SPACE LIFE SCIENCES SYMPOSIUM (A1)
Astrobiology and Exploration (6)

Author: Dr. Ahmad Byagowi
University of Manitoba, Canada, ahmad.byagowi@umsats.ca

Ms. Viridiana Ureña Ramírez
University of Manitoba, Canada, viri.urena@umsats.ca
Mr. Pawal Glowacki
University of Manitoba, Canada, pawel.glowacki@umsats.ca
Mr. Matthew Driedger
University of Manitoba, Canada, matt.driedger@umsats.ca
Mr. Jose Juan Mijares Chan
University of Manitoba, Canada, Jose.chan@umsats.ca
Ms. Chantelle Dubois
Space Generation Advisory Council (SGAC), Canada, chantelle.dubois@umsats.ca
Mr. Robin Raju
University of Manitoba, Canada, robin.raju@umsats.ca
Mr. Greg Linton
University of Manitoba, Canada, umlintog@cc.umanitoba.ca
Mr. Emerich Kovacs III
University of Manitoba, Canada, emerich.kovacs@umsats.ca
Mr. Mike Lambeta
University of Manitoba, Canada, mike.lambeta@umsats.ca
Dr. Steve Whyard
University of Manitoba, Canada, steve.whyard@umanitoba.ca
Dr. Barbara Sharanowski
University of Manitoba, Canada, barb.sharanowski@umanitoba.ca
Dr. Carla Zelmer
University of Manitoba, Canada, carla.zelmer@umanitoba.ca
Prof. David Levin
University of Manitoba, Canada, david.levin@umanitoba.ca
Prof. Witold Kinsner
University of Manitoba, Canada, witold.kinsner@umanitoba.ca

STUDYING TARDIGRADES AS A BIOLOGICAL PAYLOAD ONBOARD A 3U NANOSATELLITE IN LOW EARTH ORBIT

Abstract

The University of Manitoba Space Applications and Technology Society (UMSATS) is currently developing a scientific payload to study the characteristics and survivability of an extremophile called the tardigrade in low Earth orbit (LEO). Tardigrades are microscopic metazoans that are able to convert into a cyptobiotic state in the absence of water and in such a state they can survive extreme environmental conditions. Tardigrades have also shown resilience against immense pressure and radiation doses up to

six times more than what is lethal to humans. In 2007, the European Space Agency sent Tardigrades in their cryptobiotic state to space in LEO and returned them to Earth. The researchers on this project were able to re-animate the tardigrades by rehydrating them with water. Several other space related studies have been conducted on tardigrades on Earth and in space. However, to date, no study has been conducted to test and observe the characteristics and survivability of tardigrades that are re-animated in LEO after being exposed to the environmental conditions. A method has been implemented to study the tardigrades in LEO. This method involves the use of an onboard processing system which runs a set of algorithms to detect the motion of the tardigrades in a microecosystem consisting of bdelloid rotifers as food source and lichens as oxygen producers. The algorithms used to detect the tardigrades is based on the discrete cosine transform (DCT). The algorithms can detect if tardigrades are aggregated around the food source or if they are spread evenly throughout their living chamber therefore indicating presence of life. In order to increase the robustness of the detection algorithms, the tardigrades are genetically modified using enhanced green fluorescent protein (EGFP). EGFP will cause the tardigrades to fluoresce in the presence of ultra violet light and as a result they will be clearly distinguished from other organisms and debris.