

Conventional vs Biomimetic Approaches to the Exploration of Mars

1 A. Ellery

Surrey Space Centre, University of Surrey, Guildford. GU2 7XH. UK (a.ellery@surrey.ac.uk / Fax: +44 1483 689503)

It is not usual to refer to convention in planetary exploration missions by virtue of the innovation required for such projects. The term conventional refers to the methodologies, tools and approaches typically adopted in engineering that are applied to such missions. Presented is a “conventional” Mars rover mission in which the author was involved – ExoMars – into which is interspersed references to examples where biomimetic approaches may yield superior capabilities. Biomimetics is a relatively recently active area of research which seeks to examine how biological systems solve the problem of survival in the natural environment. Biological organisms are autonomous entities that must survive in a hostile world adapting both adaptivity and robustness. It is not then surprising that biomimetics is particularly useful when applied to robotic elements of a Mars exploration mission. I present a number of areas in which biomimetics may yield new solutions to the problem of Mars exploration – optic flow navigation, potential field navigation, genetically-evolved neuro-controllers, legged locomotion, electric motors implementing muscular behaviour, and a biomimetic drill based on the wood wasp ovipositor. Each of these techniques offers an alternative approach to conventional ones. However, the perceptive hurdles are likely to dwarf the technical hurdles in implementing many of these methods in the near future.