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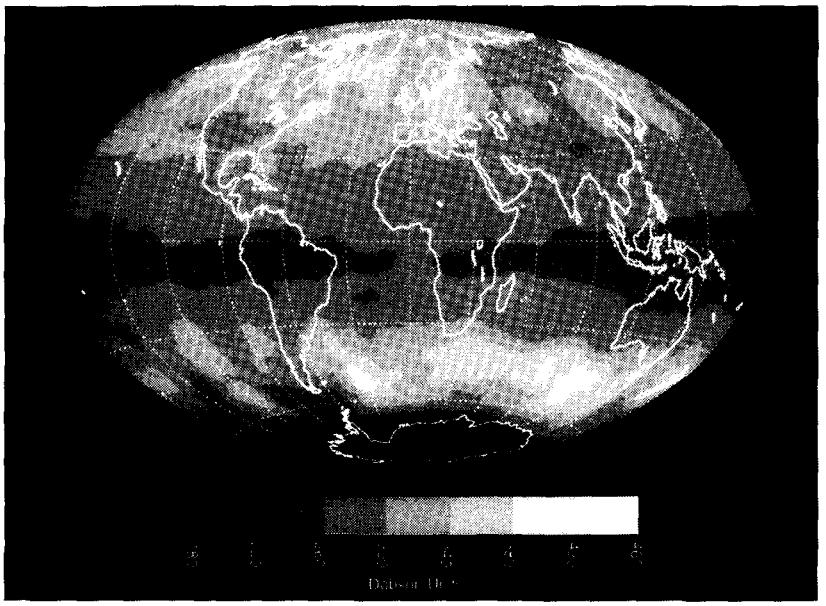
Ozone Mapping Back In Business



It works! **The recently launched Total Ozone Mapping Spectrometer (TOMS) Earth Probe (EP) instrument has taken up where Nimbus-7 left off in 1992, to return its first global image of our precious ozone layer on July 20-21, 1996. The TOMS-EP team perservered in the last two years to make this moment "picture perfect." The team of employees from five of Goddard's directorates, a dozen contractors, and other military launch personnel stayed the course through a series of launch delays and an eleventh-hour replanning exercise to change orbit and mission objectives and take advantage of the overlap in TOMS-EP and ADEOS-TOMS scheduled flight times. The TOMS team created opportunity out of adversity to deliver an exciting lower orbit, higher resolution mission. See for yourself.**

This gray scale image shows total ozone levels for July 20-21, 1996. The gray scale at the bottom of the figure indicates low ozone levels in the darker shades (180) and higher ozone levels in the lighter shades (460). The dark oval at the bottom of the image shows polar night, where data is not taken.

Explorer's Quick Reflexes to Catch Images of Aurora

by Jim Sahli

Auroras have been a source of fascination and superstition for centuries. In recent decades, however, we have gained a better understanding of the phenomenon through scientific research aided by space flight instrumentation. NASA's Fast Auroral Snapshot (FAST) Explorer's "state-of-art" instruments will probe the physical processes that produce these dazzling displays and add to our understanding of Earth's environment in space.

"The purpose of the FAST spacecraft is to investigate the physics of acceleration processes in nature. Specifically, FAST will investigate how particles are accelerated in space to create the aurora or 'northern and southern lights'," said Dr. Rob Pfaff NASA Goddard project scientist for FAST.

Scheduled for an August launch from the Western Test Range, at Vandenberg Air Force Base in Calif., FAST travels to orbit on a winged Pegasus-XL launch vehicle.

The five scientific instruments onboard FAST will gather high speed "snapshots" of the electric fields, magnetic fields, and energetic electron and ion distributions at high altitudes of 1,200 - 2,600 miles and at high latitudes (greater than 60 degrees) near the Earth's magnetic poles.

FAST science complements the science investigations performed by many of NASA's other satellites in the International Solar Terrestrial Physics Program, including the recently launched Polar mission. Polar is taking images of the aurora from altitudes of eight Earth radii above the poles to look at how the auroral light is distributed within the Earth's high latitude regions. The FAST spacecraft, on the other hand, will journey to the "heart" of the aurora, the region about 1,250-6,250 miles above the Earth at high latitudes, where charged particles are energized and where they are subsequently accelerated down towards the upper atmosphere where the auroral light is emitted.

