

drogen and carbon must exist at or near the surface when a crust forms upon a cooling star.

The nature of the chemical combinations into which these elements at first enter is perhaps open to some question. But as the temperature falls in the cooling of a sun or planet the affinities of carbon and hydrogen for oxygen increase, so that carbonic acid and water must normally result. For oxygen is almost certainly present in the sun; it is found in meteorites, and the vast store of it in the earth's atmosphere and crust (roughly one half of their total mass) justifies the belief that it is everywhere one of the commonest of elements. Hence an atmosphere containing water and carbonic acid appears to be a normal envelope of a new crust upon a cooling body. Even were not these substances at first present in such an atmosphere, volcanoes must soon belch them forth in enormous quantities to relieve the pressure which inevitable chemical processes set up.

It is clear that no one can give an exhaustive description of the formation of the earth's atmosphere and the changes which underlie vulcanism, so long as the theoretical considerations involved remain often more obscure than the facts. However, be the process what it