

Time and Stratigraphic Correlation

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The law of superposition is of fundamental importance to discuss time in geology. The fact that sediments consist of layers which are piled on top of each other, forms the basis of all stratigraphy. If a sediment body (lithosome) is considered as a three dimensional object, then the famous law by Hutton permits a translation of the lithosome spatial coordinates into a time coordinate. If this translation is possible, most of the problems of stratigraphy can be solved. The basis of the

superposition law is the sedimentation process, which may be represented by a simple random walk model. Sedimentation increases in irregular steps (for example the arrival of particles) and at irregular time intervals. The cumulative thickness of the sediment therefore performs a random walk in space and time.

No basin analysis can proceed without correlating individually established sections, or to put it differently, without finding in the originally mentioned three dimensional sediments, the appropriate time planes which connect events of identical age. Stratigraphic correlation is defined as the process of finding time equivalent stratigraphic units in different localities. In quantitative approaches, the accuracy of stratigraphic correlation can be measured by the time range within which synchronism can be established. There are almost as many computer correlation methods as individuals publishing on the subject. We favor a weighted correlation method that mixes normalized shale similarity and the Pearsonian correlation coefficient.

Solution of time and stratigraphic correlation problems is illustrated by a number of examples.