Fast Auroral Snapshot (FAST) spacecraft to study bright streamers of light in Earth's atmosphere created by electric and magnetic fields.

The FAST spacecraft includes an on-board flight computer which enables it to take high resolution "snapshots" when it encounters interesting science events. In addition, FAST will receive real time commands from scientists on the ground to operate in certain modes and to revise the selection criteria used to identify various unique features of the aurora.

FAST carries a series of instruments designed for aurora investigations: Electrostatic Analyzers to measure energetic electrons and ions, an Electric Field Experiment, and an Instrument Data Processor Unit provided by the University of California at Berkeley; a

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Surface Ultraviolet Radiation Levels Have Increased from 1979 to 1992

by Allen Kenitzer

Solar ultraviolet radiation reaching the Earth's surface has increased over large regions of the planet during the past 15 years, as the amount of total ozone in the atmosphere has decreased, according to a scientific paper published in the August 1 issue of Geophysical Research Letters.

This finding, derived from extensive analysis of data from the Total Ozone Mapping Spectrometer (TOMS) aboard NASA's Nimbus-7 satellite, is based on the known relationship between atmospheric ozone depletion and the resulting decrease in protection from ultraviolet radiation (UV-B, 290 nm to 320 nm). The accuracy of the TOMS-derived surface UV-B values has been validated by comparison with several ground-based spectrometers in Canada, New Zealand, and South America.

"The increases are largest in the middle and high latitudes, where most people live, and where the majority of the world's agricultural activity occurs," said Dr. Jay R. Herman, an atmospheric scientist at NASA's Goddard Space Flight Center, Greenbelt, Md., and the lead author of the paper, "UV-B increases (1979-1992) from decreases in total ozone."

In the paper, Herman finds that annual average UV-B exposure has increased by 6.8 percent per decade at 55 degrees north latitude, where major populations in countries such as England, Germany, Russia and Scandinavia reside. At 55 degrees south latitude, which includes the southern portions of Argentina and Chile, the increase has been 9.9 percent per decade. In North America the changes are smaller since most of the population lives below 55 degrees. The UV-B changes for regions near the Canadian border show about a 4% increase per decade.

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TOMS Rides Again

Fourth Ozone Mapping Mission, ADEOS/TOMS, Set to Launch from Tanegashima, Japan in August

by Allen Kenitzer with C. A. Buck

July 2, 1996—NASA launched the third Total Ozone Mapping Spectrometer (TOMS) on a petite, ~650 pound Earth Probe (EP)—the "littlest" Earth science spacecraft launched in the Mission To Planet Earth program—from beneath the belly of an L-1011 aircraft.

August 1996—A month later, Goddard scientists are poised to play it again, sending up the fourth TOMS mission since 1978. For this round, TOMS hitches a lift from the Japanese onboard their 3 1/2-ton, 8-instrument spacecraft known as the Advanced Earth Observing Satellite—or ADEOS for short.

NASA's fourth TOMS instrument will fly in a higher orbit than TOMS-3 (EP), sailing over the same terrain at a 800 kilometer (km) altitude above its cousin's 500 km orbit. The 300 km separation between TOMS 3 and 4—roughly the distance between Greenbelt and the Goddard Institute for Space Studies in New York City—will enable scientists to build 3-D maps of ozone columns. From its lofty view, ADEOS-TOMS will image a larger 42 km square footprint, while TOMS-EP will "peer between the clouds" to focus in on a tighter 25 km square area, according to ADEOS/TOMS principal investigator, Dr. Arlin Krueger.

The two TOMS instruments should fly in crossing orbits for the next two to three years, providing scientists with continuous ozone data and near-real time monitoring capability.

Goddard engineers have introduced several key improvements for the newest TOMS generation, enabling scientists to monitor instrument changes and maintain long-term calibrations. The measurement precision for TOMS 3 and 4 is a factor of three greater than the original TOMS, allowing researchers to accurately measure ozone concentrations within volcanic clouds for the first time. Scientists will be able to detect smaller volcanic eruptions and provide longer duration tracking of volcanic clouds which can be a danger to aircraft.

> ADEOS-TOMS will image larger footprints, while TOMS-EP will "peer between the clouds" to focus in tighter.

