

GLOBAL FRIENDSHIP THROUGH SPACE EDUCATION

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ASTRO NEWSLETTER

Hello again! Since the year 2000, the International Space Station (ISS) has been one of the most productive research laboratories. Astronauts, cosmonauts, and scientists from several different nations have conducted hundreds of experiments over the first 16 years of the ISS's ongoing mission including the "Twins Study". In this issue, we wanted to focus on some of these experiments.

3D printing in zero G

The ISS crew is testing 3D printing processes as a first step towards establishing a working machine shop in space. This would allow for in-space manufacturing, making onboard experiments more flexible, and crew members less reliant on ground support. At the moment, if something breaks on board a space vehicle, the replacement is sent with an additional launch. 3D printing will make deep space missions possible and affordable.



The Robonaut

The Robonaut is a humanoid robot with arms, hands, and legs. He's designed to eventually take on critical tasks to assist the crew in its daily routine. With Robonaut on board, the crew will be saving time, and staying away from harm's way. The Robonaut made his ISS debut in 2011, but has been evolving with new

technology and abilities ever since.

Originally built with just a torso, it had limited movement through the cabin on a track. The robot's legs were deployed during the Expedition 40 mission. The unit has also been outfitted with an all-new tele-operation system where the robot mimics the motion of a human.



How to Put Out a Fire in Space

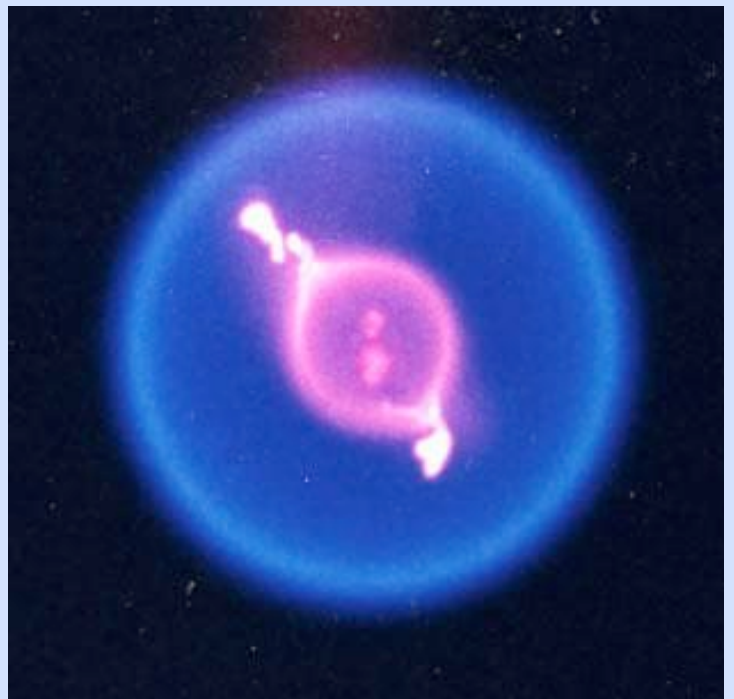
NASA is conducting a series of experiments aboard the space station to understand how to fight fires in space. Materials used to extinguish fires in space must be present in higher concentrations. Learning how to fight fires effectively in space will become critical as we reach for farther destinations like Mars. Screaming "fire" in a crowded spacecraft may still create a panic just as it would here on Earth, but putting out the flames isn't as easy as grabbing the nearest fire extinguisher.

Fire behaves very differently in zero or low-gravity. Here on Earth, hot air rises, pulling combustible material away from the flame and drawing oxygen toward it. That's why candle flames look like a teardrop.

Flames in space burn at a lower temperature, slower and with less oxygen than in normal gravity. This means that materials used to extinguish fire must be present in higher concentrations. The ISS uses CO₂ extinguishers.

Scientists at NASA figured out that flames burning methanol and heptanes – two common fuels onboard – will burn as long as there is at least 12 to 13 percent oxygen levels in the spacecraft. Humans need around 14 to 15 percent oxygen minimum to survive.

