

Space Grant News

Fall 2005



Newsletter of the New York NASA Space Grant Consortium

Supporting education and research in space-related fields through fellowships, internships, outreach, and corporate partnerships

New York NASA Space Grant Consortium

Lead Institution:
Cornell University

Affiliates:

- Barnard College
- City College CUNY
- Clarkson University
- Colgate University
- Columbia University
- Lockheed Martin
- Manhattan College
- Medgar Evers College
- Polytechnic Institute
- Rensselaer Polytechnic Institute
- Sciencenter
- SUNY Buffalo
- SUNY Geneseo
- Syracuse University
- York College CUNY

G r e e t i n g s



Dear Space Grant Colleagues:

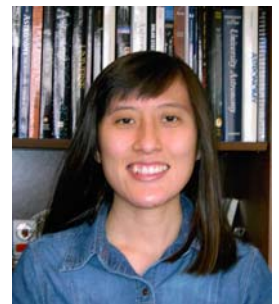
The New York Space Grant Consortium has been very fortunate to have enlarged its affiliate membership by including Medgar Evers College and York College; both primarily serve minority communities in New York City. Medgar Evers College is conducting experimental ballooning projects that involve scores of undergraduate students. York College reaches out to students, the surrounding community, and other research institutions with its observatory.

Early in August 2005 the NY Space Grant co-hosted a Balloon Science Workshop with NASA's Mid-Atlantic Region Space Science Broker. The workshop provided researchers, science teachers, and undergraduate students an opportunity to discuss suborbital research projects and opportunities. Throughout the year, our affiliate institutions were active in projects involving undergraduate students in activities ranging from rocketry to automated parasail systems. By hosting a bridge designing/building event and a workshop for teachers on integrating sensors into classroom laboratories, affiliates also helped invigorate younger students' interest in science and technology. A new museum exhibit, set to open this fall, will provide hands-on insight to astronomical imaging for visitors of all ages. Undergraduates Kelley Hess and Ben Herbert participated in the NASA Academy Program at Goddard Space Flight Center and were thrilled with the experience.

The New York Space Grant is looking forward to hosting the Space Grant National Meetings in October 2006, in New York City. We expect a record attendance and promise an exciting program.

At our main office we recently welcomed Erica Miles, our new Program Coordinator. Elizabeth Humbert is now a part-time Associate Director with the Space Grant. During the year our New York program greatly benefited from advice from Mary Sandy (Virginia) and Bill Hiscock (Montana), to whom we are grateful.

Finally, we wish Professor David Meisel, our Affiliate Director from SUNY-Geneseo, all the best upon his retirement and we welcome his successor, Professor Ed Pogozeleski. We are looking forward to an exciting year ahead.



Erica Miles, our new Program Coordinator.

Yervant Terzian
Director
New York NASA Space Grant
Cornell University



New Astronomy Exhibits to Open this Fall at the Sciencenter

The Sciencenter, in Ithaca, New York, is currently installing a series of exhibits that introduce museum visitors to astronomy and imaging with filters. Tentatively named “Mars and the Stars,” it includes four kiosks with computer games that focus on color and infrared imaging of the planets and stars.

The exhibit is funded through combined NASA grants from the NY Space Grant Consortium, two NASA EPO programs through Cornell University scientists, and the Space Telescope Science Institute. By combining the funds for these four grants, the Sciencenter was able to transform a mezzanine area on the second floor of the museum into a themed astronomy exhibition area.

Visitors will enter the area through a bridge between an older part of the museum and the newly constructed addition. There will be seven posters along the hall that show beautiful images taken by the Hubble Space Telescope. The windows along the hall have been coated with a filter gel so visitors can see the effect colored light has on the walls, their clothes, and objects outside. Further along the hall, posters created by astronomers at Cornell University demonstrate imaging by spacecraft and telescopes by showing Jupiter in the X-ray, ultraviolet, visible, infrared, and radio wavelengths. A set of eight-foot tall panels painted by a local artist, depicting the surface of Mars, covers one side of the exhibit area and helps visitors feel as if they are in another world.

