

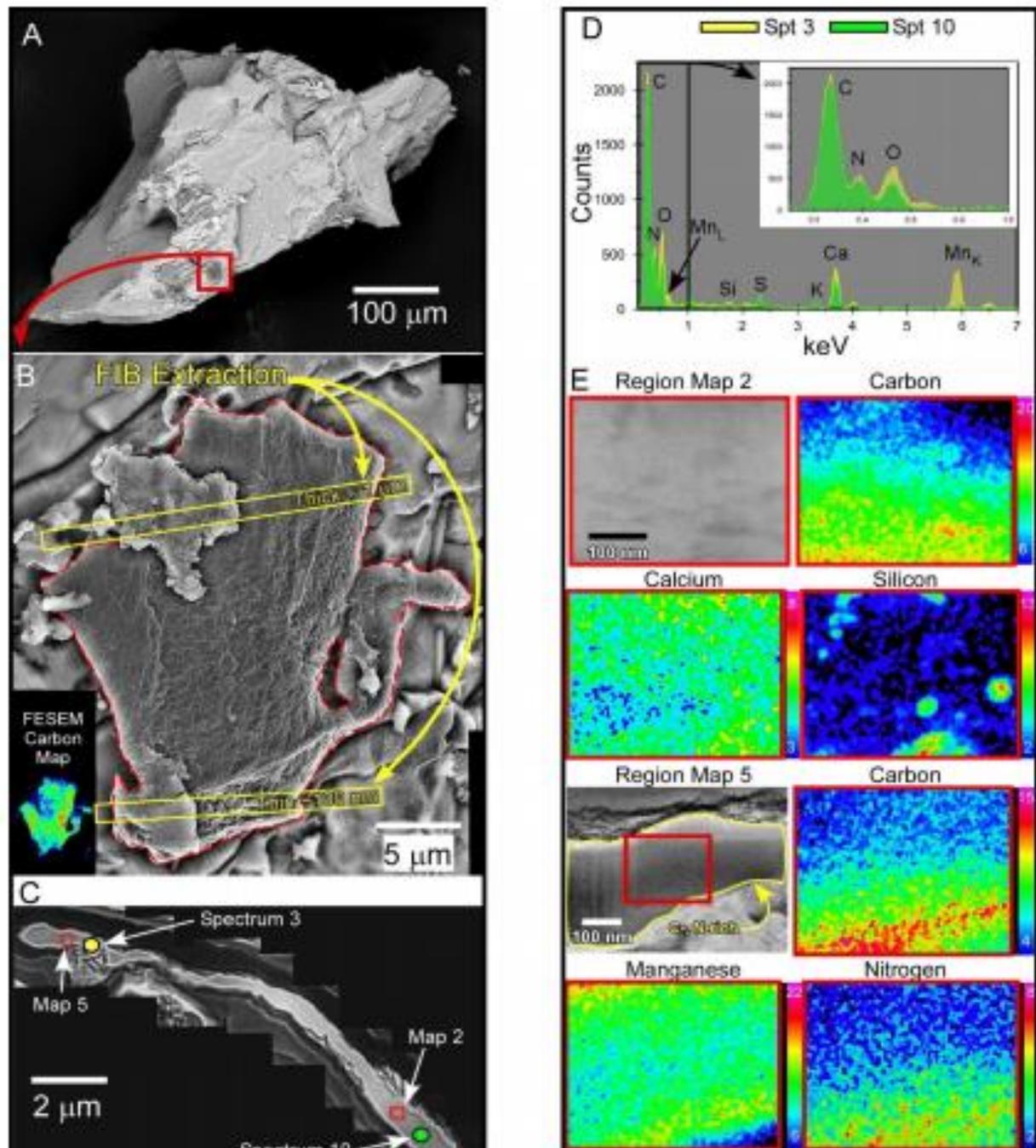
Evidence of Learning #1

Date: January 26,2017

Subject: Astrobiology

Analysis:

This year in ISM, I have focused my research on organic matter in Martian meteorites. Additionally, I will be working at JSC's labs to search for regions of interest in the Nakhla Meteorite, which fell from Mars and landed in Egypt in 1911. With that said, my mentor's work mainly consists looking for organic compounds in Martian meteorites. In my first video conference with her, we analyzed results from her experiments on the meteorite. She taught me how to read the data that was provided by high quality technology. We both identified the areas of the meteorite that consisted of detectable carbonaceous matter. Below is the actual data from the experiment done by my mentor at the Johnson Space Center.



My mentor and I spent a considerable time discussing the process of which the experiment was conducted. She used special laboratory to extract a piece of Nakhla that she thought to be of great interest. She achieved this by using laser technology.

The red dotted line around the Nakhla piece (Figure B) was the region where she focused her study. Within this area, she investigated two specific locations for organic material. To identify if there was any carbonaceous matter, Dr. Thomas-Keprta utilized the field emission scanning electron microscopy (FESEM) and the energy dispersive X-ray spectroscopy (EDX). After she did this, she used the focused ion beams spectroscopy to cut out the carbon-rich regions. Once this was done, the sample was taken for further analysis of organic composition.

In figure D, you can see how there several peaks in certain chemical elements. These peaks showed that there was detectable amount of carbon, oxygen, nitrogen, silicon, sulfur, potassium, calcium, and manganese. Of the elements that were found, Dr. Keprta and I were mostly interested in three elements mentioned above. Those elements are carbon, oxygen, and nitrogen. The unique aspect of these three elements are that they are essential for the formation life. After All, you cannot have organic chemistry without carbon and living organisms need oxygen for respiration. Both of these elements have been present in other Martian meteorites. However, the presence of nitrogen in this Nakhla fragment was something that wasn't detected before in other meteorites. Dr. Keprta explained to me how amazed she was when she identified detectable nitrogen. The detection of this element is extremely important because of DNA consists of nitrogen bases and that nitrogen fixation on Earth is making life possible for all of us. Since this is the first time that nitrogen was identified, Dr. Keprta and I will be conducting more experiments in the March of 2017. Moreover, Dr. Keprta told me that the sharp peaks at calcium and manganese startled her. She has

absolutely no idea why there were a high increase in this element. To gain a scientific explanation for this, we will be doing more in depth experimentation on the meteorite. Dr. Keprta has been looking Martian samples for a very long time. However, every time she observes the sample something new. The discovery of nitrogen in this meteorite is an important step in knowing if Mars is habitable or not.