

The Formation of Mountains

MR. ALFRED R. WALLACE asks one of our "great" physicists to enlighten us about the possibility of the interior of the globe "cooling more rapidly than the crust." If he will turn to a chapter on Conduction in such a work as Maxwell's "Theory of Heat," he will find an explanation of the principle. At p. 247 is a passage especially relating to the loss of heat by the earth.

But perhaps even a little physicist may help our great naturalist as the mouse did the lion.

In the first place it is of course understood that whenever it is said that "the interior of the globe cools more than the crust," it is not meant that it ever becomes cooler than the crust, but only that the interior, from age to age, goes on getting cooler than it was before, whilst the crust keeps at nearly a constant temperature.

An illustration, which I think gives a good idea of this process, may be taken from the dispersion of a crowd of persons in the street. Suppose each person to represent a certain quantity of heat. Then the number of persons in any space may be considered to represent its temperature, so that the crowded part will represent a very hot space. As the people disperse they move off the more quickly the further they get from the dense mass.

Now draw two lines near together across the street at some small distance from the densest part of the crowd, and let the space between these two lines represent the crust of the earth, while the space occupied by the crowd represents the earth's interior, and all beyond the outer line represents infinite space. Then the number of people passing outwards between the two lines at any particular moment will represent the quantity of heat in, and so the temperature of, the crust. At the

same time the number of persons remaining in the crowd will represent the quantity of heat in, and so the temperature of, the interior. Then it will be obvious that as the crowd disperses the number of persons at any one time between the lines may continue about the same (although the individuals will be changed), whilst those in the central crowd become fewer and fewer. This illustrates how the temperature of the crust may continue nearly uniform in spite of the continued loss of heat from, and cooling of, the interior.

I believe that I have long ago proved that the mere cooling of a solid earth would not give the amount of contraction needed to account for the observed inequalities of the surface, and I surmise that a diminution of the earth's volume has been caused by the escape of steam and gases from volcanic vents during past ages. This view has, however, attracted more attention in America than at home.

O. FISHER

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