The four computer kiosks will contain a variety of games for the visitors. The “Mars Quest” kiosk, created by the Space Science Institute, is a stand-alone kiosk that incorporates five of the games from the marsquestonline web site <<http://www.marsquestonline.org>>. Another kiosk, tentatively named “Color Search,” contains games that reveal how scientists learn about many things by looking through different colored filters. The third kiosk,

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RAISE Professional Development Day

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nder a recent NSF-funded GK-12 Fellows grant titled “Revitalizing Achievement by using Instrumentation in Science Education (RAISE),” Professor Kapila, his colleagues Professors Iskander and Kriftcher, and 12 Polytechnic undergraduate and graduate fellows focused on revitalizing high school students’ interest in science. This was done by incorporating modern sensors, computers, and user-friendly software in the science labs of four New York City high schools. Thanks to additional support from the NASA/NY Space Grant Consortium, the RAISE team utilized the infrastructure developed and experience gained under the GK-12 project to design and conduct a daylong professional development workshop for NYC middle- and high-school science teachers. Specifically, on Saturday January 22, 2005, the RAISE team conducted the RAISE Professional Development Day (PDD). This one-day hands-on workshop provided teachers of science, mathematics, and technology with valuable training in the use of modern sensors, instrumentation, and measurement techniques. The goal of the workshop was to educate teachers on integrating modern sensing technology in their labs.

The 20 teachers, selected from more than 70 applicants for this program, each received a stipend and a sensor kit for use in their schools. The sensor kit consisted of light sensor, magnetic field sensor, stainless steel temperature probe, and a low-g accelerometer, all obtained from Vernier, Inc., which supported the project with generous discounts.

The workshop commenced with a presentation on introduction to sensors. Teachers then performed three sensor-based lab experiments: damped vibrations, magnetic field of a solenoid, and light intensity vs. distance. This was followed by a presentation and demonstration of an EKG/heart rate lab. All activities were supervised by RAISE fellows and three teachers from RAISE high schools.

At the conclusion of the RAISE PDD, each teacher filled out a survey to evaluate lectures, experiments, and the overall effectiveness of the instructors. The general consensus was that the RAISE PDD was successful. One teacher commented: “It was a great professional development opportunity.” For more information, visit: <http://gk12.poly.edu/Information/RAISE_PDD.htm> .



RAISE Fellows and NYC teachers collaborate on hands-on learning activities at the RAISE PDD workshop (January 22, 2005).

-Vikram Kapila
Polytechnic University
Brooklyn, NY



Balloon Science Workshop Offers Science Educators Chance to Soar

On August 1-2, the New York Space Grant and Mid-Atlantic Region Space Science Broker co-hosted the “NASA Balloon Science Workshop: Fostering New Research Partnerships.” The workshop was organized to give science faculty from the mid-Atlantic area an opportunity to map their research and ideas to balloon science vehicles. Experienced balloon science researchers and enthusiasts from the New York, Arizona, North Carolina, Ohio, and Vermont Space Grant Consortiums, as well as representatives from the NASA Balloon Science Program Office and Wallops Space Flight Facility participated.



Clark Science Building on the Cornell University campus, site of the Balloon Science Workshop.

The workshop agenda was designed to:

- Inform educators about NASA balloon science and related suborbital research opportunities,
- Highlight current suborbital research projects underway, and
- Facilitate cross-institutional discussions to generate new ideas for teaming on future projects.

Yervant Terzian, Director of the NY Space Grant Consortium, welcomed the thirty researchers, science educators, undergraduate students, and NASA program administrators gathered together at the Clark Science Building for this workshop. Then the workshop coordinators, Shermane Austin (NASA/MUSPIN CUNY NRTS, Medgar Evers College), Bill Waller (Tufts University & the New England Space Science Initiative in Education), and

Laurie Ruberg (Mid-Atlantic Region Space Science Broker), gave a brief overview on how this workshop took shape from balloon science discussions at the Chicago 2004 Conference, sponsored by the NASA Science Mission Directorate.

The program began with three NASA representatives speaking about balloon and other suborbital research opportunities. Louis Barbier, Deputy Project Scientist with the Balloon Program Office at NASA Goddard Space Flight Center, gave an overview of past successes and future potential in balloon science research. Dave Pierce, Director of the Balloon Program Office, Special Orbital Projects Directorate at Wallops Flight Facility, gave a description of current suborbital, space, and earth science research activities. As a complement to these balloon research overviews, Chuck Brodell described the educational flight projects available to kindergarten through graduate students via the Educational Flight Projects Office at Wallops.



Workshop participants discuss scientific ballooning in one of the breakout sessions.

