SPACE, the Academy

The First SPACE Retreat

SHEN GE, CONTRIBUTOR

An earlier SPACE event took place on the Isle of Man. Horizons reported on that starting on page 20 in the January / February 2012 issue.

Above: A chart about university plans for SPACE.

On January 8, 2013, a group of space professionals and enthusiasts gathered at a vacation apartment called Tropical Park in a little town called Callao Salvaje on the tropical isle of Tenerife, one of the Canary Islands. There, under the sunshine of an eternal summer between episodes of going to the beach and eating plenty of Canarian chicken and other local culinary delights, these dozen or so folks gathered together for serious presentations and discussions on the various aspects of space and space habitation. All presentations started at ten o'clock in the morning to accommodate for people's potential late nights. This "unconference" organized by the Scientific Preparatory Academy for Cosmic Explorers (SPACE) hoped to gather together people from diverse backgrounds with the common goal of sharing knowledge and building together a roadmap for space habitation.

Above: The Observatorio del Teide (Teide Observatory) is an astronomical observatory on Tenerife operated by the Instituto de Astrofisica de Canarias. Opened in 1964, it became one of the first major international observatories, attracting telescopes from different countries around the world because of the good astronomical seeing conditions. Later the emphasis for optical telescopes shifted more towards Roque de los Muchachos Observatory on La Palma. It is considered one of the world's major observatories. Caption: Wikipedia. Image credit: SPACE.

On the first day of presentations, Shen Ge talked about the purpose of Scientific Preparatory Academy for Cosmic Explorers (SPACE) and the plans for making SPACE the organization to create the human talent for a spacefaring civilization. Shen discussed the ways that SPACE is acquiring attention and money, including planning events such as this SPACE Retreat. Another example is an educational module to be ready later this year or early next year. It will consist of spacecraft and space mission design taught at foreign universities that do not have such a program. The foreign university will pay SPACE instructors to teach such courses at the respective university. Within the next five years to a decade, SPACE will garner enough donations and sponsorships to build its own campus.

Ryan Haughey, a student under Dr. David Hyland, an aerospace engineering professor at Texas A&M University, made the next presentation. He spoke about the spacecraft which he and 33 other students designed as part of a spacecraft design course. The design is for an interplanetary spacecraft that can fly 2-3 years with a crew of 12. This project is very ambitious and will cost far more than the F-35 Joint Strike Fighter, an aircraft which required about $1 trillion to develop. Nonetheless, its consequences for humanity will be far greater.

Later that night, Dr. Hyland talked about the overall plan for the human habitation of the solar system. Since he couldn't make it in person due to family obligations, the presentation took place using Skype. Despite connection issues, the attendees were able to acquire an understanding of the roadmap for space habitation as envisioned by Dr. David Hyland. After this presentation, the attendees were treated to an appetizing dinner party with plenty of sangria and wine.

On the second day, Virgiliu Pop, a space lawyer currently working for the Romanian Space Agency (ROSA), talked about the legal considerations of asteroid exploitation and deflection. He pointed out that asteroids aren't considered things that can be owned. However, claiming ownership is an issue since some people might do it, and just stating that you own an asteroid does not imply real ownership. Robots may make the case for ownership. A recent shipwreck was recovered by robots. Virgiliu's second topic was the legal or moral obligation of people to deflect an Earth-impacting asteroid. Apparently, there are no legal obligations but there are definitely moral ones. Finally, Vrigiliu described the Sagan dilemma, "The same technology used to deflect an asteroid can be used as a weapon to harm Earth." This issue might prevent testing of asteroid deflection techniques.

Roy Tucker, famed asteroid discover (Wikipedia, extracted February 7, 2013: "He is a prolific discoverer of asteroids, identifying at least 404 and co-discovering one between 1996 and 2009."), next gathered

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everyone around for a roundtable discussion (using a rectangular table) about achieving space habitation. Three topics were addressed: financing, technology, and the will. For financing, the several topics addressed included resources (asteroid mining), energy (asteroid mining), people (tourism), and intellectual ideas (science, entertainment). For technology, Roy directed the conversation to rotovators, telepresence, and digital immortality. For the will, Roy suggested the Pilgrim analogy where people initially venture forth to escape confinement on Earth and seek freedom of expression.

Caption: Rotovator concept image from Wikipedia. Douglas will crop the bottom of that image and add the caption and image credit from Wikipedia.

On the third day, there was a break from presentations. We piled into a bus for a memorable trip to the World Heritage site called El Teide, an active volcano in the middle of the island. The landscapes there were truly extraordinary, often seeming to be from another planet or the Moon. On top of the volcano was the Teide Observatory. The attendees were taken on a tour of several telescopes including the oldest telescope called the Carlos Sanchez Telescope.

