

lites, "probably of silex," are developed from many independent points in the decomposing layer. Colored films indicative of incipient decomposition have been observed on surfaces of glass exposed only to the air of the atmosphere for twenty or thirty years. Brilliantly iridescent films have been produced on the glass of windows exposed for not more than twenty years to the air and ammoniacal vapors of a stable.⁵⁶ That similar transformations take place in the natural silicates of rocks seems in the highest degree probable. They may form the earliest stages of the change to the usual opaque earthy decomposing crust, in which, of course, all trace of any structure developed in the preliminary weathering is lost.⁵⁷

In humid and temperate climates, weathering is mainly due to the combined influence of rain and sunshine. Saturated with rain-water, which dissolves more or less of any soluble constituents that may be present, and thereafter exposed to the desiccating and expanding influence of the warm rays of the sun, rock-surfaces are disintegrated, breaking up into angular fragments or crumbling into dust.⁵⁸ In high mountainous situations, as well as in lower regions where the temperature falls below the freezing-point in winter, weathering is in large measure caused by the action of frost (p. 698); in arid lands subject to great and rapid alternations of temperature, it may be mainly due to the strain of alternate expansion and contraction (p. 559) and the mechan-

⁵⁶ This fact has been observed by my friend M. P. Dudgeon, of Cargen, in an ill-ventilated cow-house, and I have seen the plates of glass removed from the windows. The process of decay in glass has been treated of in great detail by Mr. James Fowler, *Trans. Soc. Antiquaries*, xlv. (1879), pp. 65-162.

⁵⁷ Reference may be made here to the liquid inclusions already alluded to as developed in felspar during the decomposition of gneiss, ante, p. 200.

⁵⁸ This action can be instructively imitated by boiling and drying shales in the manner described in Book V. Sect. vii.