

Goddard Projects do Atmospheric "Doubletake"

Soviet Rocket to launch New TOMS

Dolores Beasley

More than two years of close international cooperation between Goddard and Soviet space personnel will culminate with the launch of NASA's Total Ozone Mapping Spectrometer (TOMS) aboard a Soviet Meteor-3 spacecraft.

This first flight of a complex U.S. instrument on a Soviet spacecraft is scheduled for August 15. The Meteor-3/TOMS two-year mission makes it possible to ensure continuous monitoring of global ozone levels by measuring the total ozone content in the Earth's upper atmosphere.

The project is taking place under the 1987 U.S./U.S.S.R. agreement on "Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes," signed by President Ronald Reagan and Michail Gorbachev.

Goddard's Arlin Krueger, Code 916, project scientist for the Meteor-3/TOMS, described the interaction between the U.S. and Soviet teams as "absolutely super."

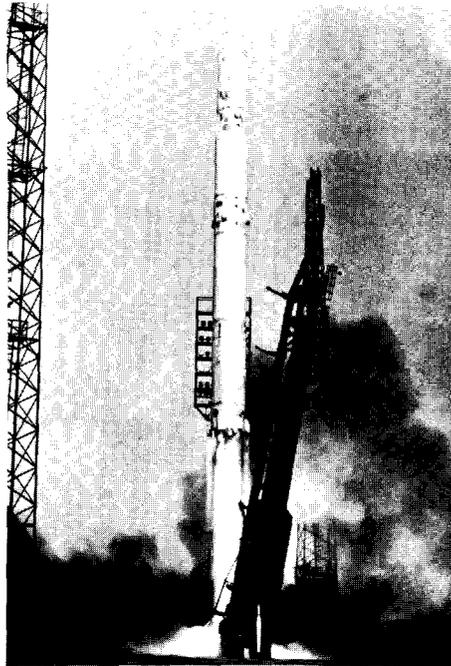
"The Soviets have done a superb job," he said. "They were ready to do whatever was required to get (TOMS) launched on time."

The Meteor-3/TOMS instrument is similar to the TOMS instrument aboard the Goddard-managed Nimbus-7 satellite launched in 1978. By launching in August, Meteor-3/TOMS will be in place to observe the formation of the Antarctic ozone "hole" in September and October. The ozone hole is a large area of intense ozone depletion over the Antarctic continent that typically occurs between late August and early October and typically breaks up in mid-November.

"Nimbus-7 is 13 years old," Krueger noted. "This mission was really necessary in order to continue the observation of global ozone."

Goddard is supplying the TOMS instrument and is providing on-board storage for science data. The Soviet Union's State Committee for Hydrometeorology (Hydromet) is providing the launch vehicle, mission operations and TOMS house-keeping data. Charles Cote, Code 910, is project manager.

(Continued on page 2)



A NEW ERA IN INTERNATIONAL RELATIONS -- This Soviet Cyclone rocket is similar to the one that will launch the Goddard Total Ozone Mapping Spectrometer, an instrument aboard the Soviet Meteor-3 spacecraft. At press time the launch was scheduled for August 15. This is the first time a complex American instrument will be launched from a Soviet launch vehicle.



First Mission to Planet Earth Spacecraft - UARS - to be launched

Goddard's Upper Atmosphere Research Satellite (UARS) will be making history when it is launched in September. UARS is the first spacecraft to be launched as part of NASA's Mission to Planet Earth program -- an initiative to study the global processes of Earth and Earth's atmosphere.

The goals of the UARS program are to understand the mechanisms that control upper atmosphere structure and variability, the response of the upper atmosphere to natural and man-made disturbances; and to define the role of the upper atmosphere in climate and global change. UARS will be launched at an altitude and inclination that will allow remote sensing instruments on the spacecraft to "see" nearly the entire globe.

The Earth's upper atmosphere plays a fundamental role in global climate and provides a shield against harmful ultraviolet radiation from the Sun. Recent and substantial changes in atmospheric composition, caused in part by human activity, has created the need for a thorough understanding of upper atmospheric processes.

UARS will carry out the first systematic, detailed satellite study of the Earth's

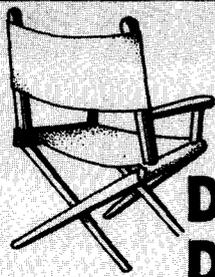
(Continued on page 2)

A PREFLIGHT INSPECTION -- STS-48 Mission Specialist Sam Gemar, center, conducts the sharp edge inspection of the Space Shuttle Discovery's primary payload, the Upper Atmosphere Research Satellite at the Payload Hazardous Servicing Facility at the Kennedy Space Center, FL. This inspection is performed by the astronauts, prior to flight, to ensure that there are no sharp edges or protrusions that could puncture a space suit if a contingency space-walk should become necessary.

