

Astrobiology News February 2016: Planetary Protection in Real and “Reel” Life

I am a geek. I love science fiction and always have. I’m a first-generation Trekker - one of many children who wrote letters to keep the original series on the air for a third season back in 1968, so I can claim some very small part in keeping Star Trek alive to become the franchise that evolved. In my opinion the best science fiction starts with the science of what is, envisions what might be, and explores the ethical dimensions of what should be.

Case in point: Last month, I participated in a “Reel Science” event at the Adler Planetarium, wherein we focused on science topics related to the movie, “Star Trek II: The Wrath of Khan.” In that movie, a team of scientists develops a device (aptly named “Genesis”) to terraform planets in a matter of hours by breaking down and re-organizing matter at a subatomic level. The intent is to use the material of lifeless worlds to create new worlds that support life. It is the ever-ethical Dr. McCoy, of course, who poses the inevitable question, what if this device were used on a world where life already exists? As you might be able to guess even if you haven't seen the movie, not all of the characters are as committed as the science team to using Genesis on a sterile world... Although there are many scientific problems with the “Genesis Device” as it is described in the movie, terraforming other worlds, such as Mars, over a period of centuries is within current technological capabilities.

Of course, terraforming is an example of deliberate, directed change of a planet’s environment. What about accidental change? Recognizing the real possibility of Earth contaminating other worlds or other worlds contaminating Earth, in 1967 the United Nations established the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies.¹ The treaty states that all participant countries “shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination.” An interdisciplinary committee known as the Committee on Space Research (COSPAR) meets regularly to debate and update guidelines and specific requirements on planetary protection as new information becomes available. Protection categories are established based on the likelihood that the target world might have gone through chemical evolution that could support or potentially harbor life.

This month, a *News & Views* article in the journal *Astrobiology* provided recommendations for updating the current framework of planetary protection, focusing on Mars “Special Regions”, where strict measures have to be applied before

¹ General Assembly of the United Nations, 1967, Article IX

² Rettberg, P., et al. 2016, “Planetary Protection and Mars Special Regions – A

a spacecraft can explore them.² The authors report on two significant new discoveries during the past couple of years – methane in Mars’ atmosphere and features on the Martian surface that may form as a result of contemporary flows of salty water (brine). Although methane doesn’t necessarily have a biological origin, several possible production mechanisms involve the presence of liquid water and temperatures that could support subsurface microbial life on Mars, either now or in the past.

Before humanity had the technological capability to explore other worlds in situ, science fiction envisioned many of the difficult ethical questions such exploration would raise. Does this mean we shouldn’t explore? No, exploration is and always has been part of human nature. Rather, it cautions us to consider thoughtfully the potential consequences of our actions and make every attempt to understand those consequences as fully as possible, recognizing that we can never foresee all of them. Many of you have developed sermons on science and religion that are available on the Clergy Letter Project web site. Those of you who are also science fiction fans might consider reading Rev. Dr. George Murphy’s “Pulpit Science Fiction” if you haven’t already.³ George is a retired Lutheran minister and theoretical physicist, as well as a CLP signatory. As he aptly illustrates in this book, science fiction can be a great way to pique interest in both science and religion!

Until next month,

Grace

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² Rettberg, P., et al. 2016, “Planetary Protection and Mars Special Regions – A Suggestion for Updating the Definition”, *Astrobiology*, Vol. 16, no. 2, 119-125

³ Murphy, G. (2005). *Pulpit Science Fiction*. Lima, Ohio: CSS Publishing Company. (ISBN 0-7880-2377-2)