

## QUAD-CITIES POPULAR ASTRONOMY CLUB

## I have favorite moon on my vacation home in space

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Last month, I looked at the possibility of colonizing other planets in the Solar System, and how none are actually good candidates due to harsh conditions. This month, we'll look at the moons of Jupiter and Saturn, and at one in particular that has some Earth-like characteristics.

It's currently known that Jupiter has 80 moons and Saturn has 83, all ranging greatly in size, shape and composition. Jupiter's moons Ganymede and Callisto, and Saturn's moon Titan, are all about the same size as the planet Mercury.

My favorite moon is Titan. Titan is an interesting object which might have some attractive characteristics for colonization.

Titan has an atmosphere, consisting of about 95% nitrogen and 5% methane. The atmospheric pressure on the surface is 60% higher than on Earth, comparable to what a scuba diver might experience at a depth of around 20 feet. This is tolerable.

Earth's atmosphere is about 80% nitrogen and 20% oxygen. While there is no free oxygen in Titan's atmosphere, the nitrogen which dominates is very similar to what we have here.

The big issue with Titan

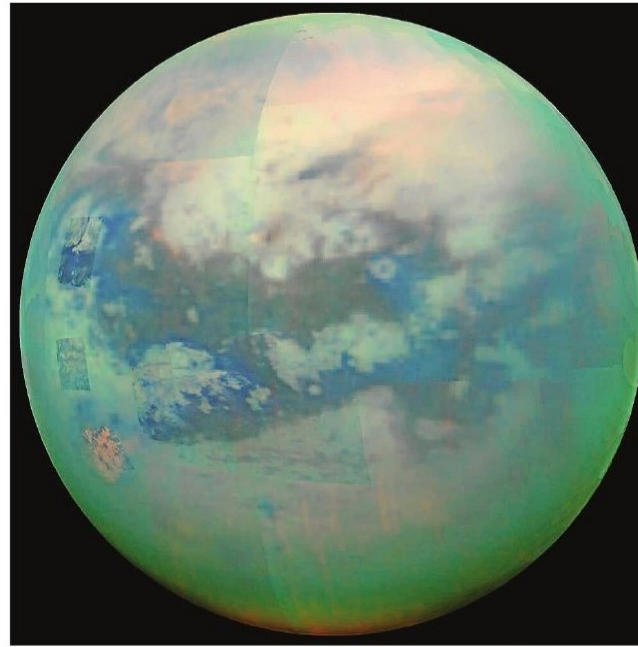


is the frigid cold. The surface temperature there is around minus 280 degrees Fahrenheit (minus 175 Celsius). While this is much colder than it ever gets in Antarctica, a human could potentially handle the temperature with very well insulated or heated clothing, and would only need an oxygen mask to breathe. A pressurized spacesuit, like that needed on the surface of the Moon, would not be required on Titan.

Interestingly, despite the fact that Titan is 50% larger than our Moon, the surface gravity is actually less. Titan's gravity is only one-seventh as strong as Earth (the Moon is one-sixth). That's because Titan is composed mostly of water ice and other ices frozen into its crust.

Titan has an average density of about 1.88 (the density of liquid water is 1.00). Earth's density is 5.51, and the Moon's is 3.34. The Earth and Moon have large, heavy iron cores surrounded by layers of rock. On the other hand, Titan lacks a significant iron core, making it very light. The result is very weak gravity on the surface of Titan.

If you want to lose weight



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This composite image showing an infrared view of Saturn's moon Titan was taken by NASA's Cassini spacecraft on Nov. 13, 2015. Titan has both a dense atmosphere that contains oxygen and frozen water.

**Besides the recreational opportunities offered by slow-motion skydiving, another reason Titan might be an attractive spot for real estate development are its beautiful lakefront properties. Yes, Titan actually has lakes, though not ones filled with liquid water.**

without going on a diet, Titan would be a good place to visit. A 150-pound human would only weigh about 21 pounds on Titan. Weight Watchers, eat your heart out!

Here's a question to mull over: How fast would a skydiver fall if they jumped out of a plane flying over Titan? The average skydiver here reaches a maximum free-fall speed (i.e. termi-

**If you go**

Titan and other moons of Saturn, as well as the planet itself, remain visible in the evening sky in September. You can view Saturn and other celestial objects at the Popular Astronomy Club's monthly public observing session on September 17 at Niabi Zoo, beginning at sunset. These sessions are scheduled for the third Saturday of the month through November.

For more information, visit [popularastronomyclub.org](http://popularastronomyclub.org) or search for "Popular Astronomy Club" on Facebook.

nal velocity) of around 120 miles per hour, or 200 kilometers per hour. This speed depends on the size and weight of the skydiver, and the density of the air they are falling through.

Given Titan's dense atmosphere and low gravity, it would be interesting to try skydiving there and see what happens. Because the air pressure is higher and the temperature is lower, the air density near the surface of Titan is about four times higher than on Earth. Since the gravity is only one-seventh as strong, the terminal velocity might be significantly lower. In fact, if one

does the math, we find that a skydiver on Titan would have a terminal velocity of only 22 miles per hour (35 kilometers per hour).

Would a skydiver even need a parachute on Titan? I would guess that doing a belly-smacker face-first onto the ground at 22 miles per hour would not be good, but it might be survivable. To avoid injury, a parachute would still be needed, though it could be much smaller than one used on Earth, given Titan's thick atmosphere.

Besides the recreational opportunities offered by slow-motion skydiving, another reason Titan might be an attractive spot for real estate development are its beautiful lakefront properties. Yes, Titan actually has lakes, though not ones filled with liquid water.

Titan's lakes are filled with liquid hydrocarbons such as methane and ethane. The H<sub>2</sub>O on Titan is frozen solid, but could easily be mined as a source of drinking water, and broken down into hydrogen for rocket fuel and oxygen for breathing.

Actually, Titan's huge reserves of hydrocarbons, found both in the lakes and in the atmosphere, could easily be burned using current technology, separating the oxygen from the H<sub>2</sub>O to generate heat and energy.