**Dr. Michael
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Directors' Dialogue

Q. As a result of Threat Condition 3, Security felt a need to close down Gate 5, by the Visitor Center, which had only been open during the morning and afternoon rush hours. How much longer, now that the reason for instituting Threat Condition 3 appears to be over, is this gate to be left closed during these time periods?

A. Threat Condition 3 demonstrated that traffic entering and exiting the Center can be managed effectively with three active gates (Main, East and Parkway). Because Security Force resources are currently being directed at higher priority concerns (e.g., the new East Campus gate), we do not anticipate operating additional gates in the foreseeable future. We will, however, continue to monitor closely the Center traffic conditions with a view toward implementing safe and cost-effective changes.



Sherry Foster, Director Management Operations Directorate Code 200

UARS to be launched

(Continued from page 1)

upper atmosphere providing for the first time the global data sets required to probe the chemistry, dynamics and radiative inputs of the upper atmosphere, particularly the stratosphere and mesosphere. The data collected and analyzed by the UARS mission will be used in the formulation of future environmental policies.

The UARS mission is comprised of nine complementary scientific instruments provided by principal investigators located throughout the United States, as well as in Canada and England. Each instrument will gather data on a particular aspect of the upper atmosphere that can affect the global environment: wind, temperature, pressure, gas concentration,



A NEW KIND OF ATHLETE -- GSF personnel posed with the Colorado State University (CSU) walking machine and members of the winning team at the Fifth Annual Robotic Walking Machine Decathlon, which was held recently at the University of Maryland, College Park. Nine universities, eight US and one Canadian, entered the contest. The CSU entry successfully completed all 10 portions of the decathlon, which included teleoperated and autonomous events to "walk away" with the first place. Pictured from Goddard are Maureen Bartholomew (standing, far left) and Tim Sauerwein (kneeling, far left) both Code 714, who served as judges, and Rules Committee Chairman and Chief Judge Russ Werneth, Code 409, (standing, far right). Dennis Hewitt, Code 409, (not pictured) gave the decathlon keynote speech on "GSFC's Flight Telerototic Servicer: Robotics in Space."

Letter From the Editor

Dear Readers of the *Goddard News*,

I need your help to improve the *Goddard News*. How often do you read the *Goddard News*? How much of it do you read? Do you get every issue? What types of stories do you prefer? Human interest? Science Stories? Current events at Goddard? Are there areas of interest at Goddard that you would like to see covered more often or in greater depth? Do you find the *Goddard News* easy to understand? Hard to understand?

What would you change about the *Goddard News* story content if you could? Remember that the *Goddard News* will remain a monthly, black and white, 8 page publication.

Please take the time to let me know what you think. You don't have to write a lot. Even a paragraph will help. You can send it to me through the mail at *Goddard News*, Code 130 or through GSFCmail to SMARUCCI. No phone calls, please.

Thanks for taking the time to help us make the *Goddard News* better.

Susie Marucci
Editor, *Goddard News*



Photo: J. Semeraro

charged particles and radiation energy input, and the processes that couple the upper atmosphere to the lower atmosphere. These instruments will remotely measure concentrations of ozone, methane, water vapor, carbon dioxide, carbon monoxide, hydrogen fluoride and several chemical species in the nitrogen and chlorine families, including chlorofluorocarbons.

Although not part of the UARS mission, a tenth instrument which will monitor the total solar constant (integrity) will fly aboard the UARS spacecraft. The data it will produce will be independent of the UARS data set.

Soviet Rocket launches TOMS

(Continued from page 1)

After launch, a Moscow team will control the commands to the spacecraft and every two weeks, Goddard personnel will send via computer the command sequences for TOMS operations. Data will be downlinked to receiving stations at Goddard's Wallops Flight Facility and a station in the Soviet Union. The data will be archived at the National Space Science Data Center here at Goddard and at the Central Aerological Observatory of Hydromet, located at Dolgoprudny, Moscow Region.

