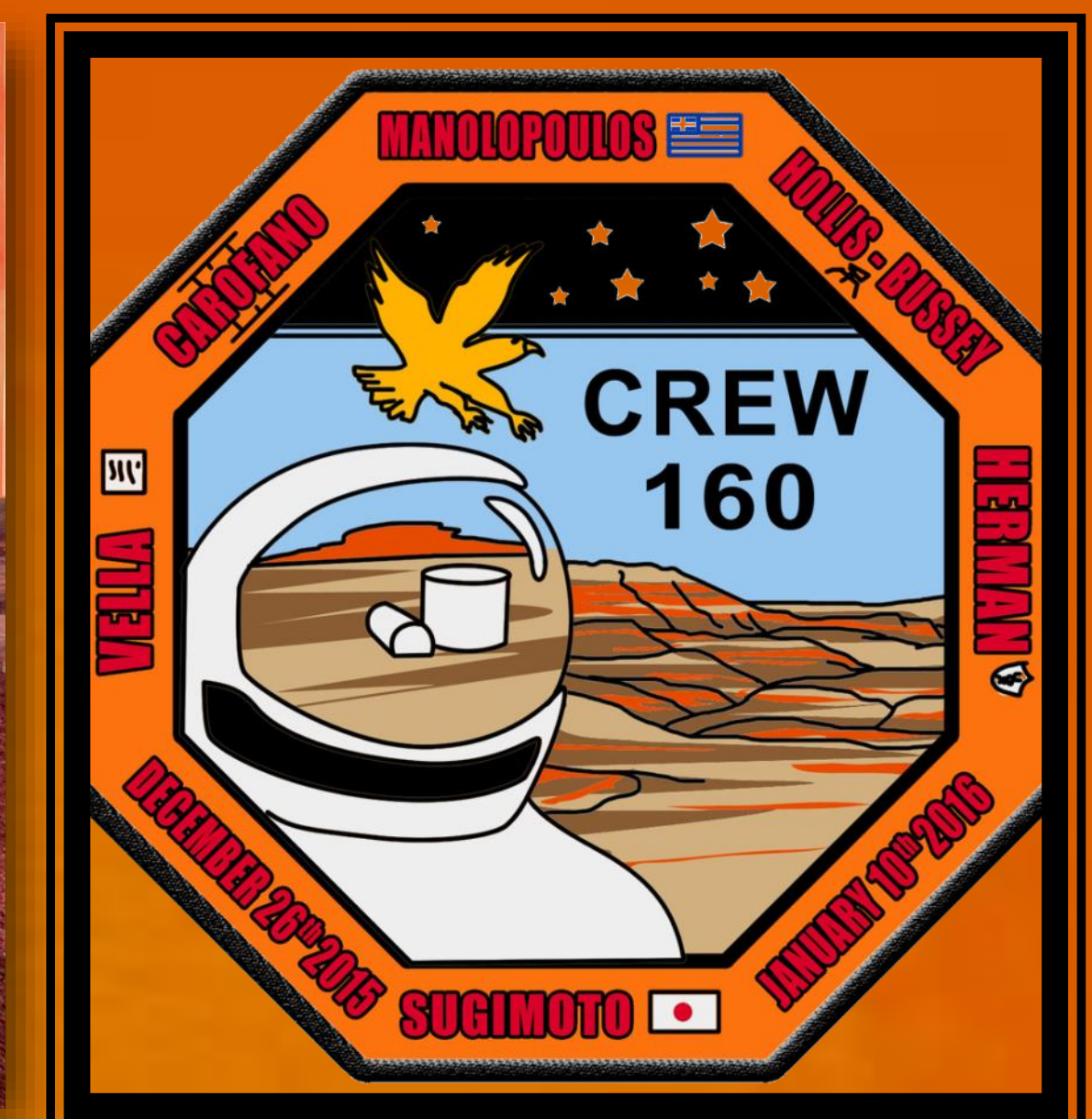


The Mars Desert Research Station

ERAU Crew 160

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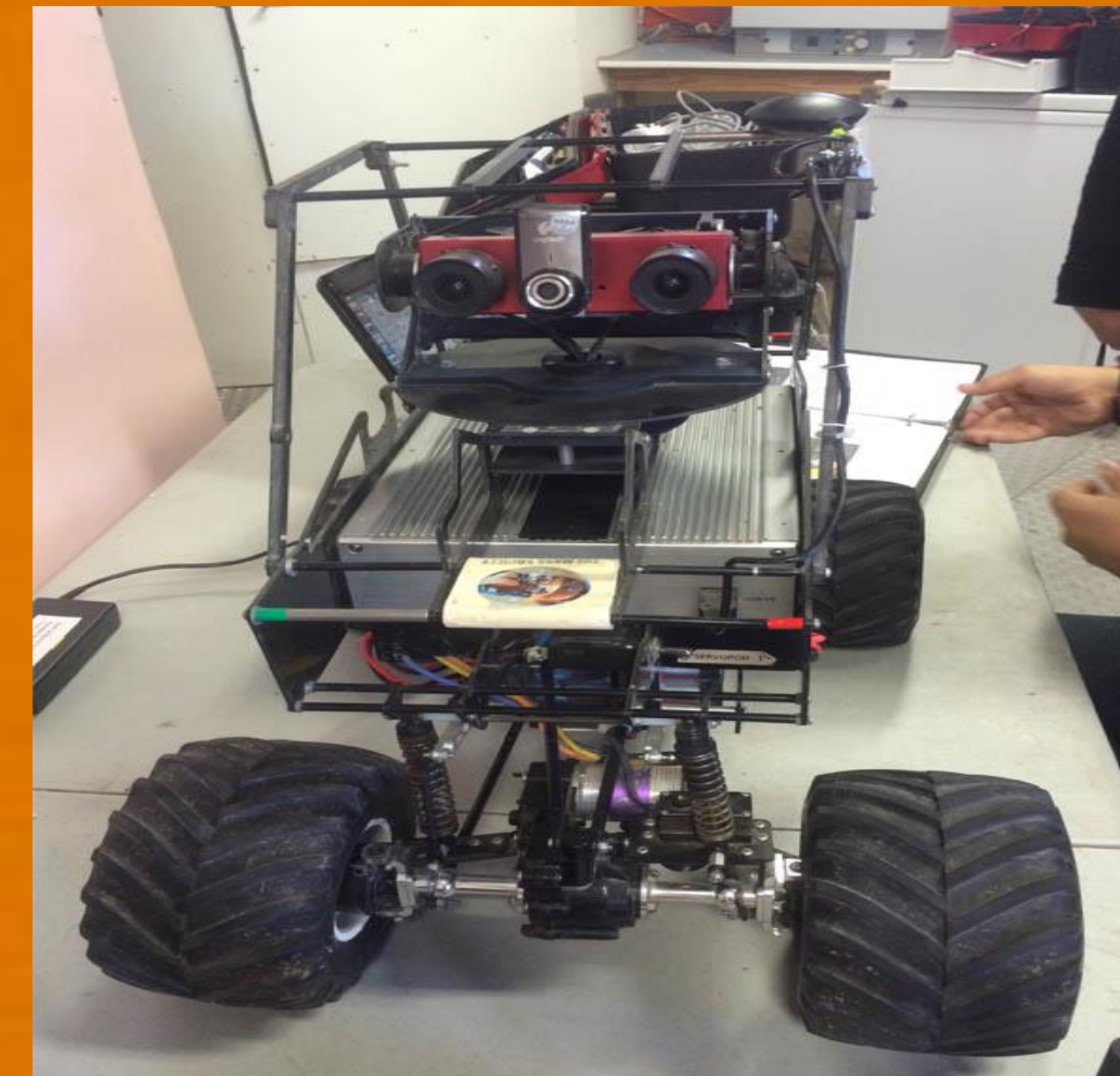


Mission Objectives

- ◇ Expand knowledge for the future habitation of Mars
- ◇ “Survive” a two week simulation
- ◇ Conduct EVAs for cartography, establishing communication relay points, and Mission Support
- ◇ Obtain Personal and Mission Support Research
- ◇ Maintain contact with Mission Support
- ◇ Conduct daily tasks for Habitat and EVA suit maintenance