Knowing the exact point at which the flame goes out will help engineers build better firefighting gear, and astronauts make better decisions should another disaster occur.



Below is an article about Nebulas written by Dalya KINSIZER from Hisar School. We thank Dalya once again for her contribution and we encourage all the students to send us their space related articles.



The Fascinating Nebulas



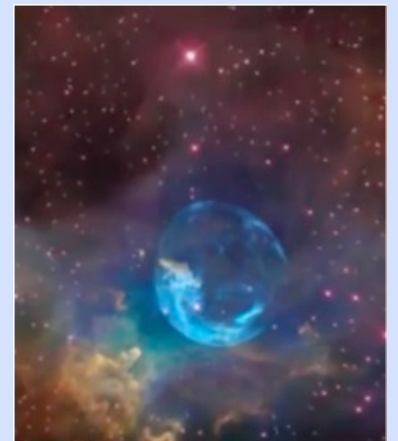
Have you ever heard of Nebulas before? Each is unique and different by shapes, colors and types. There are many Nebulas out in our galaxy and beyond. Nebulas are stars that are in a different stage in their life cycle. Their chemistry explanation is; is an interstellar cloud of dust, hydrogen, helium and other ionized gases. Technically, each position of a star comes from its earlier genetics. This may sound confusing but here are some examples to clear it out for you; let's begin with Stellar Nebulas which are my personal favorite, they can become an average star or a massive star and the average star becomes another form of a star and the cycle continues until the star finally expends its life time and dies. A dying star is called a Black Hole, which I'm sure you had heard many times before.

The most common known Nebulas are the Planetary Nebulas. As said earlier Nebulas can be seen in many different shapes such as, bubbles lately spotted by the Hubble Telescope which is 26 years old, cats and anything you can imagine! Not only they are in many different shapes they are also very colorful such as rainbows and shadings of violets, pinks, green, reds, blues and yellows and almost every color with sparkles!

The latest Nebula discovery had been done by Nasa on April 21st by their one and only Hubble Telescope! This was said to be a birthday gift to the telescope for its 26th birthday! The Nebula is in a shape of a bubble. You can see a picture of the Bubble Nebula below, on the right corner. Wow! Wouldn't it be super awesome to discover a Nebula that rhymes with your name on your birthday as a gift! I can't even think about what it'll be like!

Dalya KINSIZER
Hisar School

References:
nasa.gov



PSSP & FEP

As we come to the end of another school year, we are amazed how fast time flies. The schools participating in our programs are working hard on their last projects these days and they are doing a great job at it. You can find ÜST-ZEM's article about Mars and their conference photos below. They have done some amazing stuff and continue to blow our minds with limitless creativity. We thank them for that!

Humans to Mars

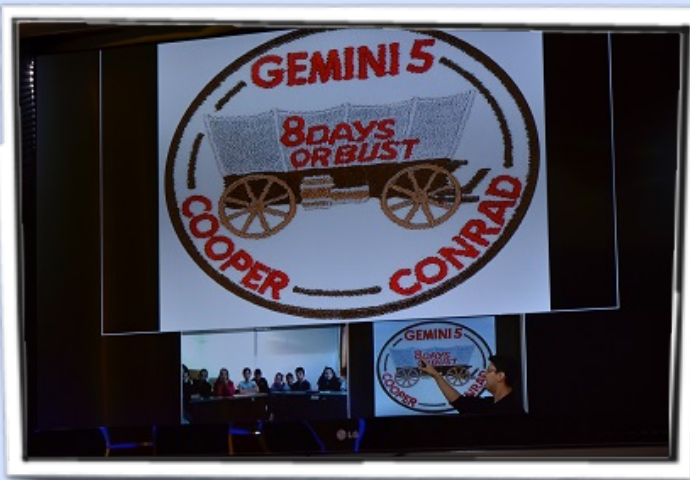
Mars gravity is thirty eight per cent of that on Earth. The cold temperatures and thin atmosphere on Mars do not allow liquid water to exist at the surface for long. Water is found just under the surface in the polar regions. Because of gravity and existing water, we thought astronauts can build colony under the Mars' surface. Gravity force is inversely proportional to the distance. By living under the surface, colony increases the gravity and has protection against high-energy cosmic rays. Also the colony would be much closer to subsurface water-ice on Mars. Through mole machine, colony is built under the Mars' surface. These machines also are found subsurface water-ice on Mars and carried to the colony. At the colony, water-ice is heat at the water cycle center and becomes ready for use.

