2015 NASA ASTROBIOLOGY STRATEGY DOCUMENT AND THE EXPLORATION OF MARS. L.E. Hays[1], Michael H. New[2], and M.A. Voytek[2]. [1]Jet Propulsion Laboratory-Caltech, [2]NASA Headquarters.

Introduction: In 2015 the NASA Astrobiology Program released the Strategic Plan [1] to outline the goals of the research program for the next decade. The grass roots process of creating this document took over a year, involved almost 200 scientists from various aspects of the field of Astrobiology, and created an inclusive document that is 257 pages long. This document was designed to be as all-encompasing as the field of Astrobiology itself – so that any scientist who explores a field with broad astrobiological relevance can see their work reflected within the Strategy. Importantly, the structure of the document was not centered around targets (Mars, Europa, exoplanets, etc.), but instead focused on seven major topics of research in the field today. This means that research that addresses the field of Mars Exploration can be found in multiple places within the Strategy, which we will highlight here.

Major Topics: The seven major topics covered in the Astrobiology Strategy are below:

1. Identifying Abiotic Sources Of Organic Compounds

2. Synthesis And Function Of Macromolecules In The Origin Of Life

3, Early Life And Increasing Complexity

4. Co-Evolution Of Life And The Physical Environment

5. Identifying, Exploring, And Characterizing Environments For Habitability And Biosignatures

6. Constructing Habitable Worlds

7. Challenges And Opportunities In Astrobiology

Within these topics, research focusing on Mars exploration is most strongly focused in topics #1 and #5, but also came up throughout the other chapters.

Within topic #5, the Exploration of Mars fell primarily under two of the four highlighted areas of research. The first "How can we enhance the utility of biosignatures to search for life in the solar system and beyond?" addresses not only the six forms of terrestrial biosignatures highlighted in the Mars 2020 Science Definition Team report [2], but also additional biosignatures such as "technosignatures" that might be more relevant to exoplanet research. Many of the key research questions within this highlighted area of research are those that have relevance to this conference on Biosignature Preservation – such as "how are habitability and biosignatures interrelated?" and "what are the fundamental characteristics of life (even as we do not know it) that may translate into biosignatures?"

The second highlighted area of research within topic #5 addresses the question: "How can we identify habitable environments and search for life within the solar system?" This section focuses primarily on Earth Analog Environments, Mars and Icy Worlds. The first two sections contain key research questions that are relevant to the goals of this conference – such as "what are the potentials for preserving the signatures of life in extreme environments?" and "what major processes on Mars work to either degrade or preserve signatures of habitability and life?"

Summary: This paper will focus on highlighting the areas of overlap between the goals of this conference and the suggested key research directions highlighted in the Astrobiology Strategy. The goals of Mars exploration and those of astrobiological investigation can both be enhanced by careful consideration of where missions to Mars such as Mars 2020 are landed.

References:

[1] Hays L. E. (editor-in-chief) *2015 NASA Astrobiology Strategy (https://astrobiology.nasa.gov/uploads/filer_public/01/28/01283266-e401-4dcb-8e05-3918b21edb79/nasa_astrobiology_strategy_2015_151008.pdf)*

[2] Mustard J. F. et al. (2013) *Report of the Mars 2020 Science Definition Team, 154 pp., posted July, 2013, by the Mars Exploration Program Analysis Group (MEPAG). (http://mepag.jpl.nasa.gov/reports/MEP/Mars_2020_SDT_Report_Final.pdf)*