Crew Members

- ◇ Commander — Lycourgos Manolopoulos
- ◇ Executive Officer — Ashley Hollis-Bussey
- ◇ Health and Safety Officer/Biologist — John Herman
- ◇ Crew Journalist — Cassandra Vella
- ◇ GreenHab Officer — Hiroki Sugimoto
- ◇ Crew Engineer — Marc Carofano III



Above Photo: Picture of the Sandstorm Rover in affiliation with NASA, Google, and the Mars Society - NorthCal Chapter

Research Results

◇ Impact on Memory Simulated on Mars

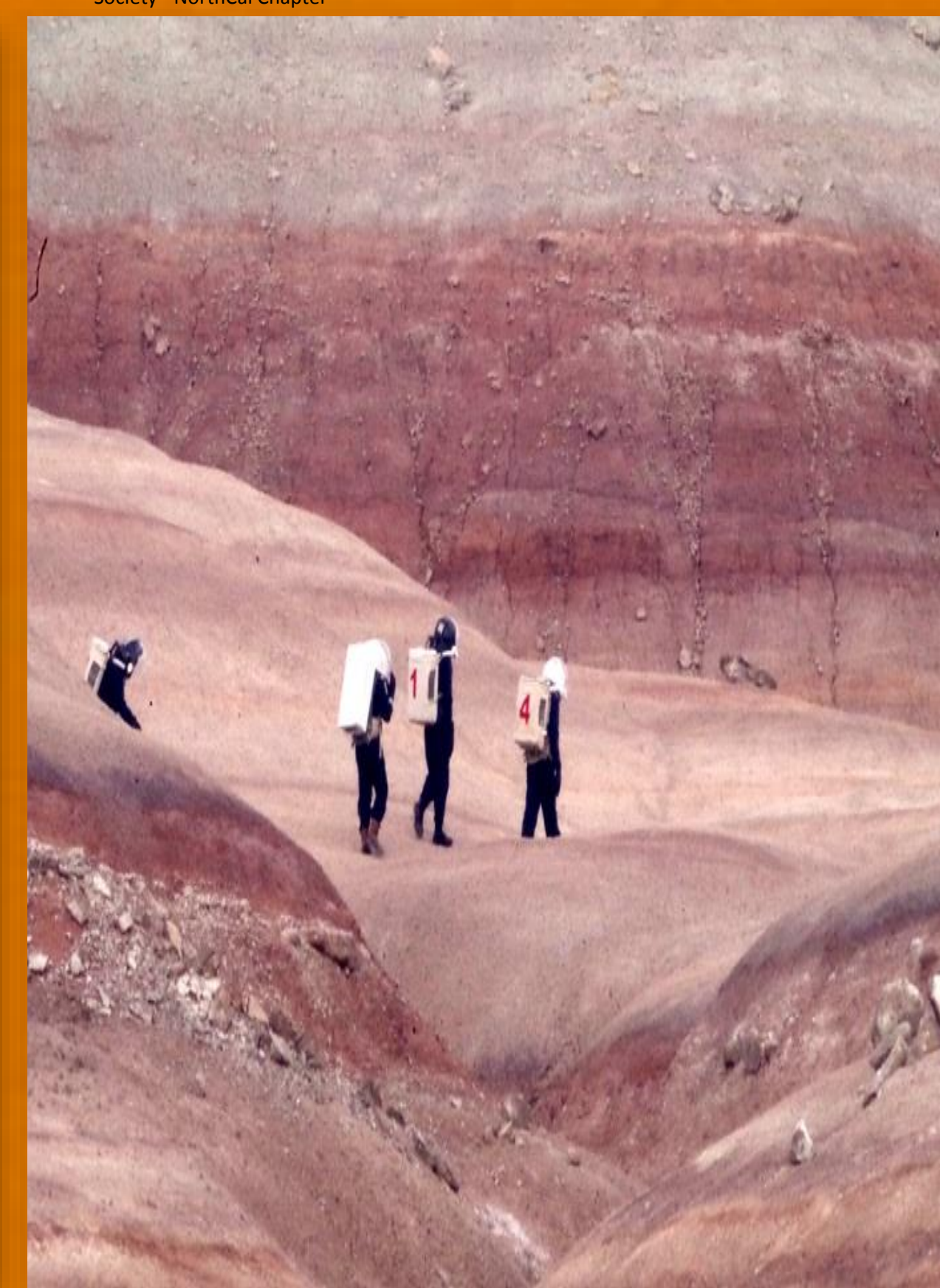
Crew members’ memory can be tested with their understanding and reactions to simple memory games and challenges all administered periodically throughout the simulation. Data during the full period of fourteen days could not be accomplished due to the failure of the crew mate’s memories to remember to complete the timed puzzle challenges and fill out the log., which resulted in only eleven days of acquired data. The data involved a record of food and nutrient intake, sleep quality, stress quality, dreams, injuries, activities, out/indoor EVA recognition, memories of the previous day(s), and amount of puzzle pieces filled within five minutes. From the data it can be observed that the crew mates’ stress levels fluctuated to higher levels throughout the eleven day periods. Although stress increased, so did the crew mates’ self-measured quality of sleep. The participants had also been eating less over the course of the study. The members who listed dreams had more vivid dreams as the days went by as well. Everyone who listed their previous day’s memories had also been noticed to lack more details as the study progressed. As the participants logged their timed puzzle attempts, each log increased in puzzle piece connecting amounts. With the stresses of the mission that the recorded five participants endured, it is plain to see that within just eleven days their memories were impacted. Lacking of details in the log entries of just eleven days show that the participants’ memory was deteriorated by the end of the study. The study ended early due to the participant’s forgetfulness in remembering the log, whether it was the lack of priority with the competing with the other mission stresses or the boredom of the participants, the log showed the impact of the environment and simulation on memory of these simulated astronauts.