While the instrumentation for TOMS 3 and 4 has been upgraded for higher resolution, the spacecraft duo continues the harvest of information about Earth's ozone begun with Nimbus-7 almost two decades ago, allowing scientists to track changes in the Earth's environment during our lifetime, and providing clues for the future as we uncover the mysteries our fragile atmosphere.

Cooperative Agreement Signed with Litton Industries

by Donna Drelick

Litton Industries of Goleta, Calif., has signed a cooperative agreement with Goddard to pursue the development of an Advanced Hemispherical Resonator Gyroscope (HRG). Support for this dual use technology development is provided by the Goddard Office of Commercial Programs, the Hubble Space Telescope Project, the Geostationary Operational Environmental Satellite Project, and NASA's Jet Propulsion Laboratory, Pasadena, Calif.

Design goals for the Advanced HRG include increased reliability, increased dynamic range, cost and size reduction, higher temperature and shock durability, and lower noise values. Litton now manufactures and markets a medium pointing accuracy HRG-based Space Inertial Reference Unit (SIRU). While this product will be used on several new communication satellites and spacecraft, the potential exists for increased sensitivity not currently realized in its present design.

The Advanced HRG is an excellent example of NASA's real dual-use technology. The reliability and low cost of the gyroscope will certainly benefit NASA on future missions, while it has tremendous commercial use. By working cooperatively with

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Rosa Parks Travels from History to Future on 40-City Tour

by Tammy Jones

"Freedom Riders" Stop at Goddard to Launch Model Rockets and Future Dreams.

"One small step for a man, one giant leap for mankind." These memorable words are from the Apollo 11 moon landing. They are also fitting for an earlier date in history when the actions of a black woman who took one small step would forever change race relations in this country. On a cold 1955 December day in Montgomery, Ala., Rosa L. Parks refused to give up her seat on a bus to a white male passenger. The move led to Parks' arrest, the Montgomery Bus Boycott, and a wave of protest throughout the U.S.

Parks, nationally recognized as the "Mother of the modern day Civil Rights Movement," visited Goddard on July 30, with nearly 100 students ages 11 to 17. The visit was part of the annual Pathways to Freedom tour, sponsored by the Rosa and Raymond Parks Institute for Self-Development.

The students, dubbed "freedom riders," travel with Parks to 40 cities to study history and explore the future. Their stop at Goddard was a special opportunity for exposure to careers in science and technology sponsored by the Black History Club. David Carter, in the Earth Sciences Directorate, arranged for Parks and the freedom riders to tour Goddard, see a model rocket launch, meet an astronaut, and participate in a full day of activities at the Center. Almost 500 people turned out for Center Director Joe Rothenberg's welcome and Parks' remarks. Former astronaut Fred Gregory and Hubble scientist David Leckrone also spoke, encouraging the students to strive for success.

"Pathways to Freedom" takes place over four weeks in the summer. It's an intensive educational and historical research program for students from different socioeconomic, religious and ethnic backgrounds. The students' journey traces the route of the Underground Railroad into the Civil Rights Movement and beyond.

Pathways to Freedom is more than a history lesson, a significant goal of the program requires students to enhance their interpersonal and communications skills, to instill self-esteem, and develop an appreciation for the performing arts, goal setting, career planning and budget management.

Some of the students and even adults who spent the day with Parks said that it was great just being in the presence of someone who had made a positive mark in history. Parks told *Goddard News* that she would like to be remembered as "someone who stood for freedom, equality, prosperity and all that goes with making a good life for all people."

Boot Camp

Ready. Get Set. Go.

Deputy Director for Flight Projects, Jim Moore, takes his place on the CPI assembly line for cutting, soldering and stripping a wire to make a better "Model A." Fellow pupils time the operation and observe the number of steps required to complete the task.

Twenty senior managers signed on for three days at Continuous Process Improvement (CPI) Boot Camp this summer. Top brass rolled up their sleeves and set about the business of improving work practices and processes. CPI's hands-on approach fosters teamwork and teaches the troops to look critically at how work is accomplished.