Launch Update: Greenland Campaign

Researchers from Goddard's Wallops Flight Facility will attempt to obtain measurements of polar glacier surface elevations in Greenland that will aid in determining ice buildup or melting because of global climate change. The measurements will take place between August 23 and September 16. The scientists will use an instrument aboard a P-3 Orion aircraft to measure the elevations of the glacier surface to an accuracy within 4 inches (10 cm). According to Bill Krabill, Code 972, principal investigator from Wallops, such accuracies can be obtained using a satellite network called the Global Positioning System (GPS) and laser ranging technology. Repeated surveys in following years will help determine if the glaciers have received a gain or loss in the volume over a wide area.

The principal instrument on the aircraft is Wallop's Airborne Oceanographic Lidar (AOL). (Another story about the use of AOL appears on page 4.) The AOL measures the time it takes for a laser pulse to reach the ice and return to the aircraft. Time variations will occur because of the changes in the terrain, allowing the researchers to scan an area 656 feet (200 meters) wide immediately below the aircraft. At press time, the aircraft was about to start the first of several test runs prior to heading toward Greenland.

Other instruments on the aircraft will include two radar altimeters, a profiling laser and an inertial navigation system to measure the aircraft's pitch and roll.

"Knowledge of the ice budget in polar glaciers will provide an indirect measure of sea level changes and may indicate trends in world climate," Krabill said. He added that making direct measurements of sea level is very difficult and that measuring large ice sheets may be a more practical method for assessing changes in sea level."



Photo: D. McCallum

SHARING AND LEARNING TOGETHER -- A 15-member delegation of Soviet space officials came to Goddard in response to an invitation from NASA Administrator Richard H. Truly last October during his visit to the Soviet Union. The group visited five NASA centers as well as NASA Headquarters. In this photo, Oleg N. Shishkin, seated, Minister of the General Machine Building, manipulates the Craft Master Hand Controller in the Robotics Lab in Building 11. Steve Leake, Code 714.1, wearing visor, assists Shishkin, as members of the Soviet team watch.



Visitor Center Events for September

Through Labor Day the Visitor Center is open seven days a week. After Labor Day the Visitor Center will be open Wednesday through Sunday. The hours are 10:00 a.m. to 4:00 p.m., closed all federal holidays. For more information call x6-8981.

Launch Site Goddard -- Sunday, September 1, 1:00 p.m. and 15, 3:00 p.m. Come out for Goddard's model rocket launches.

Saturday Videos -- Saturday, September 14, 1:00 p.m. View "STS-35 Mission Highlights," a video about the nine-day ASTRO-1 mission.

Know and Tell -- Sunday, September 22, 1:00 p.m. "Life aboard the Space Shuttle Columbia -- The Flight of the

ASTRO-1 Observatory" -- Join Goddard Astronaut Ron Parise, Computer Sciences Corporation, as he talks about his role in the STS-35 mission and life aboard the shuttle.

Community Day -- Sunday, September 15, 10:00 a.m. to 4:00 p.m. Once a year Goddard opens its doors and throws a party for the community. There will be tours of the Center, model rocket launches, food, entertainment and more! Last year almost 5,000 members of the local community came to see what Goddard is all about and to have a good time. For more information about Community Day call x6-8981.

The New Strategic Plan -- An Overview

Join Center Director Dr. John Klineberg for an all-hands meeting to discuss the new strategic plan -- a road map to Goddard's future. The meeting will be held in the Building 8 auditorium on September 20 beginning at 10:00 a.m. Take the time to find out where Goddard is going in the future!

Goddard Scientists Improving Detection of Ocean Microscopic Plants

by Keith Koehler



Photo: L. Hancock, Wallops

Looking at Lasers -- Dr. Frank Hoge, Code 972 and Robert Swift, EG&G Washington Analytical Services, both researchers at Goddard's Wallops Flight Facility, examine the Airborne Oceanographic Lidar (AOL) on board the Wallops P-3 aircraft. The researchers use the AOL to develop instruments to improve mapping of phytoplankton, microscopic plants found in the ocean.

Phytoplankton, microscopic plants found in the ocean, play a major role in the marine food chain as nutrition for small animals and fish. It also plays an important role in the absorption of carbon dioxide from the atmosphere. Carbon dioxide is the principal greenhouse gas thought to be responsible for most global warming.

To help understand the role of phytoplankton and its importance, scientists at Goddard's Wallops Flight Facility are developing instruments to improve mapping of these small plants on a world-wide basis.