◇ Study on the exposure to Natural Sunlight and the consequence on Stress Levels on Martian Mission

Any correlations between the emotions and stress levels and the sunlight intensity and going out were analyzed although the results are not what were expected; there was almost no correlation between the exposure to high intensity of sunlight or nature/activities in outside. Rather, the stress levels were affected more by social relationship between other crew members. From observation, this was due to the fact that the period of the expedition was two weeks and relatively short compared to the amount of time astronauts would be exposed to during their missions on Mars. The stress level was not yet affected by the isolated environment and therefore appears to be a function of other factors -- the social factor in this case. Also, the number of data points collected are too small, and plenty of error exists. Actual influences of sunlight and outside activities should be observed for longer duration of expeditions.

Abstract

The Mars Desert Research Station (MDRS) is a research program which is owned and operated by the Mars Society. MDRS is a space analog facility located in Hanksville, Utah that hosts field seasons that are two weeks long for professional scientists and engineers as well as college students of all levels, in training for human operations specifically on Mars. The relative isolation of the facility allows for rigorous field studies for research in a two week simulation that acts as if the crew members are conducting a real expedition on Mars. Participants are assigned specific roles and tasks that are typically aligned with their research topics as well as their educational backgrounds. Six students were selected from Embry-Riddle Aeronautical University to attend in December of 2015. Two main studies were conducted at the station which included memory tracking in isolated environments and monitoring solar radiation levels and the corresponding consequences on personality/characteristic traits.



Conclusions

The two week simulation at the MDRS was successful. There were times when certain parts of the habitat begun to fail as well as simulated EVA missions that turned for the worst. It was with constant team cooperation and critical thinking that allowed the team to pull through and thrive in the isolated environment. Each problem that created a possible simulation threat was tackled head on with the utmost commitment of the crew. Astronauts would face very similar challenges and situations that they must prepare for. The two research projects revealed that stress and memory were both affected when exposed to the isolated environment that would be similar to Mars. Although it was expected, it is important to continue researching the human factor consequences that may take place during a long expedition so that the safety of future crews and the fulfillment of any mission, is confidently secured.

Sol	Stress Level	EVA	Peak Intensity of Sunlight ($\mu\text{W}/\text{cm}^2$)
4	128	0	1693
5	108	0	1094
6	25	1	5091
7	33	1	4549
8	44	0	56
9	29	1	2595
10	33	1	Data Unavailable
11	44	0	81
12	58	1	2978
13	16	0	1171

Table 1: Stress level and sunlight intensity measured on days of EVA/non-EVA. The values of the intensity of sunlight were of inside on days of no EVA and of outside on days of an EVA. In the EVA column, 0 indicates no EVA, and 1 represents going on an EVA.