CPI HONOR ROLL

100	Joe Rothenberg, Director	400	Vern Wyers, Flight Projects
100	Al Diaz, Deputy	400	Jim Moore, Flight Projects Deputy
180	Mary Kicza, Assoc. Director Space Sciences	405	Charlie Vanek, Tracking and Data
100	Kathy Nado, Special Assistant	500	Art Fuchs, Mission Operations
110	Jerry Simpson, Human Resources	600	Steve Holt, Space Science
114	Wayne Boswell, Training	700	Al Sherman, Engineering
130	Jan Ruff, Public Affairs	700	Mike Fitzmaurice, Engineering
150	Nancy Abell, Deputy Comptroller	700	Mitch Brown, Engineering
200	Sherry Foster, Management Operations	800	Arnold Torres, Suborbital Projects
300	Bob Baumann, Quality Assurance	900	Vince Salomonson, Earth Sciences

Celebrate Goddard Day

by C. A. Buck

Fun.

July 12—A warm, misty breeze. Overcast skies. The calypso beat of Caribbean steel drums. Aromas suspended in humid air of spicy curried dishes, tropical seasonings, and fragrant, sweet plantains. People calling out to one another, exchanging greetings and catching up on news as they crowded around exhibit booths and jammed long food lines. The scene was festive for more than 4,000 participants in the first "Celebrate Goddard Day." Big canvas tents dotted the lawn in front of administration building 8. The rain held off.

The event was a day to remember. "It's the first time I can remember something like this happening here at Goddard. I think it's a good idea," employees said. "We are people from many nations," said the Center Director. The governor's office made it official, issuing a proclamation designating July 12th as "Celebrate Goddard Day."

Participants celebrated the many different cultures and countries represented in Goddard's workforce with food and entertainment from three continents, 10 countries, and more than a dozen unique cultures. Employees also listened to Byron Kunisawa's thought-provoking keynote address.

Many traded traditional business attire for clothes of many colors and creeds. At the Music and Drama (MAD) table, Bill Struthers, clad in his MacDonald Scottish kilt and matching knee socks, recruited talent for the upcoming musical. Wearing his gold letter Alpha Phi Alpha African-American international fraternity t-shirt, Leon Holmes manned his booth, handing out free news papers on behalf of his 15 frat brothers at Goddard. Eight Indian folk dancers, draped in red and silk dresses fringed with gold, posed for a photograph at the side of the main stage. Men and women in colorful kente outfits and dashiki shirts mingled, as a smiling older gentleman wandered through in his traditional Bavarian lederhosen—leather shorts and suspenders. Fidos for Freedom—specially trained seeing-eye-dogs—and their owners dispensed information on their programs and the Advisory Committee for People with Disabilities.

"There are a lot of people here working together. That's basically what it's all about," said event co-chair Sheri Thornton.

Festival.

Food.

Multiculturalism

The Greater the Inclusion, the Greater the Solution

Sheri Thornton, Hubble Financial Manager and* Celebrate Goddard Day *Co-Chair

Thornton and daughter, Shamara.

Have you ever had to plan, build, or just get something done when you weren't sure what you needed to do, how you needed to do it, or what it was supposed to look like when it was done? This is where we started on the Celebrate Goddard Day Committee.

While I was excited about being involved in a Center-wide event for all employees, I was also apprehensive about the challenge. I'd never done this before, and neither had Sandra Irish, my event planning co-chair. Our starting position was that no one had all the answers. We needed team of more than 40 people from ten directorates serving on four committees to get the job done. We viewed everyone as a resource. What evolved in less than three months was remarkable.

I think that people don't always recognize the potential rewards of delving into the unknown. We all are capable of coming up with fresh, exciting, and successful ideas. Facing new challenges forces us to shift our thinking forward and into a higher gear. It forces us to dig deeper, use ingenuity, and tap creativity and spontaneity that are often overlooked.

I am not suggesting that we should start from scratch with new people every time we begin a project, or that we should overlook the value of experience, history, and lessons learned. Instead, I would challenge my co-workers to look for ways to include people with different experiences and perspectives in their projects. It may seem risky—but considering the new opportunities created and the potential rewards—it is worth forcing ourselves and others to venture into new and unknown territory. You could be doing yourself a favor, and achieving a level of success beyond what you could attain or imagine on your own.

