

# Eight days on the Space Station

The International Space Station (ISS) is staffed by a crew of two -- one Russian cosmonaut and one American astronaut. They serve six month tours of duty. But when a new crew comes up to replace the existing crew, they bring along a third passenger, who remains on board the ISS during the eight-day overlap and returns with the crew that has completed its six month tour. Sometimes the third person is an astronaut from another country, such as Brazil or Japan. Less often it is a civilian, who needs to be very well connected, politically or financially. It was the latter that brought Greg Olsen along on a recent voyage, which he recounted to the Princeton University Sigma Xi chapter on 13 April 2006.

But Olsen needed much more than money to get on board. He had to pass a physical exam, physical fitness tests, and other tests based on more than 900 hours of training (in Star City, Russia) -- on the Russian language, the systems aboard the ISS, and survival (in case of an emergency). He almost didn't make it because of a spot on his chest X-ray. But, as he recalled, he didn't let an "F" in trigonometry stop him from pursuing a career in science (he heads his own company); and he persisted in applying to go into space until the spot "went away."

Once accepted, Olsen had to be fitted for a space suit, which was made from a body mold, after which he endured more fittings than a bride for a wedding dress, as he put it. Then, when launch date arrived, he boarded the Russian *Soyuz*, which was delivered to the launch site by train (rather than by dedicated vehicles at Cape Canaveral). The crew had to say in the same position (parallel to the 3 g's of rocket acceleration) two and a half hours before launch and four hours after. Olsen told his audience that they were all outfitted with Huggies -- and they all used them. (The body loses blood in the "zero gravity" environment of the Space Station, and there is much urinating the first few days, he said -- but aboard the Space Station it is done into a vacuum hose.)

The first two days, Olsen said, were so exciting that he didn't sleep very well. After that, though, he said he was able to get the six to six and a half hours of solid sleep he usually gets on Earth. But, as his visual presentation showed, there *is* a difference: because of the "zero gravity" environment, all positions are equivalent to do everything -- the only requirement is that one be strapped into whatever position is chosen for sleeping.

Although the crew aboard the ISS can see the Sun rise and set every 90 minutes, the time it takes to orbit the Earth, they try to organize their routines along the lines of Earth days, which run by a clock set at Greenwich Mean Time. From 11 p.m. until 8 a.m. is quiet time -- intended primarily for sleeping but suitable for any other activity that doesn't disturb the rest of the crew. Breakfast is at 8 a.m.

The food, Olsen said, reminded him of "backpack food." He said he liked the shrimp cocktail best. And he added that the reported shortage of food was only of the "good stuff."

One thing that is *not* done on the Space Station, Olsen told us, is laundry. This means bringing clean underwear and socks for each day aboard -- quite a lot for those on a six month

tour. All this clothing must return to Earth with the crew that wore it, along with the waste from bodily functions.

Olsen related that his only disappointment was not being able to carry out his goal of growing crystals in space, but he did carry out some experiments for the European Space Agency. Most experiments, he said, are biologically related, concerning life support. These experiments, he noted, are more supportive of future space missions -- *e.g.*, to Mars.

His most harrowing experience, Olsen said, was re-entry and landing. Returning to a gravity environment, he pointed out, requires reorientation -- more time for people who have been in "zero gravity" longer, in spite of a regimen of two and a half hours per day of exercise on treadmill, bicycle, and spring weights. But, Olsen concluded, given the opportunity, he'd gladly do it all again. Meanwhile, he spends a lot of his time giving talks about his space experience to students, in hopes of getting them more interested in studying math and science. He was in seventh grade when *Sputnik* was launched, and he hopes to provide the same kind of motivation today that *Sputnik* did for him.