Astronauts can grow plants on Mars' surface in a special capsule. This capsule doesn't allow high-energy cosmic rays through. Colony can use plants for nutrition and oxygen. Against calcium loss astronauts can sunbathe under the capsule on the Mars surface. In the future, humans may change the atmosphere on Mars by the oxygen obtained from the plants.

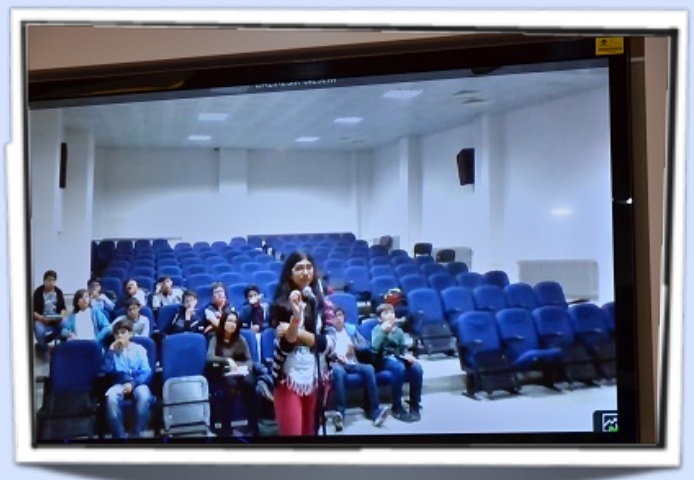


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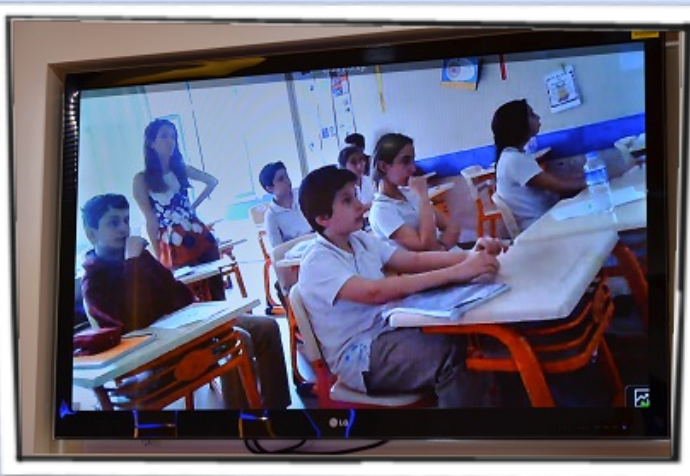
Here are more photos from our videoconferences over the past few months. Two schools from Bulgaria have started participating in our Future Explorers Program. Also, for the first time, we have completed our "Planet Hunters" project with one of our participating schools. We are looking forward to adding new subjects to our curriculum in the next couple of years.



25 School, Bulgaria



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TAKEV, İzmir

ASTRONOMY PICTURE OF THE DAY



Cat's Eye Wide and Deep

Image Credit & Copyright: Josh Smith

The Cat's Eye Nebula (NGC 6543) is one of the best known planetary nebulae in the sky. Its more familiar outlines are seen in the brighter central region of the nebula in this impressive wide-angle view. But the composite image combines many short and long exposures to also reveal an extremely faint outer halo. At an estimated distance of 3,000 light-years, the faint outer halo is over 5 light-years across. Planetary nebulae have long been appreciated as a final phase in the life of a sun-like star. More recently, some planetary nebulae are found to have halos like this one, likely formed of material shrugged off during earlier episodes in the star's evolution. While the planetary nebula phase is thought to last for around 10,000 years, astronomers estimate the age of the outer filamentary portions of this halo to be 50,000 to 90,000 years.