Thermal properties of saline environments: potential targets for detecting signatures of past or present life on Mars.

Author: Stanley Scher, P.O. Box 9456 Berkeley, CA 94709

Abstract: The search for water on Mars is central to our understanding of pre-existing or extant life on that planet. Several lines of evidence suggest that substantial quantities of water may have existed, or currently exist as ice on the surface or subsurface of Mars.

On Earth, approximately half of all inland waters are saline. By analogy, we can assume

that at least some of the water on Mars may be associated with sites containing salts. Concentrated salt solutions—brines—form by evaporation, or interaction of salt deposits with water-ice. High salinity brines not only depress the freezing point of water; they also serve to stabilize the heat capacity.

The heat capacity of ice is less than half that of liquid water. Accordingly, we can expect saline brines or other salt-rich aqueous environments to remain liquid over a wider range of temperatures and to exhibit greater thermal stability compared with analogous regions lacking or depauperate in dissolved salts.

We propose here that the lower freezing point and high heat capacity of saline waters may provide a more stable medium for salt-tolerant microorganisms on Mars or elsewhere. This combination of thermal properties may represent a decisive factor in the selection of target sites for detecting evidence of past or present life on Mars, or by analogy, sub-freezing polar environments on Earth.