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Geological Sonification: Using Auditory Signals to Represent Geological Data

Sonification is the representation of data by sound signals. Musical descriptions of geological phenomena, such as "The Moldau" and "The Grand Canyon Suite", are both artistically and geologically meaningful. They demonstrate the basis for an auditory representation of geological data. The utility of sonification in the geological sciences arises from the multidimensional nature of Earth systems and the difficulty of comprehending multidimensional data with the eyes alone.

Sonification requires a mathematical mapping of information from a data string to a sound string. A geophysical property that is digitized as a function of distance along a traverse might be mapped to a string of musical notes. Apparent resistivities in an induction well log can be mapped to musical pitch, and the audible results will preserve the critical geometric information in the original well data. Similarly, morphologies of trace fossils can be mapped to musical pitch. In group theory, Cayley's Theorem demonstrates that a finite group, such as a point symmetry crystallographic group, is isomorphic to a subgroup of the permutation group of the same order. Permutation groups can have sonic representations, such as bell changes.

A major benefit of sonification is that sound strings can be heard and understood while simultaneously viewing other data sets in a visual format. Finding the proper balance between the total amount of information that can be presented in a sound string and the effectiveness of that sound string to communicate meaningful information to a listener is the greatest challenge for sonification.