

ABSTRACT NO.: 521

TITLE: **Astrobiology: To Examine the Levels of Water Activity at Trinidad's Pitch Lake, which serves as an Analogue to the Moon Titan, in Connection to the Possibility of Sustaining Life at the Microbial Level on Titan**

AUTHOR: Terry Ramnanansingh

SUPERVISOR: Dr. Shirin Haque

Titan, a moon which orbits the planet Saturn, consists of hydrocarbons especially the hydrocarbons methane and ethane. The average surface temperature on Titan is -180°C , so the water which exists there is frozen. The Pitch Lake, in La Brea Trinidad, is a naturally occurring asphalt lake. The Pitch Lake shows similarity to Titan since the asphalt is also highly hydrocarbon based. Thus the Pitch Lake's hydrocarbon nature can serve as an analogue to Titan's hydrocarbon environment. It is known that the Pitch Lake harbours microbial life within the asphalt up to depths of 32 cm, even though polyaromatic hydrocarbons, which make up the composition of the asphalt, can be toxic to most organisms.

It is also known that micro-organisms do not proliferate below a water activity (a_w) of 0.60. The low temperatures on Titan indicate that water activity levels are very low, that is, below $a_w = 0.60$. If low water activity values of 0.60 and below can be found at the Pitch Lake, this means that life can exist in other areas of low activity, such as on Titan. Water activity readings were taken at random points in the Pitch Lake which showed an average of $a_w = 0.97$, clearly indicating that there was sufficient levels of water activity for microbial proliferation. In terms of water activity then, the Pitch Lake is not a well suited analogue to the current Titan environment. However in places where geothermal activity persists on Titan, the higher temperatures would result in increased water activity which would support microbial growth in the hydrocarbon environment of Titan.