For me, the feedback on Celebrate Goddard Day has been overwhelmingly positive. Some people have said that despite it being a "first," the day went well. Instead, I'd say it was the absence of a precedent that made Celebrate Goddard Day a success.

Keynote Excerpts

The following quotes are excerpted from remarks made by multiculturalism trainer, Byron Kunisawa.

"When you move forward as an organization, it is important that you understand that festivals like this go on everywhere in the country. It is not the same as what you do. The reason for that, in many organizations, is this is all that they do. They have no way to integrate this concept into what goes on every single day. When you only do these ethnic celebrations, let me tell you what we create. If your model is simply comprised of ethnic food and ethnic music, then the only outcome that you produce will be fat people that can dance."

Photos by Mark De Bord

Progress Report

"Nine years ago this day would not have been a reality. We argued and fought about this issue and concept nine years ago. At least today we are having discussions about whether or not the concept of multi-culturalism has utility or not. There is enough of a nucleus here at Goddard to begin to move forward.

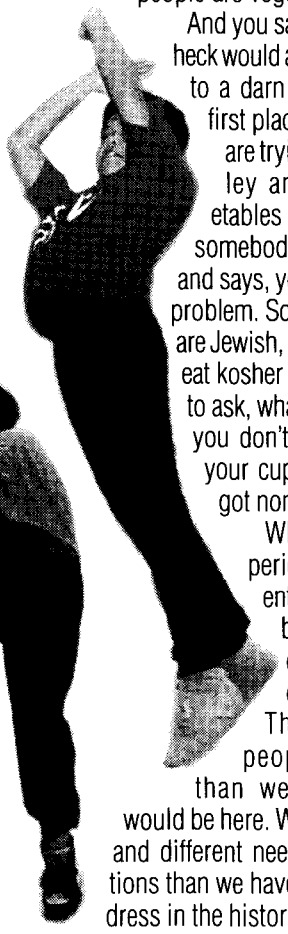
Even though God-dard has progressed, I think our nation has regressed. We are far beyond 'at risk' and entering what he calls crisis and chaos. The country is in denial. Why? Because of apathy and a lack of leadership."

The Barbecue Story

"In this country, I believe that when we can't solve problems we look for scapegoats. What I find frightening is the new scapegoating of illegal aliens. In a country that can't differentiate immigrants from citizens, all of us who look different are viewed as illegal aliens.

Let me use the example of hosting a barbecue. We invite ten people. We make sure that we have enough food for at least 15. We feel comfortable. But then, some of our friends have friends drop in on them. They show up at your doorstep, and you want to appear like this gracious host or hostess. So you say, 'No problem. Come on in.'

Then you tell your spouse, 'Honey, we've got a problem, because there are 25 people out there, and we've only got food for 15.' So you try to figure out how to divide up the food when someone else comes in and says you've got a bigger problem than that. Some of the people are vegetarians.



And you say, 'Why in the he heck would a vegetarian come to a darn barbecue in the first place?' So while you are trying to make parsley and catsup vegetables to pass around, somebody else comes in and says, you've got another problem. Some of the friends are Jewish, and they can only eat kosher food. If you have to ask, what is kosher food, you don't have to look in your cupboard. You ain't got none.

What you will experience in trying to entertain at this barbecue is what this country faces every single day. There are more people here today than we ever thought would be here. With more unique and different needs and expectations than we have ever had to address in the history of this country. And our problem today is that we don't have the understanding and the capability at this point in time to address those needs. So if you can't address them, you turn the problem on the guests. And I'm saying that's what goes on every single day. If we focus here on the NASA system at Goddard, I believe that you are focusing and moving in the right direction."

Half the Equation

"At NASA, we only have half of the equation: technology. The other half is diversity. Your task is to try and develop an institution that is both compatible with accommodating changing technology, but also accommodating the changing diversity. Because if you're able to match the technology with the diversity then you will ultimately have the capability to move forward. If you don't have that match, technology does not move by itself. Because NASA is such a leader in technology, as an organization we run the risk of thinking that our technology alone can carry us."

The Challenge

"We are a nation at the crossroads of crisis and change. It is critical that we take the high road through change. Freedom only has value when we all share it. Equality only has value when we all have it. Your job is not to solve the problem. Your job is to be willing to commit to the struggle for change in this country so that everybody will ultimately live the life that should be a given to every individual in our society.