To conduct studies of phytoplankton, a team of Wallops' researchers led by Frank Hoge, Code 972, use a laser spectroscopy instrument known as Airborne Oceanographic Lidar (AOL). This laser system is mounted in the Wallops P-3 aircraft which flies only 500 feet (150 meters) above the water. According to Hoge, "Nobody else has the laser system to do this research."

The AOL transmits a green light pulse from a laser into the water where it is absorbed by the phytoplankton. A receiver on the aircraft detects the green light reflected from the water surface and red light which is emitted by chlorophyll pigment in the phytoplankton. At the same time, another instrument on the aircraft is taking measurements, similar to the process used by satellites, from sunlight reflected from the water and emitted by the chlorophyll. Satellites can measure the phytoplankton concentrations in the top several yards of the ocean, where the laser equipped AOL can measure concentrations as deep as 128 feet (39 meters).

For global change research, measuring concentrations of phytoplankton is essential in understanding the role of oceans in the global carbon cycle. By improving their knowledge of how oceanic phytoplankton take-up, process, and release carbon as sedimentary by-products, scientists can better understand and model global climate.

Another phytoplankton pigment which the Wallops researchers have had some success in detecting is phycoerythrin. The phycoerythrin was first detected with the laser in 1979, and the researchers began measuring the solar reflected light in 1984.

According to Hoge, the phycoerythrin fluoresces like chlorophyll when stimulated by the laser from the aircraft. The phycoerythrin, however, emits a yellow light instead of red.

Because only certain phytoplankton have phycoerythrin, the prospect of studying species variability from orbit is being studied. Researchers are interested in understanding how these species, compared to other phytoplankton, contribute to carbon fixation and their contribution to the Earth radiation budget. Hoge said, "I'm very pleased with the progress we're making." In a recent paper published in "Remote Sensing of Environment," Hoge and Wallops researcher Robert Swift, EG&G Washington Analytical Services of Pocomoke, suggests that pigments such as phycoerythrin may be detected and mapped by orbiting ocean color sensors.

GRO Detects Strongest Gamma Ray Source

by Randee Exler

After less than four months in space, Goddard's Energetic Gamma Ray Experiment Telescope (EGRET), one of four instruments aboard Goddard's Gamma Ray Observatory (GRO), has detected "the most distant and by far, the most luminous gamma-ray source ever seen," according to EGRET Principal Investigator Dr. Carl Fichtel.

The EGRET team, led by Fichtel, reported in a telegram to the International Astronomical Union, Cambridge, MA, that a source of intense localized gamma radiation, was detected between June 15 and 28. The source of this radiation has been identified with the variable Quasar 3C279, located in the constellation Virgo, approximately seven billion light years from Earth.

Fichtel says that the quasar is emitting a large flux of gamma rays, each gamma-ray photon with an energy greater than 100 million electron volts. In contrast, a visible light photon has an energy of only a few electron volts. The luminosity or total energy emitted by this quasar is approximately 10 million times that of the total emission of the Milky Way galaxy, according to the Goddard scientist.

"Quasar 3C279 is a variable quasar, meaning that its intensity changes over time," Fichtel explained.

Fichtel added, "Between 1982 and 1991, this quasar has gone from being undetectable to being one of the brightest objects in the gamma-ray sky. Because of its large distance, this observation is dramatic confirmation of the dynamic nature of the gamma-ray sky and an example of the most energetic processes in nature."

GRO, the second of NASA's Great Observatories, was launched April 5, 1991, aboard the Space Shuttle Atlantis to study high-energy radiation from deep space.

EGRET is the largest instrument ever assembled in-house at Goddard. The 4,001 pound EGRET is between 10 to 20 times larger and more sensitive than any high-energy gamma-ray telescope ever to orbit the Earth.

The Gamma Ray Observatory was developed, managed and operated by Goddard. Dr. Neil Gehrels, Code 661, is the project scientist. John Hrastar, Code 490, is GRO project manager.