Faculty members from three different Cornell University departments presented their astrophysics and suborbital research projects. Professor Terry Herter (Space Sciences Department, Co-Investigator for the Spitzer Space Telescope Infrared Spectrograph) gave an overview of multi-wavelength astronomy research and science opportunities in this area. Professor Mike Kelley (School of Electrical and Computer Engineering) reflected on 29+ years with the Cornell sounding rockets program and suggested ways to launch an undergraduate student rocket research team. Professor Mason

Peck (Mechanical and Aerospace Engineering) gave a presentation on siting, control, and tracking systems including CUSat and Cubesat.

In addition, the workshop included speakers from other colleges and universities who described how they involve faculty and students in their suborbital research projects. Professor Barry Lutz (College of Engineering and Natural Sciences, Northern Arizona University/NASA Space Grant program) highlighted educational balloon satellite experiences for middle school, high school, and undergraduate students sponsored by the Arizona Space Grant Consortium. Shermane Austin and Leon



Participants discuss challenges and capabilities of ballooning techniques while preparing a presentation.

Johnson (Medgar Evers College) and Michael Fortney (University of Vermont) provided a demonstration of devices and summary of launch activities conducted by the MEC Suborbital Satellite program. Malcolm LeCompte, Research Director for the Center of Excellence in Remote Sensing Education and Research (CERSER), Elizabeth City State University, introduced CERSER facilities and capabilities plus described current earth and space science projects and ideas for possible balloon science collaborations.

Industry and nonprofit technical support representatives were involved as potential partners. Thomas Meyer (research associate with the Boulder Center for Science and Policy) described Deep Space Exploration Society (DSSES) dish specifications and capabilities for

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2005 Summer Space Grant Students

This year, the following students from Columbia, Cornell and Syracuse were chosen for our Undergraduate Research Program:

- **Cameron Cogburn and Daniel Jones** - Worked on software for visualizing black holes and gravitational waves.
- **Mark D'Aprile** - Researched the correlation between distances derived via the Tully-Fisher relation versus Type 1a supernovae.
- **Lizzie Davies** - Worked on experimental methods to generate vortices using an airfoil; results could be used to improve propulsion systems.
- **Norbert Huber** - Supported operations of ICE CUBE satellites, and worked on next-generation student-based satellite design.
- **Andrew Melkonian** - Tested feasibility of using remote sensing method to measure Mars surface pressure; pressure is used in global weather models.
- **William Regan** - Worked on designing and building a bird-sized ornithopter, a flapping-wing aircraft, that uses evolution to learn how to fly.

Balloon Science Workshop

cont.



Shermane Austin and the MEC team gave a debriefing on what they had prepared for the launch.

supporting balloon missions. Tin Kam Ho (Bell Laboratories, Lucent Technologies) provided a hands-on introduction to the MIRAGE Data Analysis Software, which provides interactive data visualization for scientific data plus instrument and system design analyses.

Attendees participated two separate round-table sessions. Topics addressed in the breakout sessions included scientific research opportunities, technology and engineering challenges, and strategies for organizing collaborations and partnerships.

The following comments from participants illustrate the benefits of this workshop:

- “The interactions and seeing the examples of the student projects was awesome! I was very inspired by the work of the students and teachers.”
- “...[The workshop] left me with a strong focus on expanding what we do (opportunities beyond current activities).”
- “It is good to see the level of research done by NASA through ballooning. This will allow me to relate to students the bridge between balloon outreach activities and cutting-edge research.”
- “I was a bit discouraged by the significant hurdles and barriers to mount a successful collaboration, but the collaborative spirit and energy of the participants and real opportunities have encouraged me to jump in with both feet and consider the meeting a major success.”
- “Exciting way to do science with undergrads and K-12.”



Participants share reports from breakout group discussions.

In closing, on behalf of the Mid-Atlantic Region Space Science Broker Program, Bill Waller, and Sherman Austin, we would like to thank the New York Space Grant Consortium for making this workshop possible. We also thank the workshop participants for their time, enthusiastic participation, and willingness to open doors for others.

