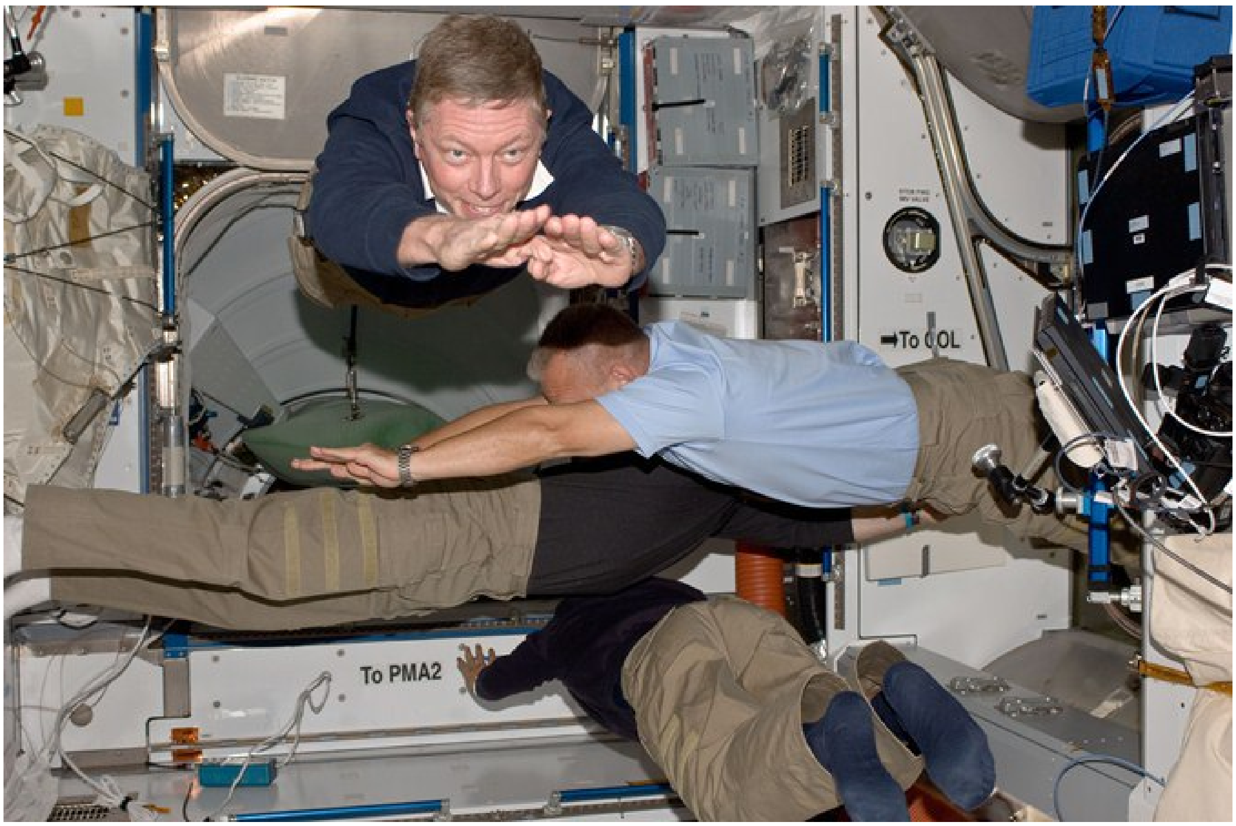
Could we make artificial gravity?

July 31 2015, by Fraser Cain



Astronauts strut their superpowers on the final shuttle mission, STS-135. Credit: NASA

It's a staple of scifi, and a requirement if we're going to travel long-term in space. Will we ever develop artificial gravity?

It's safe to say we've spent a significant amount of our lives consuming science fiction.

Berks, videos, movies and games.

Science fiction is great for the imagination, it's rich in iron and calcium, and takes us to places we could never visit. It also helps us understand and predict what might happen in the future: tablet computers, cloning, telecommunication satellites, Skype, magic slidey doors, and razors with 5 blades.

These are just some of the predictions science fiction has made which have come true.

Then there are a whole bunch of predictions that have yet to happen, but still might, Fun things like the climate change apocalypse, regular robot apocalypse, the giant robot apocalypse, the alien invasion apocalypse, the apocalypse apocalypse, comet apocalypse, and the great Brawndo famine of 2506.

Not to mention things that'll probably never happen, things that could not be, in accordance with the laws of nature. Faster-than-light travel, instantaneous teleportation, and the ability to destroy whole planets with a space station laser pointer.

But there's one future technology, a massive violation of the laws of physics which plays a role in nearly every single book, show and movie you can mention.

I promise you, if authors, screenwriters and directors tried to adhere to the laws of physics with even a shred of accuracy, your favorite scifi would unfold very differently.

I'm talking artificial gravity.

It's magical. Captain Kirk can actually *stand* on the bridge of the USS Enterprise, and he just stands there. He can sit in the mess and enjoy a pint of Romulan Ale not served in a plastic bag, or go just to the bathroom without a freaky-weirdo suction toilet.

I understand scifi authors are imagineering spaceships like ocean going vessels, yet in space.

That's where they go wrong.

On Earth, you can stand on the deck of your warship, drink your Romulan Ale from an open topped non-collapsible container, and it's all thanks to you, gravity. The Earth is pulling the ale towards its center, and it's stopped by the glass, which is stopped by your meat and skeleton, stopped by your well polished boots, stopped by the plates on the deck of the ship, held up by the rest of a the ship, held up by buoyancy, which all work to keep everything from zipping down to the center of the planet, or at least the floor of the ocean.

Astronauts share a lunch on the ISS. Credit: NASA

Out in space, no gravity. You've seen the crew on board the International Space Station.

