would seem certain that intense heat must be generated in the immense mass that stretches between the surface and the centre of the globe. So great is the compression of the various forms of matter as we descend, that is, if the same laws observed by us prevail uncounteracted to all depths, that all the gases must be rendered solid, and stone must be reduced to one-eighth of its bulk, and steel to one-fourth, at the centre. Hence, although the argument to which we have objected be laid aside, others are not wanting to support the doctrine of the heated state of the interior of our globe. But we must return from this digression, reserving the subject for further remarks at a future time.

From the fact of their underlying all others, igneous rocks were first supposed to be, without exception, the most ancient of any. But it has since been shown that while other formations rest upon them, they also penetrate upwards through these, and even spread in wide sheets over portions of them, at some points. In all cases, however, there are proofs of this having been caused by violent injection, or, where the mass is very great, by gradual upheaval. Of these phenomena we have examples in the trap, or, as they are popularly called, whinstone dykes, which intersect all the strata, and the extensive ranges of granite mountains, whose protrusion from below is forcibly proved by the masses of broken and uptilted rocks which rest on their flanks. Basalt, of which Fingal's Cave at Staffa, and the Giant's Causeway are formed, is one of the igneous rocks, which have been injected in a liquid state, even to the surface of the most recent strata. It is of volcanic origin, it having been found that lava, under particular circumstances, assumes the form and texture by which it is distinguished. As our readers may be aware, it has a peculiar glassy grain, in which it is resembled by all the class to which it belongs. This, the experiments of modern chemists have shown to have been caused by slow cooling, the rate of which has determined the size of the crystals of all the varieties of igneous rocks. Of this the lava streams of volcanoes of the present age exhibit illustrations, their surface and sides being always finer than their middle, which necessarily was solidified more slowly than the rest.

THE STRANGE WOMAN.

From Lectures to Young Men. By H. W. Beecher.

Enter with me, in imagination, the strange woman's house—where, God grant you may never enter in any other way. There are five wards—Pleasure, Satiety, Discovery, Disease, and Death.

Ward of Pleasure.—the eye is dazzled with the magnificence of its apparel,—elastic velvet, glossy silks, burnished satin, crimson drapery, plushy carpets. Exquisite pictures glow upon the walls, carved marble adorns every niche. The inmates are