FEATURES

International Space University

by Jason Nolan

While the majority of you have been absent from York this summer — working, travelling, lying on the beach — the place has not been 'mothballed' awaiting your return. The Downsview campus was taken over by a roving educational facility right out of *Star Trek*; the International Space University (ISU). Students, from over 30 countries, studied things like how to build Solar Power Satellites, how to mine asteroids, and build bases on the moon. They came to seek solutions to the problems of today and tomorrow among the stars.

ISU is a non-profit graduate education facility for space development and research. Students and faculty from around the world collided at York University for the intensive 10 week program during July and August.

Founded in 1987, the first ISU session was held at MIT in 1988. After the second session at Universite Louis Pasteur in Strassburg, France in 1989, the ISU has come to York University, hosted by the Institute for Space and Terrestrial Science (ISTS). In 10 weeks, 130 ISU students attend over 240 hours of lectures and 280 hours of design work.

The program consists of courses in Space Architecture, Business and Management, Engineering, Life Sciences, Physical Sciences, Policy and Law, Resource and Manufacturing, and Satellite Applications. Courses and workshops are conducted by experts from around the world. The two design projects in this program 1) The International Asteroid Mission and 2) The International Program for Earth Observations will develop space projects of the future.

ISU founders Peter Diarnandis (COO), Tod Hawley (CEO), and Bob Richards, a Canadian, inaugurated the ISU at a founding conference held at MIT in 1987, and from there came the long term goal of developing a Master's of Space Studies (MSS) program. The founders hope that the ISU will someday have a campus in orbit.The 1991 ISU session will be held in Moscow, USSR; Kitakyushu in the south island of Japan, near Japan's version of Cape Canaveral, will be the site of the 1992 session. Choices for the site of the permanent terrestrial compus are in Florida, Texas, Colorado, Canada, France, Japan, Sri Lanka, Australia, and the Soviet Union.

Members of Planet Earth co-operate to explore the last great frontier. York's campus hosted the third annual session of the International Space University this summer.

Gregg Maryniak has been with ISU for 3 years, and the Space Studies Institute (SSI) for 12 years as executive vice president. He explains the purpose and value of the ISU: "We are in this multi-national multi-cultural environment. We are trying to break down the barriers of secrecy which exist."

Gregg goes on to say that, "after ISU you suddenly have a peer group of 130 students, friends, and you know exactly what they do because you worked with them, you partied with them, you were up till three in the morning in the computer labs . . . so you don't feel shy about calling them up." He sees the ISU as "the ultimate career network builder in aerospace."

Maryniak also praises the work done by the York administration in helping to make the 1990 ISU a success, "York has worked hard to help make ISU work in 1990. We had a great reception at York."

According to Maryniak, it is the Institute for Space and Terrestrial Science (ISTS), the actual hosts of the ISU, who made this session work, "People at York don't really know about ISTS," being lumped over on Keele street, but they are "the unsung heroes" of ISU-York 1990.

The ISTS grew out of the Center for Research in Earth and Space Science (Cress) which has been part of York for the past 25 years. Virtually unknown to the majority of York students, these graduate research centers have helped to keep Canada in the forefront of space sciences despite the Canadian Government's desire to chase basic R&D out of the country.

Tuition for the 10 weeks costs $12,000 CDN, which is difficult to come up with if you have just finished a number of years struggling to finish at other post-graduate institutions. In most cases, however, funding is provided by government institutions. There is no room for a part-time job when an entire year of study must be completed in 10 weeks.

The ISU is an idea whose time has come. With support from so many nations and private corporations, there is finally an institute beyond national interests and political controls. Here students of the next generation can gain the experience and education to build a path to the stars which will be globally available to countries great and small.

With people like the great science fiction writer and scientist Arthur C. Clarke as Chancellor, there is some security that the ISU will evade the interference of the military. Perhaps the inhabitants of the greatest spacecraft known, the planet Earth, will finally set out to meet their neighbours in our own backyard of the solar system. Hopefully, the ISU will live up to its responsibility to all of us on Earth and take its place among the stars: the last frontier.