On the fourth day, futurist Philippe van Nedervelde, a technology nomad and entrepreneur, gave a talk on avatars and digital immortality as predicted by the 2045 Initiative. The 2045 Initiative is a projection of what the world will be like in 2045. Philippe is a transhumanist who aspires to achieve immortality in his lifetime. He fully supports the 2045 Initiative which was started by a Russian millionaire named Dmitry Itskov, a man who also has aspirations for immortality. The phases leading to immortality by 2045 will take place every ten years or so starting from now. Phase 1 is training for a non-biological body as depicted by the movie Surrogates. Phase 2 is brain sustainability where the brain can survive despite bodily destruction. Phase 3 is where the mind is substrate independent, no longer tied to the organic grey matter in our noggins. Phase 4 is where substance-independent minds will receive bodies with capacity far exceeding that of ordinary humans.

Megan Heard next presented on the life support system for the interplanetary spacecraft which Ryan Haughey presented to us on the first day. Diet will be similar that of the Ikarians, a Greek island people renowned for their longevity. Aeroponics will be used to grow many of the plants which can reduce water usage by 98% and reduce fertilizer usage by 60%. Plants will be grown in microgravity since reduced gravity encourages faster plant growth. One thing to be stressed in terms of microgravity is that despite over five decades of crewed spaceflight, there still has been no test on what level of gravity

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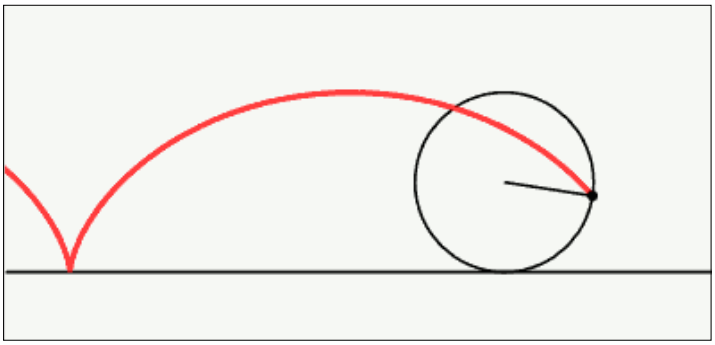
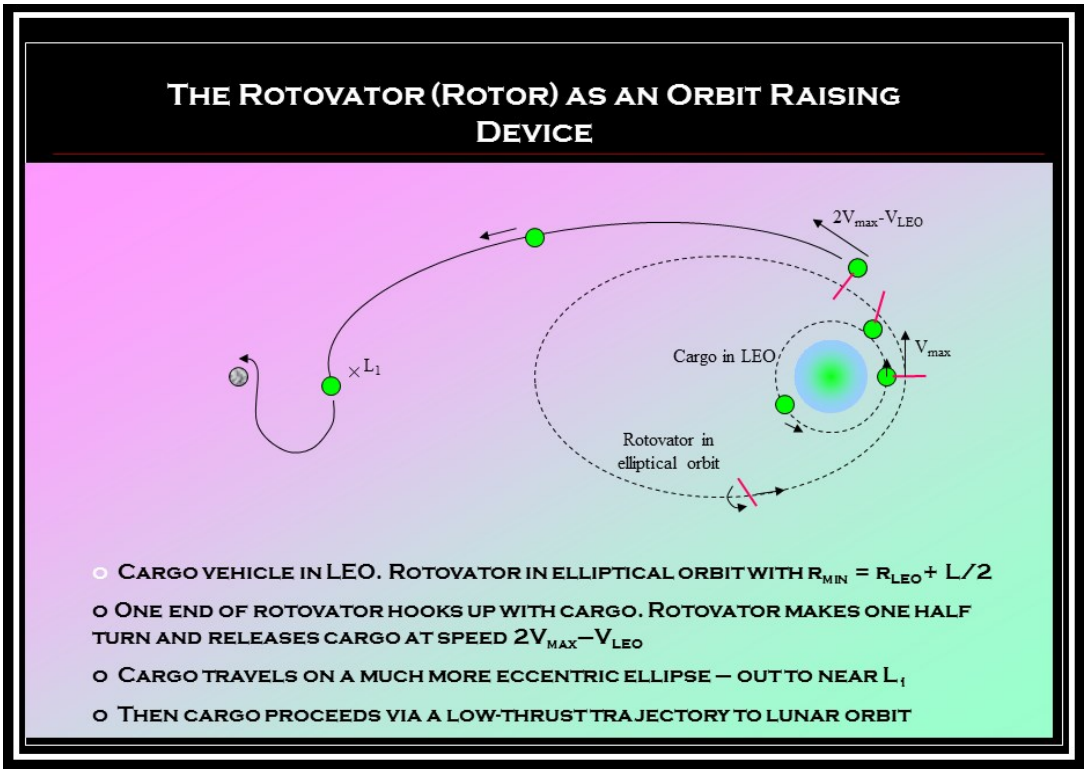


