

Several geologists, for example Studer and Hoffmann, who agreed with De Beaumont's fundamental ideas of upheaval by volcanic force, and his stratigraphical method of determining the age of mountain-systems, discredited his views regarding the simultaneous upheaval of parallel mountain-chains, as well as his assumption of sudden paroxysmal uplifts. They showed that the Alps, the Harz mountains, and the Erz mountains had suffered from repeated crust-movements. Still others, Constant Prévost, Ami Boué, Conybeare, and Charles Lyell, were in openly avowed opposition to Élie de Beaumont's doctrines from the first.

Professor Thurmann in Porrentruy made a series of valuable observations on mountain-making processes. This observer, who devoted his life to the study of the Swiss Jura mountains, elucidated their structure and composition with masterly skill and breadth of conception. The arched forms, so conspicuous a feature of the Jura Chain, were explained by Thurmann as crust-uplifts due to vertically-acting subterranean forces, and he quoted several examples to show how these forces may sometimes raise portions of the crust, and sometimes give origin to faults along which the uplifted chains are disjointed, and the several portions move apart.

Thurmann called the unbroken uplifted chains "arches," and distinguished as "combes" the crust-inthrows faulted into the middle of the arches; a "combe" wholly surrounded by faults was termed by Thurmann a "cirque." While he used the term "fold" for the crust-arches themselves, he applied that of "val" for the syncline or trough between neighbouring arches. He also gave distinctive names to mountain-valleys—the longitudinal deep ravines at the outer flanks of the chains he termed "ruzs," and the transverse valleys cutting through several chains "cluses."

The earlier treatises of Thurmann in 1830 and 1836 discuss the orographical features chiefly in relation to the original fold-forms of the Jura system and to general principles of mountain-folding and structures. His complete tectonical results regarding the causes and phenomena of relative crust-displacements were not published until 1856, a year after his death, at the age of fifty-one, from cholera. In these later papers Thurmann recognised the existence of one hundred and sixty incipient chains in the Jura mountains, only thirty of which could be regarded as of primary importance. He