The challenge right now is to get employees to see this as part of work. People look at

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KUNISAWA Continued from Page 5

is as, 'this is not my job.' They ask, 'What's in it for me?' Rather than looking at it from the perspective of what might I learn by participating, or what is interesting about the experience for all of the people who have chosen to be here.

Until we change the attitude from not, 'What do I get out of it,' but what are other people going there for, and what can I learn about those other people that could benefit me in working more effectively, we will not have truly progressed."

❖ ❖ ❖

Kunisawa does not blame leadership or make white men the scapegoat for failures to fully embrace a multicultural approach. Instead, he explains that, "the problem is one of breaking the cycle of old behaviors that helped to make you successful in the past."

"I do know that not everyone has come to training," he says. Kunisawa is not concerned when people question multi-culturalism training, but he does gets concerned when they don't show up.

Stepping Up to the Challenge

Following Kunisawa's remarks, Goddard managers participated in a panel discussion on multiculturalism and diversity. Deputy Center Director, Al Diaz, described Goddard's discourse and efforts to grapple with multiculturalism and diversity issues saying,

> "Becoming a multicultural organization is going to take some action. Unless we learn to act together to achieve the common objectives, we are not a multicultural organization. Unless we are inclusive of all of our differences, rather than exclusive, I think that we have missed the opportunity for benefit. The fact is that we are different as individuals. People are not going to perform to their fullest, unless they feel at least respected, if not totally comfortable.
>
> If you look at the demographics in the year 2000, unless the organization is multicultural, it will deprive itself of the best and brightest. If people don't feel respect, they are not going to seek employment with us.
>
> In the scientific enterprise there is an additional value that multiculturalism brings. Diversity provides an enhanced capability to solve problems because of the different view points brought to the bear on a problem."

Thumbs Up for Hitchhiker TEAMS Performance

All Systems Were "Go" for Goddard Special Payloads Flown on Recent Shuttle Mission

by Tammy Jones

When NASA launched Space Shuttle Endeavour STS-77 on its the 10-day mission with its record-breaking four planned rendezvous, several Goddard-managed payloads were on board. Neal Barthelme, mission manager in the Special Payloads Division, says STS-77 was the second shuttle mission in less than a year to fly three bridges from his Division at the same time. (STS-69 also carried a trio of Goddard special payloads.) The shuttle's Hitchhiker carrier this time contained four experiments called Technology Experiments for Advancing Missions in Space (TEAMS).

Barthelme and more than 200 of his colleagues compared notes on TEAMS' outstanding performance with the STS-77 astronauts this summer when the crew visited the Center for post-mission briefings. While much of the data remains to be processed, early indications show that all went well for Goddard's STS-77 payloads. Here's the run down.

TEAMS

✔ ***Goddard's Passive Aerodynamically Stabilized Magnetically Damped Satellite (PAMS) did exactly what it was supposed to do.*** This pint-sized free-flyer doesn't need a steering wheel to stay on course. PAMS is a technology demonstration designed to test aerodynamic stabilization as a means for maintaining satellite direction. PAMS consists of a small deployed satellite and a measuring system to observe the satellite during a Shuttle mission. Linda Pacini, PAMS experiment manager, said the satellite performed as expected, "This demonstrates that aerodynamics stabilization techniques work."

✔ ***Refueling experiment topped off the*** tank. The Vented Tank Resupply Experiment (VTRE) was designed to test

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Newsmakers

Frank Ceppolina makes the grade at Santa Clara University (SCU). The school awarded former alum Ceppolina with its Distinguished Engineering Alumni Award, printing a full-page profile on the HST Flight Systems and Servicing Project Manager for the school's magazine. "When Ceppolina came to SCU in the late 50's, he wasn't particularly interested in rocket science. He was more a 'model airplane guy.'" Let's hear it for the class of '59.

Dennis Christopher is the Cable Guy. Bucks County Cablevision in Pennsylvania made the Goddard Education Specialist a local celebrity with their 8-part interactive TV program called "Lift-Off to Learning," broadcast for more than 1,400 students. Christopher brought the excitement of space down to earth for his MTV-generation audience with video clips, live demonstrations, and interviews with astronauts. His work will also be featured in the Time Warner Corporation's trade magazine. "One of the major advantages of cable is knowing our customers and being able to meet the specific needs of each individual community," said the Cable Station's appreciative programming director.