-Laurie Ruberg
Mid-Atlantic Region Space Science Broker
Center for Educational Technologies, Wheeling Jesuit University
Wheeling, WV



New Astronomy Exhibits

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named “Starry Night,” is a modified version of software created by Imaginova, Ltd. It is a program that was originally created to help amateur astronomers observe astronomical objects. Imaginova has reprogrammed “Starry Night” to our specifications for a stand-alone kiosk that visitors can use to look at 10 different astronomical objects and fly around in space. A fourth kiosk contains games that show how

infrared telescopes can detect protostars in dust clouds.

The Sciencenter will be opening this exhibit in fall 2005.

-Maureen Bell and Catherine McCarthy
The Sciencenter
Ithaca, NY



Undergraduate Students Attend NASA Academy

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wo New York state students, Ben Herbert and Kelley Hess, attended the prestigious NASA Academy program this year at the Goddard Space Flight Center (GSFC) in Greenbelt, MD. The New York Space Grant provided partial funding for these students' summer stipends and travel. The NASA Academy is, first and foremost, a leadership development program aimed at molding a new generation of leaders for the future of NASA and the aerospace community. Nineteen undergraduate and graduate students were enrolled.



Kelley Hess

The time spent at NASA Academy is divided into three separate areas:

- Individual research projects, mentored by GSFC principal investigators, mainly focused on high-risk, high-return technology.
- Networking opportunities and career development insight from guest speakers – such as former NASA center directors, astronauts, university professors, and private-sector entrepreneurs – and visits to various NASA Centers and aerospace companies.
- A group project to foster leadership and team work experience. This year's project was developing a proposal for a Mars Scout Mission, with a cost cap of \$450 million, to seek and map methane in the Martian atmosphere using a network of balloons.

Ben Herbert and Kelley Hess graduated from Cornell in May 2005 with a B.S. in Applied and Engineering Physics and a B.S. in Physics, respectively. This summer, Ben's research dealt with the development of a soft X-ray microcalorimeter detector for the Constellation-X mission. The series of telescopes are set to be launched sometime in the next decade and will surely revolutionize the field of X-ray astronomy. Kelley worked on developing a new method of fabricating feed horns and waveguides for microwave antennas using stereolithography, a form of 3-D printing. This could lead to lighter, less expensive structures that can be manufactured quickly. The major challenge was metal plating the plastic pieces and seeing how they withstood thermal cycling conditions similar to those that exist in space.



Ben Herbert

Ben and Kelley would like to thank the New York Space Grant and Cornell University for helping to provide this once-in-a-lifetime opportunity. The immediate benefits of attending the NASA Academy included watching *Apollo 13* in the Apollo Mission Control Room, and meeting the new NASA Administrator, Mike Griffin. Long-lasting benefits include potential career opportunities from contacts made during the Academy and lifelong networking through the NASA Academy Alumni Association.

-Ben Herbert and Kelley Hess
Cornell University
Ithaca, NY

Automated Parasail System

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n the summer of 2005 at SUNY Geneseo, research students Ben Oliver and Ryan Merkovich worked with Professor Ed Pogozeleski on an automated parasail system. The system consists of a five-pound payload attached to the parasail, intended to be released from a weather balloon. Besides atmospheric instruments, the payload has a programmable microchip, a GPS tracking system, steering mechanisms, and telemetry for communication with the ground station. Upon release from the weather balloon, the system will automatically steer towards the home base while

recording atmospheric measurements. Preliminary flights have been conducted using a user-operated remote control.

The following websites contain more information and a movie of a test flight:

<<http://www.geneseo.edu/~pogo/Research/Parafoil/Summer2005poster.gif>> and
<<http://www.geneseo.edu/~pogo/Research/Parafoil/flight1A.mov>>

-Ed Pogozeleski
State University of New York at Geneseo
Geneseo, NY



Test flight of parasail with attached payload.

2005 Space Grant Graduate Students

The NASA Space Grant funded the following graduate students from CCNY, Clarkson, Columbia, Cornell, Polytechnic, RPI, and SUNY-Buffalo:

