

said they were separated from one another by somewhat crooked fault-lines which ran in approximately parallel directions, or diverged at various angles of bifurcation from a main chain. In the case of the principal chains, the highest fault-blocks were those on the western side of fault-lines, and the mountain-curves were convex towards the west. Speaking generally, Thurmann distinguished in the Jura mountains a zone of the highest chains, a central zone of uplift, and a slightly-folded plateau zone. From the whole structure of the Jura, he finally concluded, in opposition to his earlier views, that the chains had not taken origin as vertical uplifts, but *that lateral forces had acted from the Swiss side and had compressed the strata along parallel folds.*

One of Thurmann's chief tenets was the long continuation of the plastic state in sedimentary deposits. He held that sediments remained plastic long after their deposition and during the processes of mountain-formation, and he therefore differentiated sharply between faulting, bending, crushing, and shearing movements effected while the sediments were still fairly plastic, and movements of adjustment accomplished after the mountains had been formed. He contested the hypothesis that rock already consolidated was reduced to a molten or plastic condition by the processes of mountain-making.

While Élie de Beaumont and Thurmann were building up their theories of mountain-upheaval upon field observations, the English physicist, Hopkins, was trying to solve the problem upon theoretical grounds, and one of his doctrines is specially worthy of note. From his consideration of the pressures exerted by explosive gases, vapours, and other subterranean forces upon the crust, he concluded that in almost all cases of crust-fracture two systems of faults must take origin at right angles to each other, and must then be fundamental directive lines during the formation of continents and mountain-systems.

Constant Prévost, in his report on the Island Julia (*ante*, p. 264), contested the theory of Elevation-Craters, and in opposition to Élie de Beaumont regarded the origin of mountain-systems and continents only as results of slow sagging of the crust, or of occasional inthrows when one side of the fissure was pressed outward and the rock-material was stemmed against it. Much later, similar ideas were enter-