

STRUCTURAL CONCEPTS FOR GOLD EXPLORATION: BRIDGING THE GAP BETWEEN THEORY AND PRACTICE

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ABSTRACT

As a result of the high level of gold exploration in the 1980's, economic geologists have once again focussed their attention on the numerous technical problems that relate to the geology of gold deposits. Much of the research on these topics has been devoted to the establishment and testing of genetic models that are used to guide exploration in a general way, but, in practice, there is a greater requirement for specific concepts and methods that can be applied routinely to optimize exploration programs. In all topics that pertain to the geology of gold deposits, there is commonly a large gap between theoretical concepts and their practical application, and structural analysis applied to gold exploration is no exception.

The productive gold deposits of the Archean and Proterozoic granite-greenstone terranes of the Canadian Shield, as typified by the La Ronge Domain in Saskatchewan, show an uncanny correlation with shear zones, and to a lesser extent with folds. Most genetic controversies centre on the significance of such a relationship, be it fortuitous or causative. Regardless of genetic implications, this relationship has broad application in exploration because such structures commonly dictate not only the sites for gold concentration, but also the orientation of individual veins and shoots. Most productive gold deposits comprise several orebodies of complex shape and arrangement but typically are constructed from one or more simpler elements such as shear veins (veins parallel to, and within, shear zones), extensional veins, and vein breccias that typically involve oblique extension. Where sufficient data have been collected, it appears that the orientations of these elements are not random but are related to definable deposit-scale axes of extension and shortening that, in turn, are coincident with regional fabric axes that are inferred from observation of lineation and foliation in the vicinity of deposits. Plunges of ore shoots are commonly coincident with one or more of these axes.

Although the theoretical basis for structural analysis is firmly established, there are many limiting factors such as lithological anisotropy that prevent such analysis from being treated as an exact science for the purpose of gold exploration but, treated with caution, it can be used as a technique to optimize exploration programs.