High praise for Mission Operations and Data Systems project manager, Algelita Castro Kelly. Featured in a new book of 70 outstanding role models, "Filipino Achievers in the USA and Canada: Profiles in Excellence," Kelly is recognized for her professional achievements and dedication to mentoring others. Phillipine President, Fidel Ramos, commends Kelly "for her significant work which gives well-deserved recognition to our countrymen who have succeeded despite many obstacles."

Jeannette Benavides is rocking "La Nacion." Featured in a full-page color story appearing in Costa Rica's major newspaper, "La Nacion," the flight assurance technologies chemist and materials engineer talks about the importance of the EOS program, and opportunities for Costa Rica to participate in this interdisciplinary, international program.

Alan Binstock gets thumbs up verdict from Washington Style. A photo and article on Binstock's sculpture appeared in the Washington Post Style article, "Sculptor Acquits himself well in Greenbelt Show." The Facility Management Division's architect exhibited his flagstone and steel works at the Federal Courthouse this summer, winning rave reviews. A project manager at Goddard, Binstock is perhaps best known for his sculpture in the Building 1 cafeteria: a design and installation in the serving area which resembles space hardware.

A Scholar's Journal

by Kelly Fox, 1996 National Space Club Scholar & Atholton High School Senior, Columbia, MD
Mentor: Mr. Ian Sprod, TOMS Atmospheric Scientist

DAY 1: After receiving my security badge without incident, I met three other Space Club Scholars. We stuck out as summer students, who didn't know where to go, how to get there, or who to ask. Realizing we were stronger united, we immediately bonded. The four of us introduced ourselves and walked together to Building 3. The tight security quickly changed my first day jitters into precautionary panic. Absorbing important details, we noticed the door was flanked by a keycard security device and stated only employees with proper clearance could enter. Determining that we were at the right building, we proceeded through the double doors. I held my breath, and waited for the alarms, guards, and dogs. Silence. No one jumped out from behind the bushes. We were safe. We were at the right building. And...we were early.

> Here, the excitement of science is the invisible force that ties everyone together.

Meeting the others students and going to the orientation helped calm everyone's nerves. Our coordinator's easy going nature and great sense of humor rubbed off on the group. We even grew excited at the prospect of six weeks at Goddard. At the orientation we were warned of three very important items. Number one, the security guards carry guns. Number two, the geese always have the right of way. And number three, in order to survive on Center you must learn to speak "Acronym". No one warned me about Goddard's intense scientific atmosphere. I guess I should have known better.

After meeting my mentor, Ian Sprod, I followed him to Building 22. We discussed acronyms, and I learned a new one, TOMS (Total Ozone Mapping Spectrometer). That brought my AEL (Acronym Experience Level) to three: NASA, GSFC, and TOMS. I observed that there were an overwhelming number of chalkboards. They're on every floor and in most hallways and offices. It reminded me of my high school. The only difference was that these chalkboards were well stocked with chalk, prepared for even the most spontaneous of thoughts.

I was most amused with the toilet paper dispenser in the ladies rest room. It read like directions designed for the Shuttle: "when empty flip access door." Only at NASA.

The scientific atmosphere remained strong in even the cafeteria. The TV in the corner continually pumped Weather Channel satellite pictures into the busy room. Conversations surrounded the latest launch, the next colloquium, and future projects. The salt shaker became the Shuttle as it rendezvoused with the Spartan carrier (a.k.a. the pepper shaker). And boy did the acronyms fly!

> "The salt shaker became the Shuttle as it rendezvoused with the Spartan carrier"

I've found that Goddard is full of scientific influence. Here, the excitement of science is the invisible force that ties everyone together. I understand now that it is that excitement that I saw in the eager expressions of many of my colleagues that first day. Eager to learn, eager to understand, and eager to share.

FAST Continued from Page 1

FAST is the second of five missions in NASA's Small Explorer (SMEX) Project developed by Goddard. The SMEX satellites are highly capable, small observatories for quick response astrophysics and space physics investigations.