Above: [Horizons Editor] Regarding rotovators, this image and the following caption from Wikipedia. If the orbital velocity and the tether rotation rate are synchronized, in the rotovator concept the tether tip moves in a cycloid, and at the lowest point is momentarily stationary with respect to the ground. (Image from the cycloid article.) Image credit: Wikipedia.



Above: An example of space applications for rotovators. Image credit: Dr. David Hyland.

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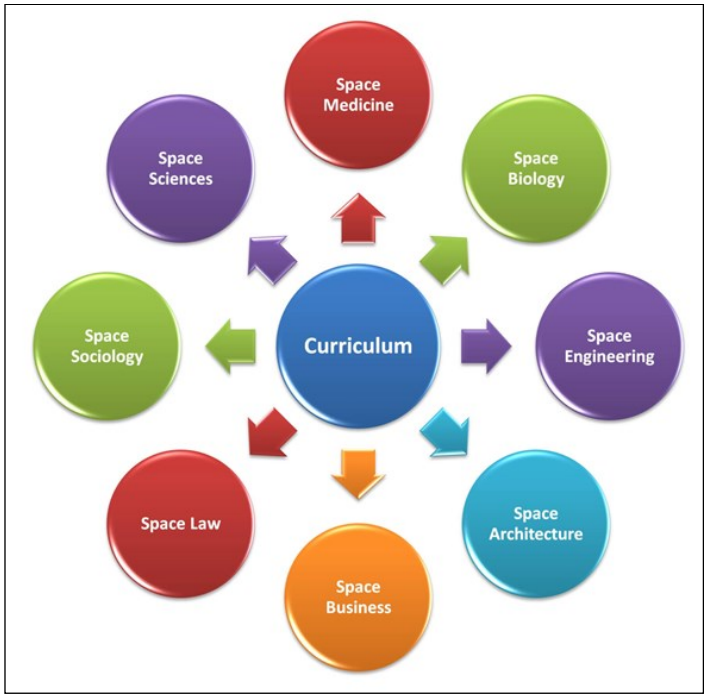
humans can actually sustain. Scientists know that 0-G is bad and 1-G is good. Between those values, little is known. The space habitat can also serve as a test of human conditions in varying gravity.

Hyerim Kim next presented on the interplanetary superhighway which uses weak stability boundaries to create low-thrust trajectories. The homoclinic chain system of orbits just inside or outside another orbit system and the heteroclinic chain system of orbits around Lagrange points L1 and L2 are orbits of invariant manifolds which can be used for traveling around the inner solar system on the way to asteroids. Heteroclinic orbits are orbits in space which join two equilibrium points, whereas homoclinic orbits are a subset of heteroclinic orbits that have the same starting and ending equilibrium point.



Above: Examples of subjects in the curriculum of the Space Preparatory Academy for Cosmic Explorers (SPACE). Image credit: SPACE.

On the fifth day, Roy Tucker presented on how he hunts for asteroids. He went over the history and then the modern method which he uses called scan-mode imaging. Roy ended his talk by showing the software Pinpoint which he uses to find asteroids. Though the program can automatically detect asteroids, the naked eye is still superior in detecting minute differences.

Amanda Shayle, an acupuncturist, next presented on how acupuncture can be used to affect the largest organ in the body, the skin, and how such techniques can be useful in a space environment. She then gathered up her needles and demonstrated on Iulia and Megan.

On the sixth day, Iulia Jivanescu, an aerospace engineer working for the Romanian Space Agency (ROSA), talked about space systems as critical infrastructures and system engineering elements used to categorize and give importance to different parts. Ina Mertens, the Eastern European space art historian, went over the history of space art and presented a number of interesting images from the early days of the 20th century to the present.

On the seventh day, Alan Pritchard, a systems engineer, presented on the holistic approach he and his company Zen Systems developed towards space. A key point is that space should not be considered separate from Earth. It is a part of Earth and can be realistically reached. Parts of Earth are harder to reach than space but are not treated with such awe.