- **Anatara Basu-Zych** (Astronomy) - Comparison of star formation rates in galaxies.
- **Thomas Berez** (Mechanical and Aerospace Engineering) - Fluid Mechanics: Rotating Flows and Friction in Bearings.
- **Georgia Bermudez** (Biomedical Engineering) - Microarray analysis of the effect of fluid shear stress on membrane protein regulation in bone cells.
- **Erica Calton** (Biomedical Engineering) - Osteoarthritis and Fourier transforms of infrared spectroscopic imaging.
- **Nathan Cole** (Physics and Computer Science) - Use of maximum likelihood techniques to identify stellar structure in the halo of the Milky Way.
- **Steven Drasco** (Physics) - Computation of gravitational waves produced when black holes are perturbed by test particles moving on arbitrary bound orbits.
- **Lidya Fissehay** (Electrical Engineering) - Two-Layer Thin Film Resistors.
- **Eduardo Hernandez** (Biomedical and Electrical Engineering) - Heart rate variability as a predictor of pacemaker need for patients with atrial fibrillation.
- **Todd Humphreys** (Mechanical and Aerospace Engineering) - Use of GPS receivers to detect atmospheric tides and creation of algorithms to track weak or scintillating GPS signals.
- **Eric Klatt** (Electrical and Computer Engineering) - Analysis of spectral electromagnetic fields measured by auroral sounding rockets.
- **Vera Law** (Chemical Engineering) - Compound Semiconductor Nanocrystals (Quantum Dots)
- **Mei-Ya Li** (Electrical Engineering) - Metal-Semiconductor-Metal Photodetectors
- **Matthew Martin** (Electrical Engineering) - Development of electron magnetohydrodynamic simulations to study magnetic reconnection in plasmas.
- **Matthew van Adelsberg** (Astronomy) - Thermal radiation from isolated neutron stars: modeling neutron star atmospheres.
- **Ali Vanderveld** (Physics) - Observational consequences of black hole formation.
- **Hong Wong** (Mechanical Engineering) - Spacecraft formation control.

YCOOP Update



The York College Observatory & Outreach Program (YCOOP) began as a NASA-funded project designed to increase the participation of minorities in Astronomy and Earth Science. Central to its success is the York College Observatory, a state-of-the-art scientific and educational facility including a research-grade optical telescope, radio telescope, and full-time professional astronomers. YCOOP has exceeded its program goals: we hired a full-time astronomer, created a minor in Astronomy which also supports a CUNY BS in Space Science, established workshops for Earth Science high school teachers, and introduced innovative Earth Science curriculum into the NYC public school system. We also supported several CUNY undergraduates and local high school students in research, and reached out to the community with a Public Open Night program for free sky viewing and special lectures. Our efforts have helped create strong research ties between York College and prestigious nearby institutions such as Princeton University, the University of Pennsylvania and the American Museum of Natural History.

Our Space Grant funding supports two undergraduate researchers working in earth sciences.

Matching funds have come from a Citibank award for Observatory infrastructure support.



New York Space Grant Affiliate Directors

Prof. Yervant Terzian, Cornell University (Director)
Prof. Wayne Anderson, SUNY Buffalo
Prof. Shermane Austin, Medgar Evers College
Prof. Thomas Balonek, Colgate University
Dr. Steven Betza, Lockheed Martin
Prof. Edward Brown, Manhattan College
Prof. Thong Dang, Syracuse University
Prof. David Helfand, Columbia University

Prof. Vikram Kapila, Polytechnic University
Prof. Reshmi Mukherjee, Barnard College
Prof. Heidi Newberg, Rensselaer Polytechnic Institute
Prof. Tim Paglione, York College
Prof. Ed Pogoselski, SUNY Geneseo
Dr. Charles Trautmann, Sciencenter
Prof. Daniel Valentine, Clarkson University
Prof. Sheldon Weinbaum, City College of New York



The new York College Radio Telescope has begun operations. Summer students Wainwright Joseph (LSAMP) and Ian O'Leary (SHARP), shown with Observatory Director Tim Paglione, built and tested the instrument.

-Tim Paglione
 York College/The City University of New York
 Jamaica, NY

Engineering Activities at Syracuse

Engineering Activities at Syracuse University Culminate with National Recognition

From miniature mousetrap cars to high-power rocket projects, Central New York youth gained first-hand experience in many fields of engineering while applying the rules and tools of science and math. The popularity of the events sponsored by the College of Engineering and Computer Science increases with each year; and likewise, participation increases as more technology teachers become familiar with the opportunities for their students.

Rocket Team Challenge Program



Students from LaFayette Central School District waiting to launch their high-power rocket.

school received computer-aided design rocket simulation software and hands-on instruction by College undergraduates. On launch day, all teams experienced the excitement of these high-power rockets and appreciation for 'real' math when their rockets performed as predicted.