"Innovative engineering and new technology advances have increased the potential scientific return of the SMEX spacecraft to a level comparable to larger carriers. The design has struck a balance between mission risk and cost that has allowed for the development of an extremely capable spacecraft within just three years time. The SMEX program well embodies the faster, better, cheaper concept," said James Watzin, SMEX project manager at Goddard.

OZONE Continued from Page 2

"This confirmation that we can use a space-based sensor like TOMS to measure long-term global surface ultraviolet radiation levels represents a very powerful new tool for Earth Scientists and others to use both now and in the future," said Dr. Robert Harriss, Director of the Science Division, of NASA's Office of Mission to Planet Earth, Washington, D.C.

Ozone, a molecule made up of three atoms of oxygen, is found in the atmosphere between the ground and about 37 miles (60 kilometers) in altitude. Ozone absorbs ultraviolet radiation from the Sun and shields life on Earth from its harmful effects. Scientists and others have a keen interest in ozone depletion, given that the increased amounts of ultraviolet radiation that reach the Earth's surface because of ozone depletion, have the potential to increase the incidence of skin cancer and cataracts in humans, harm some crops, and interfere with marine life.

TEAMS Continued from Page 6

improved methods for in-space refueling. The results of the experiment will be used in future designs of spacecraft liquid propellents. All VTRE video and digital data was recovered, and large quantities of unique and interesting data were returned. The Lewis Research Center experiment videotaped red-dyed freon as it was transferred at different fill rates from one tank to another and back again.

✔ ***Hitchhiker passenger turned up the heat on microgravity experiment.*** The Liquid Metal Thermal Experiment (LMTE), sponsored by the Air Force's Phillips Laboratory, in Albuquerque, N.M. LMTE looked at the performance of liquid metal heat pipes in microgravity conditions. LMTE turned out the hottest heat pipes in space history at >900 degrees Fahrenheit. The experiment was successful with its hardware and software, real time control and data acquisition obtained through ground support equipment at the Goddard's Hitchhiker Payload Operations Control Center.

✔ ***Navigation experiment pointed the compass for future space station orienteering.*** The Global Positioning System (GPS) Attitude and Navigation Experiment (GANE) is a Department of Defense navigation system that allows world-wide navigation capabilities. GPS allows pilots, boaters, hikers and others accurate real-time position and velocity determination. The International Space Station will use GPS for position, velocity, time information and attitude determination. GPS met its mission objectives.

SPARTAN 207

✔ ***The Spartan 207/Inflatable Antenna Experiment (IAE) also flew on this mission and was successful.*** Data from the spacecraft indicate that all systems functioned as intended. Mark Steiner, Spartan 207/IAE Mission Manager said that L'Garde, Inc. of Tustin, Calif., the builder of the IAE, is still evaluating data from the flight. "They were very pleased with the quantity and quality of the photo and video documentation from Endeavour. They said that it appears that the antenna portion of the IAE did not fully inflate, and are working to understand just what exactly happened," said Steiner. The flight hardware has been removed, and is in storage for future flights.

There also were ten GAS experiments on the STS-77 mission.

LITTON Continued from Page 6

industry, NASA is helping to bring these benefits to the American public," said George Alcorn, Chief of Goddard's Commercial Programs Office.

The value of the product attracts industry contributions. NASA is not the major financial contributor for the product. This represents a new way of doing business within the demands of a shrinking federal budget."

The successful development of the advanced gyroscope will greatly increase safety and reduce costs associated with various commercial activities, such as oil exploration and drilling. Current tools used by the oil industry for measuring the depth and direction of a drilling location have limited accuracy and dependability. The Advanced HRG allows for a single tool to measure depth and direction while drilling and surveying.

Designs for the Advanced HRG will be evaluated and validated by GSFC, JPL, Litton, and the California State Defense Conversion Council.

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UPCOMING EVENT

Goddard Community Day

Activities for the whole family include:

Engineering Fair
Guided tours of Center
Living-in-Space Demos
Model Rocket Launches
Control-Line Model Aircraft Demos
Discover Goddard Speaker

September 15, 1996 9 a.m. to 4 p.m.
For more information, call (301) 286-8981

Goddard News Editor, Ernie Shannon, leaves for Columbus, Ohio and a promotion to Public Affairs Director at the DOD Finance and Accounting Systems Center. Best of Luck! We'll miss you.