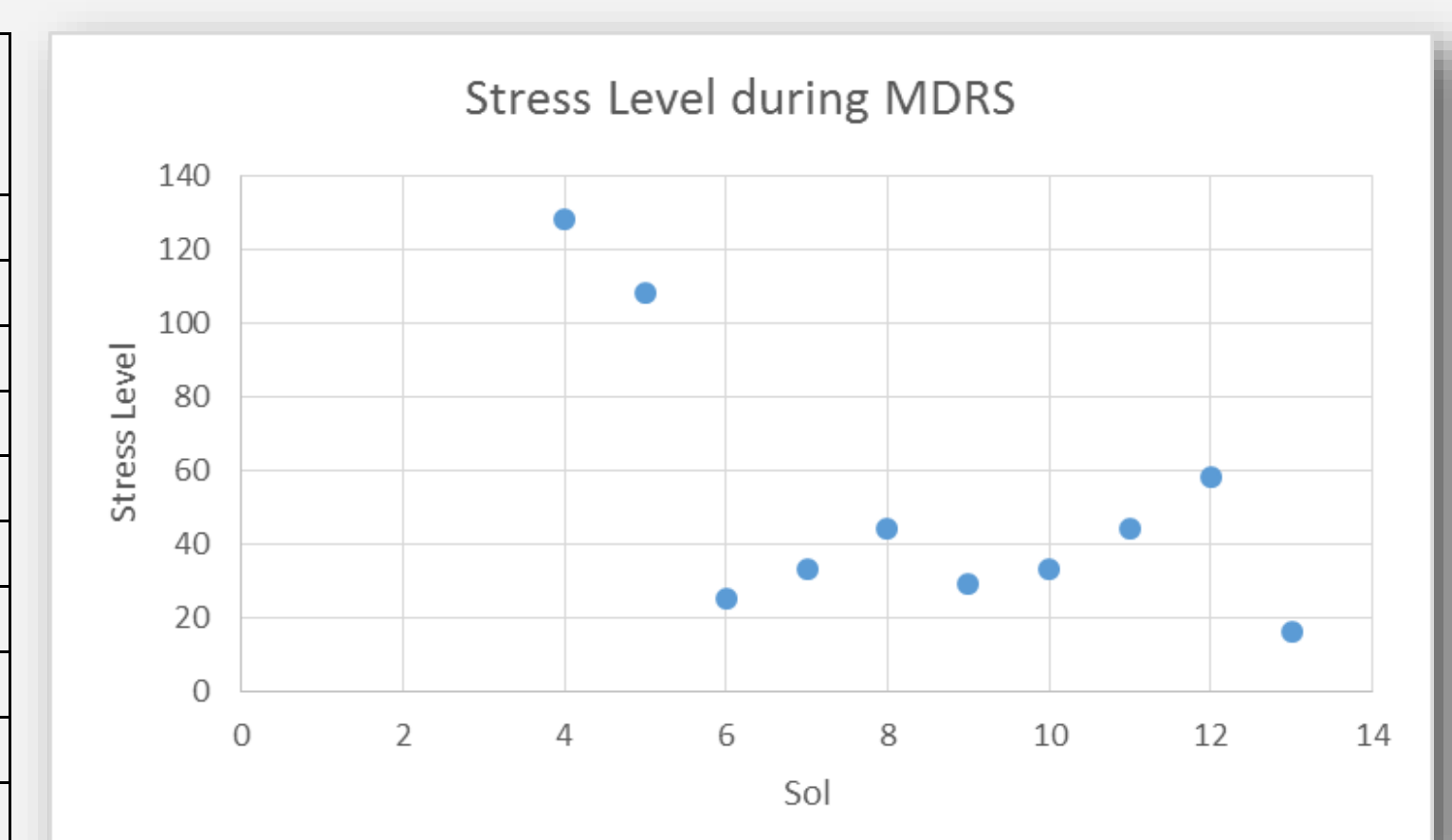


Figure 1: Plots of the daily stress levels. For Sol 4 and 5, the stress levels were extremely high. From Sol 6, the level dropped and stayed at around the same level.

