Toward a Martian Land Ethic

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Keywords: *land ethic, Mars, planetary park system*

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Aldo Leopold's (1970 [1949]) plea for a land ethic, for an appreciation of the connection of humanity to the community of nature, inspired a generation of environmental activists and scientists and helped usher in the modern environmental movement. Although, since the first publication of *A Sand County Almanac*, modern civilization has continued its march toward the complete domination of wild nature, some of its members have cultivated a respect for the land in line with Leopold's vision. As we move into a new era, one in which humanity's reach extends beyond the Earth (indeed, one in which humanity's refuse, in the form of spacecraft, is already strewn across our planetary neighbors), we must now ask, should a land ethic be extended to other worlds? This question forces us to consider whether we should value extraterrestrial life, if it does exist, as we do that of Earth and whether we have ethical obligations to even (apparently) lifeless worlds and their alien landscapes.

Sufficient evidence has accumulated from the investigations of the Mars Exploration Rover Opportunity indicating that Mars was once warmer and wetter than it is today for the scientists leading the Opportunity mission to conclude "that conditions at Meridiani [the landing cite of Opportunity] may have been habitable for some period of time in martian history" (Squyres et al. 2004, 1702). Additionally, the Planetary Fourier Spectrometer onboard the Mars Express spacecraft, currently orbiting Mars, has detected methane in the martian atmosphere, which may be biogenic (Formisano et al. 2004). Improved understanding of the historical and present environmental conditions on Mars has led to the suggestion that, "Given what we now know about Mars, planetary protection considerations require the assumption that martian life exists, until we learn otherwise" (Kargel 2004, 1691).

The quickening pace of planetary exploration threatens the other worlds in our solar system with biological contamination from Earth. If life is present on another world, the introduction of terrestrial life forms could lead to an ecological holocaust, a moral and aesthetic tragedy, as well as an immense loss to science. The potential for extraterrestrial life in our solar system is not limited to Mars. Data returned from the Galileo spacecraft provide compelling evidence that the Jovian moon Europa contains an immense liquid water ocean under an ice crust that could support a viable ecosystem (Kargel et al. 2000). The possibility that life exists on other planets, and the potential for our investigations to contribute to its demise, adds an extraordinary ethical dimension to space exploration.

In response to the threat of human exploration altering "natural" conditions on other planets, Cockell and Horneck (2004) have proposed a planetary park system for Mars that would bar the landing of unmanned craft in protected areas, so as to help prevent the despoliation of the martian environment. Nevertheless, since microorganisms can be spread across the planetary surface by dust storms, this approach would not necessarily protect such parks from biological contamination, although it may help safeguard the aesthetic qualities of some areas. Furthermore, a park system approach misses the larger question of whether it is ethically responsible to interfere with other planets at all, particularly if they have life. The "discovery," exploration, and invasion of the Americas by Europeans led to dire consequences for the indigenous inhabitants of that "New World." One must wonder if human exploration of truly new worlds will have similar consequences.

It has also been suggested that a planetary park system, or some other form of protection, be applied to the Earth's Moon (Cockell and Horneck 2004; Rogers 2004; Spennemann 2004). Although it has an environment that is unlikely to support life, the Moon's pristine landscape has intrinsic aesthetic properties and there are sites of immense historical importance, such as the site of the first manned Moon landing, which could be degraded by careless intrusions. The probable absence of life on the Moon may dramatically downgrade ethical concerns about human exploration and settlement, but it does not eliminate them altogether. Even if one rejects the notion that a lifeless world possesses its own intrinsic worth, contamination of the lunar environment could hinder future scientific inquiry.