Once you're in microgravity, you float around like a balloon. You have to drink and pee into a tube, and one of those involves a vacuum cleaner. Protip: Do not mix up those tubes.

Most importantly, once a spaceship started moving, or undertook evasive maneuvers, everyone would ping pong around like crunchy meaty bingo balls.

Will we ever develop artificial gravity?

The only way to get gravity is with mass. The more mass, the more gravity you get. Without mass, you can't have gravity.

Before we go any further, there's no such thing as anti-gravity.

Now that's out of the way, there are a few ways we can fake it.

The force of gravity that we feel is actually just an acceleration towards the center of the Earth at 9.8 meters per second squared, or 1G.

As Einstein showed us, everything's relative. If you were in a spacecraft and it was accelerating away from Earth at a rate of 1G, it would feel exactly the same if you were standing on the ground.

This is known as constant acceleration, and if you could somehow power a spacecraft with that much energy, it would be just what you needed.

Want to get to the Moon? Accelerate at 1G for an hour and a half, turn around, and decelerate for the same amount of time. Not only would you get to the Moon in under 3 hours, but you would have experienced Earth gravity the entire time.

Want to fly to Jupiter? It would only take about 80 hours of acceleration, and then 80 hours of deceleration. At the halfway point of this journey, you're going more than 2,800 kilometers per second, which is close to 1% the speed of light.

Astronauts on the Moon. Image credit: NASA

Want to travel a light-year? Accelerate for about a year, then decelerate for a year. At the mid-point, you'll be going the speed of light.

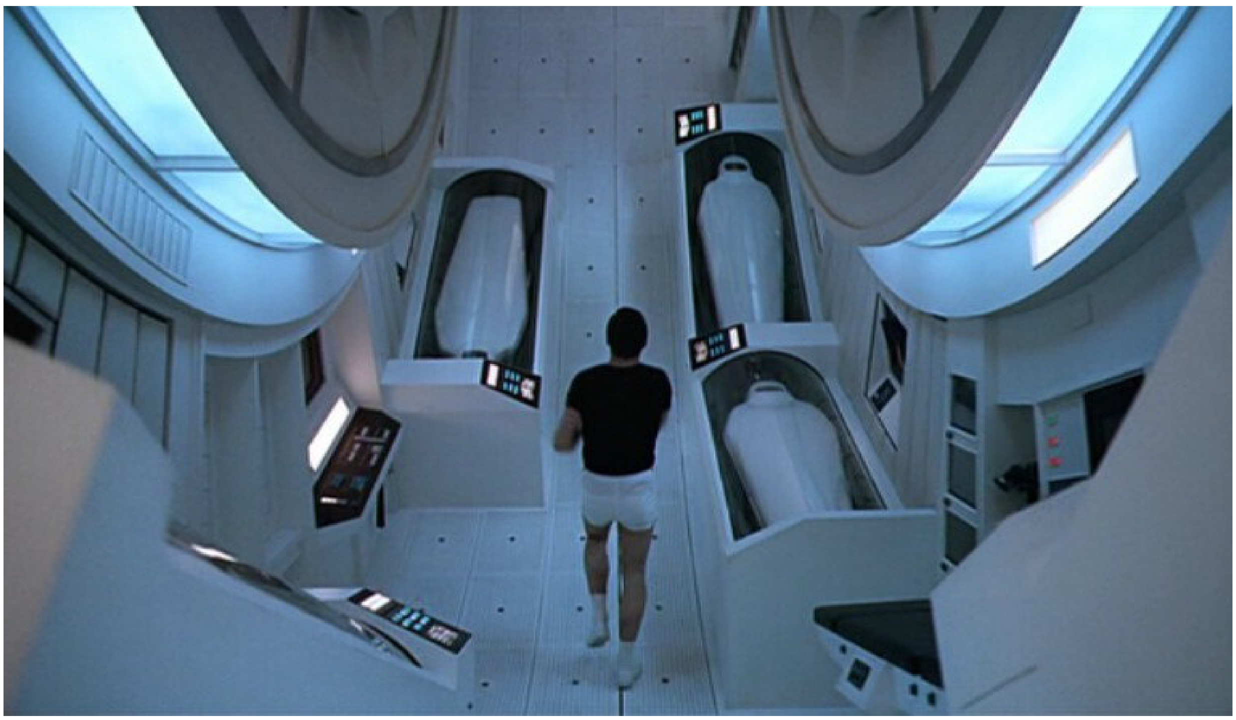
Uh oh. There's the problem. As you probably know, as you approach the speed of light, it requires more and more energy. And you can't go faster than the speed of light. So using this method only lets you travel about a light year at a time.

There's an idea that I'm sure you Arthur C Clarke fans know, which requires way less energy: artificial gravity from centripetal force… spinning.

Take a large enough spacecraft and set it spinning.

Thanks to inertia, free floating objects within the spacecraft, like astronauts, would try to fly off into space, but the hull of the spaceship would keep them inside.

To make this comfortable, you need a ring-shaped spacecraft with a radius of 250 meters. This ring would need to turn about twice a minute for astronauts within the spacecraft to experience 1 G.



Interior of the Discovery, from 2001: A Space Odyssey. Credit; Metro-Goldwyn-Mayer

Building a spacecraft like this is an engineering challenge, but it's probably within reach of our current technology.

Something like this would help us explore the Solar System without the health risks of microgravity.

That's right, not only is microgravity super annoying for trying to pee, but it'll also ruin you.

Unless we discover anti-gravity, we'll probably never have the kind of artificial gravity we see in science fiction. It's going to be huge rotating rings for the foreseeable future, sadly.

What's your favorite science fiction story that seems to have ignored the problem of artificial gravity? Tell us in the comments below.

Source: Universe Today

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