Solar Power Satellites

Harness sunlight for global electricity

by Jason Nolan

A large component of the ISU is space resource and manufacturing, the goal of which is to find ways to utilize non-terrestrial material for our use. Gregg Maryniak, managing director of ISU, brings his experience from the Space Studies Institute (SSI) in Princeton to promote the utilization of space: "SSI is a non-profit scientific research organization and we exist, in part to tell the public about all this neat stuff you can do".

SSI has helped the ISU with their extensive experience in the development of tools and techniques to harvest space resources. ISU's tele-robotics lab is compliments of SSI. As Gregg Maryniak explains, "if you want to operate a machine on the moon from Earth you have a 2.7 second time delay" which students can understand using this simulator. Other projects, like the International Asteroid Mission, which is developing strategies to exploit asteroids for extra-terrestrial building and manufacturing materials, benefits from SSI experience and research.

The thrust of SSI is the combination of the work of great extraterrestrial thinkers like Gerard K. O'Neill and Dr. Peter Glaser. Glaser, VP for Arthur D. Little Inc. and a Terrestrial Solar Power expert, recently lectured at the ISU. He sees the Solar Power Satellite concept he developed as the only way to make our homes livable in the future without technologically regressive measures.

O'Neill, Professor Emeritus of Physics at Princeton and Founder of SSI, published *The High Frontier: Human Colonies in Space* in 1976. His book outlines the steps to developing self-sufficient habitats in space, made so by the use of Solar Power Satellites.

According to Maryniak, "If you look at all the stuff people are doing now, using the moon, and talking about using it as the stepping stone for getting to the other planets, it turns out that . . . almost all the current work passes through Gerry [O'Neill]. Peter [Glaser] thought up SPS and Gerry thought of using non-terrestrial materials and those two ideas coupled together."

To get an idea of what a Solar Power Satellite (SPS) is, imagine this: a structure, say seven kilometres wide by 10km long, covered with solar panels, with an antenna on one end continually focused at a single point on earth beaming microwaves. It would be large enough to appear as a bright star on earth — a scary thought. The SPS will weigh the equivalent of a battleship and provide 5 Gigawatts of power (equal to 5 nuclear reactors, which will then never have to be built).

What happens to the power when it reaches the earth, besides, you may think, fry half of Downsview? Well, the antenna, on earth, converts the microwaves directly into electricty and feeds it into the power grid with an efficiency of 85%. The proven technology for aligning the beam shows that if it is even slightly out of alignment, the beam will diffuse harmlessly.

According to Glaser and Brian Tillotson, of Boeing and Space Research Associates, the process would require a receiving antenna (rectenna) about eight kilometres in diameter; the environmental hazard, as it is now understood, would be similar to that of living close to Hydro power lines (a lot better than living beside Chernobyl or a strip-mine). Studies have already shown that the area beneath the antenna would be safe for agriculture on land and as a fishery on water. This is because the rectenna is 70% transparent to sunlight, yet traps microwaves.

Studies on the effect of the microwave beam, which will be at 25% the intensity of light, on aircraft, communications, and more importantly, migrating birds, have been found to be negligible. Both Glaser and Tillotson, however, feel that the process must be made so safe that it will be preferred over fossil or nuclear fuels. They are clearly trying to establish a non-environmentally destructive energy source which will provide power for all nations for centuries to come. It is no good if it harms the environment.

According to Tillotson, the typical SPS will have the power of five nuclear reactors the size of those at Darlington. For the first 60 such satellites, with a total power output of 300,000 megawatts, the cost would be about $100 billion. When questioned about the possiblilty of such a project, Tillotson says that "going to the moon was science fiction 30 years ago . . . SPS is not that tough a thing to do." He compares the level of difficulty with oil exploration in the high arctic, though without the environmental degredation.

So why is it not being done?

Scientists admit that the easy access of large coal deposits and the relatively low price of oil kept governments from being really interested in solar power. "Now people are aware of the greenhouse effect again," says Tillotson, "people are aware of the vulnerability of the oil supply again and

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