Student 4

Annotated Bibliography (APA)

Bridges, N., Bourke, M., Geissler, P., Banks, B., Colon, C., Diniega, S., Golombek, M., Hansen, J., Mattson, S., McEwen, A., Mellon, M., Stantzos, N., Thomson, B. (2011, August 03). Planet-wide sand motion on Mars. *Geology*, *40*, 31-34. Retrieved from http://www.intl-geology.geoscienceworld.org/content/40/1/31.short

 With new data from the Mars Reconnaissance Orbiter, there is direct evidence of dunes and ripple motion on Mars. These dunes have been observed to move up to a few meters per year. This article makes use of extremely recent data, making it one of the most updated resources for Martian geology available. The abundance of editors also makes this article reliable, ensuring that the analyses are well-revised and that the article is a combination of well-researched assertions, rather than the more biased assertions made by a cast of editors only two or three members large. As the phenomenon of dunes is one that also occurs on Earth, it is easy to compare them despite not having samples of the minerals. This geologic feature makes for an interesting comparison in regards to the differences in Martian features and similar features on Earth.

Brown, D., Webster, G., NASA. (2012, September 27). NASA Rover Finds Old Streambed on Martian Surface. Retrieved October 20, 2012, from: http://www.nasa.gov/mission\_pages/msl/news/msl20120927.html

 This article is a primary source on Martian geology; it was published by NASA, the most notable and one of the few organizations capable of collecting data from Mars. The information in the article comes from data gathered by the rover Curiosity, a highly advanced machine that landed on Mars only a few months ago. The article discusses a particularly revolutionary discovery: an ancient streambed. The sedimentary rocks found at this location are remarkably similar to those found in streams on Earth. This is viewed as definitive evidence that there was once flowing water on the surface of Mars. Despite the article being written by only two authors, both are heavily involved in Curiosity’s mission and thus, extremely knowledgeable on the subject. However, as they are so involved in the mission, they are potentially biased in that they see the results that they hope Curiosity would observe. The image included leaves little up for debate though and appears to be clear evidence of past surface water on Mars.

Ehlmann, B., Mustard, J., Murchie, S., Bibring, J., Meunier, A., Fraeman, A., Langevin, Y. (2011, November 02). Subsurface water and clay mineral formation during the early history of Mars. *Nature, 479,* 53-60. Retrieved from http://www.nature.com/nature/journal/v479/n7371/abs/nature10582.html

 Clay minerals are very fine-grained minerals that have been exposed to long periods of weathering. On Earth, surface clay minerals indicate the presence of surface water. This article presents evidence of subsurface clay, which indicates past subsurface water. Although there are few direct samples of subsurface clay minerals, current and future Mars missions will increase the data available on the subject and either further prove or disprove the hypothesis of previous groundwater on Mars. This article has a large team of editors, meaning that it is subject to multiple opinions and is therefore less likely to be biased. This will aid my research in that it provides a hypothesis with strong observational foundations and despite a lack of abundant data, further research will likely only strengthen the hypothesis presented.

Ehlmann, B., Mustard, J., Clark, R., Swayze, G., Murchie, S. (2011, August). Evidence for Low-Grade Metamorphism, Hydrothermal Alteration, and Diagenesis on Mars from Phyllosilicate Mineral Assemblages. *Clays and Clay Minerals, 59,* 359-377. Retrieved from http://ccm.geoscienceworld.org/content/59/4/359.short

 There are certain minerals that form under specific conditions of temperature and pressure. There is evidence of these indicator minerals, pointing toward the possibility of either low-grade metamorphism or hydrothermal circulation. This article describes the various minerals and explains how their existence reveals the geologic past of Mars. Instruments capable of making such observations are extremely limited, making this article’s assessment of observation data a crucial resource. This article’s interpretation of the data is reliable based on the data received because the condition sunder which the observed minerals occurs is not- negotiable, meaning the only room for discrepancy is the possibility that the data is not entirely accurate, as the data is from an instrument that is in Mars’ orbit, rather than physically sampling the minerals. In relation to my other research, this article supports the notion that the previous existence of water on Mars is almost a certainty.

Yin, A. (2012, April 01). Structural analysis of the Valles Marineris fault zone: Possible evidence for large- scale strike-slip faulting on Mars. *Lithosphere, 4,* 286-330. Retrieved from http://www.lithosphere.geoscienceworld.org/content/4/4/286.short

 As detailed in this article, an extremely recent observation is that Mars appears to show evidence of plate tectonics. The analyses made by the author are based on data received through multiple mediums: Thermal Emission Imaging System, Context Camera, and High Resolution Imaging Science Experiment. Detailed measurements are given as well as an in-depth hypothesis as to the formation of the titular geologic features. However well-researched and reliable this article may be, it has the potential to be biased as it only has one editor. This editor likely has a vast wealth of knowledge on the subject, but without others to review the article and provide input, this article is susceptible to this single editor’s opinions only. Despite this, it proves to be an informative and insightful look at the geologic history of Mars, providing perhaps the first glimpses of what is a potentially revolutionary discovery: plate tectonics on another planet.