

## Metal Reduction as a Way of Life: Geobiology in Action

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Dissimilatory metal reducing bacteria (DMRB) catalyze the reduction of a wide variety of metals, using them as electron acceptors. The most obvious (and quantitatively most important) are iron and manganese, primarily because of the levels of these metals in the environment. However, it is now clear that a variety of different metals, including As, Cr, U, and others, can be used as electron acceptors for growth. While environmental analyses of pore water nutrient chemistry has indicated the existence of these catalytic activities for many years, isolation and identification of dissimilatory reducers that could couple metal reduction to growth was accomplished only recently. However, it is now clear that many genera of bacteria are capable of metal reduction, that a wide range of metal substrates can be used, and that in many environments, these activities dominate the redox chemistry of the given sites. Despite the intense interest in these organisms, especially with regard to their potential roles in bioremediation of metal and organic pollution, the details of the mechanism(s) of metal reduction have remained obscure. *Shewanella oneidensis* MR-1 is a facultative anaerobe that is capable of metal reduction. The genome sequence of this organism is now available, and it has been studied using both genomic and proteomic approaches. The results indicate that a number of genes are induced and activated under conditions of metal reduction, with only a few specific genes being needed for each different anaerobic electron acceptor that has been examined.