Erik Unger, a software engineer and entrepreneur, next presented a number of stunning videos of games that he has worked on and his own projects of the moment which include web software for ground tracking, videos for the space elevator startup Liftport Group and Unmanned Aerial Vehicles (UAVs).

On the eighth day, Shen Ge, aerospace engineer, presented an overview of asteroid mining concepts which included composition, mining, astrodynamics, economics and law. Antoine van de Ven, a physicist and cognitive scientist, presented his revolutionary physics theory where antimatter

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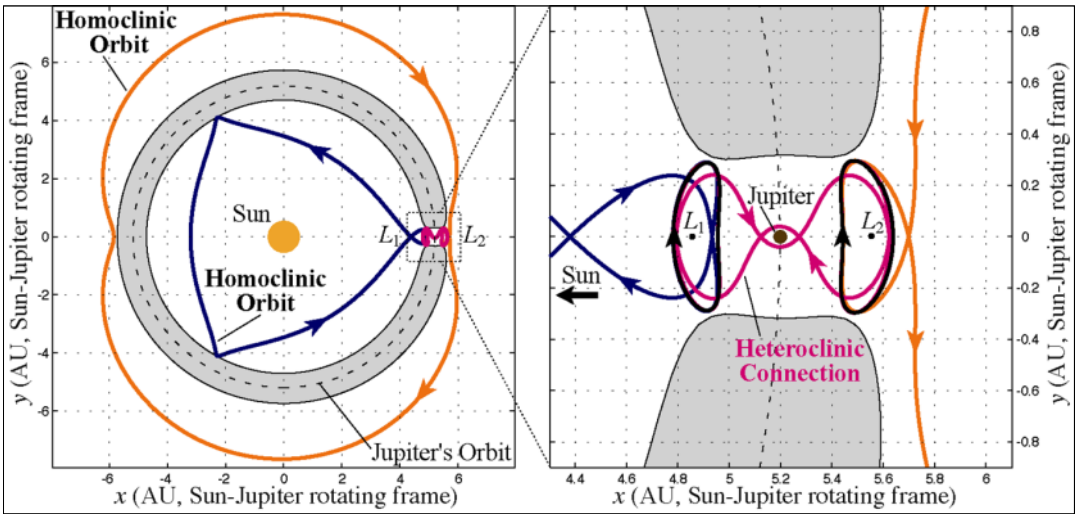


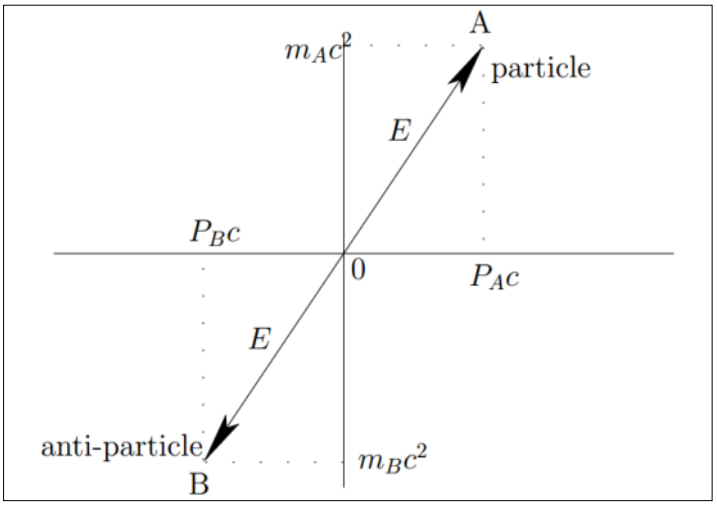
Above: An example of homoclinic orbit change and heteroclinic orbit chains for navigating to Jupiter. Image credit: SPACE.

repels instead of attracts. Using such negative-mass antimatter, a future spaceship can be propelled through space by creating interaction of antimatter with normal matter. Antoine admitted that he will not receive a Nobel Prize unless this is tested experimentally, and tests will require precise measurements between two antineutrons at a facility such as CERN. Antineutrons are antiparticles of neutrons that are just as electrically neutral as neutrons, making the effect of gravity, or anti-gravity as Antoine predicts, much more noticeable and hence potentially detectable.

