EXECUTIVE SUMMARY [NON-CONFIDENTIAL, NON-TECHNICAL ABSTRACT FOR PUBLIC INFORMATION OR PROGRAM PROMOTION]: State the application's broad, long-term objectives and specific aims, making reference to the potential public benefits of the project relevant to California. Do not include proprietary or confidential information. This may be distributed before the funding decision has been finalized.

Many Archaea swim, apparently by means of cell surface appendages called flagella, and like their bacterial counterparts, Archaeal flagella rotate and thereby propel the attached cell forward through its environment. Like the bacteria, the Archaea use directed motility to pursue their prefered habitats while avoiding detriment, albeit under more extreme circumstances of temperature and pH. Indeed, homologues of the signal transduction components that control bacterial chemotaxis do exist in Archaea. However, the rotary motors that energize bacterial flagella are notably absent. The motors that drive Archaeal flagellum rotation are likely a new class of motors that, once identified and characterized, will reveal novel information about the mechanics and bioenergetics of the Archaeal flagellum. Furthermore, since motility (including flagellum assembly) is expected to place high energy demands upon a cell, more detailed knowledge of Archaeal motility and ultimately its energy requirements might enable us to redirect the energy used for motility into maximizing fuel output (by fuel-producing Archaea such as the *Methanococcus* spp.) In addition, an understanding of the molecular motors used by the Archaea may be of particular interest to the field of nanotechnology.