In summer 2005, the College reapplied the Rocket Team Challenge concept through a partnership with the 21st Century Program at the LaFayette Central School District (LCSD). Half of the participating students at this event attend LCSD Onondaga Nation schools. Professor Peter Plumley, two undergraduate majors in Aerospace, and one community volunteer from Darwish Law Offices provided weekly, two-hour lessons on the design, flight performance and construction of high-power rockets. A successful launch was held on the extensive and open lacrosse fields at the high school.

The College hosts a Rocket Team Challenge for area high schools on the first Saturday of June. Space Grant funds are used to support this event. On June 4, 2004 participating schools included all four urban Syracuse City high schools and four rural high schools: Cicero North Syracuse, Chittenango, LaFayette and Skaneateles. Five-student teams each built high-power rockets capable of reaching 2000 feet on G-size motors. Each rocket carried an eggstronaut and a digital recording altimeter. Every



Successful launch from the LaFayette School Space Center.

Bridge Build'em and Bust'em Program

Space Grant funds provided support to the Syracuse University/TACNY (Technology Alliance of Central New York) *Bridge Build'em and Bust'em* event held on the third Saturday of each November. In 2004, approximately 500 students representing 45 schools participated. Including students, parents, teachers and College staff, the total number of participants was 700. The event teaches the graduated complexity of bridge design elements to students who participate throughout their elementary, middle school and high school education. New this year was a design, build and test Jib Crane for high school students.

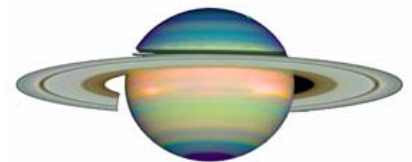


College staff prepare to test a Jib Crane at the Fall 2004 annual *Build'em and Bust'em* competition.

Mousetrap Car Competition

The College sponsors the Syracuse City School District (SCSD) technology clubs associated with the national SECME organization (see <<http://www.secme.org>>) and hosts the SECME regional competition in which student teams test their mousetrap car designs. This year's event, held March 19, 2005, included teams from all four SCSD high schools, seven middle schools and three elementary schools. The College sent Branden Callahan, a senior from SCSD, to the 2005 National Student Competition at Greensboro, North Carolina, where he was named the SECME/ExxonMobil Overall Scholar.

-Peter Plumley
Syracuse University
Syracuse, NY



Picture Credits

Earth, Crew of Apollo 17/NASA (p. 2)
Io, Galileo Project/JPL/NASA (p. 4)
Venus, Magellan Project/JPL/NASA (p. 6)
Saturn, E. Karkoschka (U. of Arizona)/HST/NASA (above)

Other NY Space Grant Programs

Focus for Teens

Ten to fifteen minority students from across New York state participate in a summer week-long science program on the Cornell campus.

Fabric for Flight

Students in this program explore textile technologies as an aspect of the conditions necessary to human space flight.

Sciencenter

K-12 students participate in a competition to write 60-second scripts for radio on science topics. The winning scripts are aired on regional radio stations.

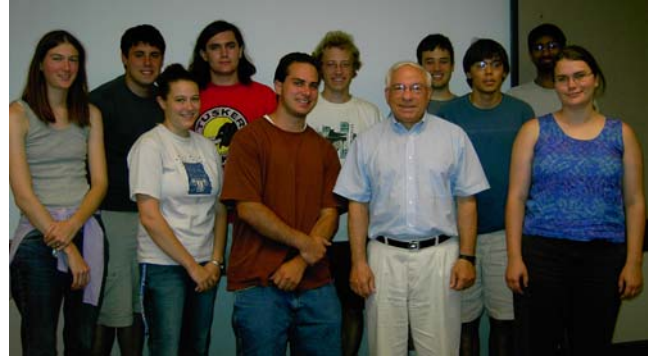
Public Observing at RPI

One night every week from April to November, the faculty and students open the A. Hersch Observatory on RPI's campus to the public.

New York Space Grant Consortium

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NY Space Grant 2005 Undergraduates



Summer undergraduate research students with Yervant Terzian.



Space Grant News

Newsletter of the New York
Space Grant Consortium
Department of Astronomy and
Space Sciences
Cornell University, Ithaca, N.Y.
Patricia Fernández de Castro
Erica Miles
Vincent Williamson
editors
Cornell University is an equal
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