

attention had been drawn to the regular succession of strata in England, first felt the want of geognostic maps. Although these phenomena, and their dependence on ancient inundations (either single or repeated), riveted the attention of men, and, mingling belief and knowledge together, gave origin in England to the so-called systems of Ray, Woodward, Burnet, and Whiston; yet, owing to the total want of mineralogical distinction between the constituents of compound minerals, all that relates to crystalline and massive rocks of eruption remained unexplored. Notwithstanding the opinions held with respect to a central heat in the Earth, earthquakes, hot springs, and volcanic eruptions were not regarded as the consequence of the reaction of the planet against its external crust, but were attributed to trifling local causes, as, for instance, the spontaneous combustion of beds of iron pyrites. The unscientific experiments of Lemery (1700) unhappily exercised a long-continued influence on volcanic theories, although the latter might certainly have been raised to more general views by the richly-imaginative *Protogæa* of Leibnitz (1680).

The *Protogæa*, occasionally even more imaginative than the many metrical attempts of the same author which have lately been made known,* teaches "the scorification of the cavernous, glowing, once self-luminous crust of the Earth, the gradual cooling of the radiating surface enveloped in vapors, the precipitation and condensation of the gradually-cooled, vaporous atmosphere into water, the sinking of the level of the sea by the penetration of water into the internal cavities of the earth, and, finally, the breaking in of these caves, which occasions the fall, or horizontal inclination of these strata." The physical portion of this wild and fanciful view presents some features which will not appear to merit entire rejection by the adherents of our modern geognosy, notwithstanding its more perfect development in all its branches. Among these better traits we must reckon the movement and heat in the interior of the globe, and the cooling occasioned by radiation from the surface; the existence of an atmosphere of vapor; the pressure exercised by these vapors on the Earth's strata during their consolidation; and the two-fold origin of the mass-

studies, in Whewell's *History of the Inductive Sciences*, 1837, vol. iii., p. 507-545.

* Leibnizens, *Geschichtliche Aufsätze und Gedichte*, edited by Pertz, 1847, in the *Gesammelte Werke: Geschichte*, bd. iv. On the first sketch of the *Protogæa* of 1691, and on its subsequent revisions, see Tellkampff, *Jahresbericht der Bürgerschule zu Hannover*, 1847, s. 1-32.