There are two primary types of arguments in support of the application of the land ethic on Earth. The first type is based on enlightened self interest: If we destroy the ecosystems and natural resources on which we depend for our survival, we ultimately destroy ourselves. The second type is

based on abstract ethical principles, rather than the desire for self preservation, and suggests that the natural world and other living creatures have intrinsic moral worth. Obviously, the first type of argument does not apply to other worlds, since our survival is not dependent on extraterrestrial ecosystems. Nevertheless, if we do not accept self interest as the proper foundation for ethics, it is unjustified to limit the land ethic to the Earth alone. Although applying the land ethic to lifeless worlds has the potential to diminish the moral force and public appeal of the land ethic, it is important to recognize that we are uncertain about where life has evolved and even where life can exist. Apparently lifeless worlds may in fact harbor organisms that we have yet to identify.

It may be objected that extending the land ethic to other worlds may inhibit space exploration. The potential inhibition of scientific inquiry by ethical standards is not unique to the proposal for an extraterrestrial land ethic, however. Ethical restrictions about the use of humans in laboratory research, for example, also may serve to limit the expansion of knowledge, although such restrictions are widely accepted as appropriate. The extension of the land ethic to other worlds need not, however, undermine an aggressive space exploration program, although it would place certain restrictions on it.

Probes that are intended to land on other worlds are, of course, potentially more problematic than are orbiters, although these are not without potential problems, since they may eventually crash into a planet or moon. The most obvious steps that are at minimum necessary for ethical exploration are thorough sterilization of probes designed for landing on other worlds and dedicated efforts to ensure that orbiters do not inadvertently collide with a potentially life bearing world. Although certain cautions are typical practice at NASA (e.g., the Mars Rovers were sterilized, although there is question as to how successfully, and the Galileo spacecraft was purposefully propelled into Jupiter, which is assumed to be incapable of supporting life (although, who really knows?), when its mission was completed so that it could not in the future crash into Europa, which may support life) ethical considerations may lead to the conclusion that even quite small risks are unacceptable, since the potential consequences for an extraterrestrial ecosystem of contamination by terrestrial organisms could be catastrophic. At the very least, the application of a land ethic beyond the Earth would require that we be extremely cautious about how we engage in space exploration.

While we, the societies of Earth, continue to grapple with our ethical obligations to our fellow humans and the other creatures with whom we share the planet, it would be wise to consider the ethical obligations we have to other worlds. We must consider whether landing spacecraft on other planets is justified if those craft may carry with them the potential to destroy endemic ecosystems. Even if these ecosystems are composed of only microbial life, our ethical obligations are not thereby diminished. Life of independent origin of that of Earth must surely deserve valuation equal to that of our world. Further, in terms of a land ethic, a landscape may deserve to be spared from our interference even if it is not a home to any life that we recognize. Perhaps it is time to think like a martian mountain. Perhaps it is time for a martian land ethic and for a land ethic that extends to all other worlds.

Endnote

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References

Cockell, C. and G. Horneck. 2004. A planetary park system for Mars. *Space Policy* 20, 4, 291-295.

Formisano, V., S. Atreya, T. Encrenaz, N. Ignatiev, and M. Giuranna. 2004. Detection of methane in the atmosphere of Mars. *Science* 306, 1758-1761.

Kargel, J.S. 2004. Proof for water, hints of life? *Science* 306, 1689-1691.

Kargel, J.S., J.Z. Kaye, J.W. Head III, G.M. Marion, R. Sassen, J.K. Crowley, O.P. Ballesteros, S.A. Grant, and D.L. Hogenboom. 2000. Europa's crust and ocean: origin, composition, and the prospects for life. *Icarus* 148, 1, 226-265.

Leopold, A. 1970 [1949]. *A Sand County Almanac*. New York: Ballantine.

Rogers, T.F. 2004. Safeguarding Tranquility Base: why the Earth's Moon base should become a World Heritage Site. *Space Policy* 20, 1, 5-6.

Spennemann, D.H.R. 2004. The ethics of treading on Neil Armstrong's footprints. *Space Policy* 20, 4, 279-290.

Squyres, S.W., R.E. Arvidson, J.F. Bell III, and J. Bruckner. 2004. The Opportunity rover's Athena science investigation at Meridiani Planum, Mars. *Science* 306, 1698-1703.