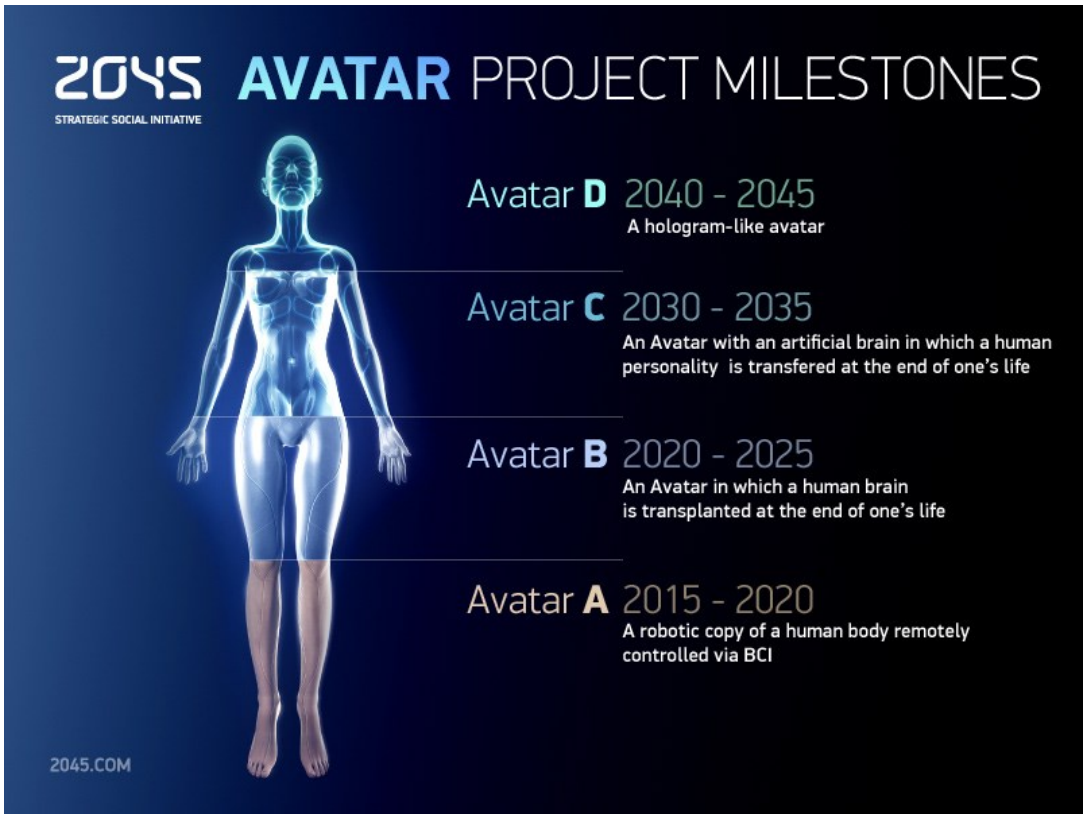
On the ninth day, Dragos Bratasanu, researcher at the Romanian Space Agency (ROSA), presented the human elements of space projects and team work. The social context behind the engineering failures such as the Challenger disaster and the Hubble telescope optics misalignment is often invisible, unacknowledged, and immeasurable. Dragos presented on the four types of team builders as outlined by Carl Jung's theory. Erik Unger decided to give another look at this theory by presenting a personality chart with Asian elements called Roger Hamilton's wealth dynamics. Prasanna Deshapriya, a Sri Lankan student of astrophysics and an astronomer, presented on space tourism. He discussed what's happening today and what the future will hold.

Though the SPACE Retreat formally ended on January 22, 2013, its 14th day, there was a final lunch with futurist Philippe van Nedervelde on the 11th day. Though the discussion was supposed to be on the preservation of humanity, since Philippe also wears the hat of spokesperson for the Lifeboat Foundation, it was hijacked by talks on panoptical systems, nearly undetectable and inexpensive optical sensor systems that will eliminate privacy as we know it. This smart dust can be anywhere and view anything anyone does. Since governments are already working on such a system, Philippe suggested that the only way to ensure personal freedom is to democratize it and allow private citizens as well as companies to spy on people. As far as lifeboats go, aside from space habitats and extraterrestrial settlements, Philippe suggested that humanity can use underground bunkers such as those built in Switzerland during World War II.

The two remaining days were full days of relaxation where the remaining attendees discussed what was learned and formulated plans in drawing out the space habitation roadmap in the upcoming weeks. The first SPACE Retreat was a success. It will be an annual event, and the second SPACE Retreat will take place in Florida or Puerto Rico early in January of 2014.



Above: Two energy-momentum four-vectors can be visualized in this diagram where the length of the vector, the energy, remains the same for both whereas the mass is negative for antimatter. Energy as stated by Antoine is equivalent to the positive square root of the sum of the squares of the two quantities, (1) mass times the speed of light squared, and (2) momentum times the speed of light. Image credit: Antoine van de Ven.



Above: Project milestones for the 2045 Initiative. Image credit: Philippe van Nedervelde.