Suborbital Study of Gamma Rays Snatches Lindsay Award

by Tanya Jones

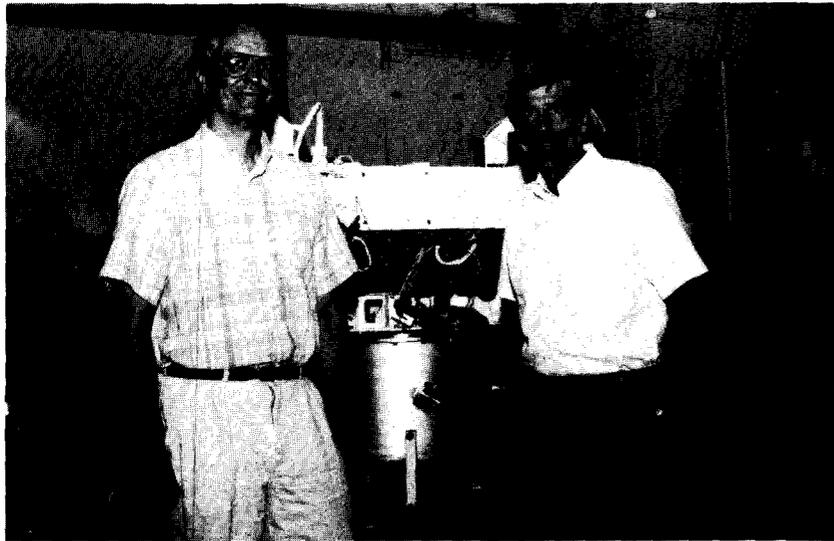


Photo: J. Semeraro

SURPRISED AWARD WINNERS -- This year's recipients of the John C. Lindsay Memorial Award for Science, Dr. Jack Tueller, left, and Dr. Bonnard J. Teegarden, both of Code 661, could hardly believe they won for their work on Goddard's Gamma Ray Imaging Spectrometer (GRIS). A suborbital instrument, carried aloft by a balloon, GRIS, shown here, has made some of the most sensitive high resolution measurements of Supernova 1987A.

Launched "down under" by a helium balloon, a Goddard-built instrument has made some of the most sensitive, high-resolution measurements of gamma-ray sources, including Supernova 1987A. Data from the Gamma Ray Imaging Spectrometer (GRIS) led Goddard astrophysicists, Dr. Jack Tueller and Dr. Bonnard J. Teegarden, both Code 661, to conclude that new elements had been formed in the Supernova. Tueller and Teegarden's experiments were among the first to provide proof of a belief held by many astrophysicists that most common elements were created in explosions like Supernova 1987A.

Tueller, instrument scientist for GRIS, and Teegarden, co-principal investigator for the project, were this year's recipients of Goddard's John C. Lindsay Memorial

Award for Science. They were honored for their creative roles in the development of GRIS and their significant discoveries in the field of gamma-ray spectroscopy. The experiments for which Tueller and Teegarden were honored were flown in May and October 1988.

The GRIS team was the first group to make reliable measurements of the shape of the gamma rays emitted by Supernova 1987A. It was "quite a remarkable achievement," says Tueller, for an instrument of this type to provide such immediate and high-quality results.

With such a low-profile project, Teegarden calls winning the Lindsay Award "a great honor that was not expected." Tueller says it was "gratifying to win the award for a suborbital project which didn't cost a lot of money."

NASA Global Change Study Raises New Questions

by John J. Loughlin II

In 1961 aerial photographs of the Sahara Desert showed that the large dry African region was expanding. But a recently released Goddard study suggests movements of the Sahara look more like an accordion than a steam roller. The study indicates that the Sahara Desert, the world's largest desert, has undergone a variety of fluctuations in size during the past 11 years.

Since 1980, Goddard scientists have been studying data from a variety of Earth observing satellites in an effort to provide insight into global climatic change. To accomplish this, scientists have engaged in a wide range of complementary studies of satellite data. One study focused on the size of the Sahara Desert in Africa using meteorological satellite data.

"The object of this study was to look at the size of the Sahara Desert to see if it is increasing in size," according to Dr. Compton J. Tucker, Code 923, a physical scientist. Scientists believe that changes in global desert area would mean that the Earth is undergoing a climate change on a global scale.

"Our data indicate the Sahara has expanded at times and contracted at other times since 1980," he said. "We can't say for sure, based on this data, whether or not the climate is changing. However, data such as these will provide a baseline to compare future data against to hopefully answer this question."

The data indicate that the southern boundary of the desert had expanded to the south by about 80 miles between 1980 and 1990, but that there were rather dramatic movements both northward and southward within this time period.

"The fluctuations are determined by the amount and distribution of the rainfall in the area," Tucker said. "That controls the amount of vegetation we see from space." Tucker added "It is impossible to study large-scale climatic phenomena without Earth-orbiting satellites."

Tucker collaborated with Wilber Newcomb, Science Systems Applications Inc., Code 923, and Harold Dregne, of Texas Tech University, Lubbock, TX, on the Sahara study.

SSBUV Takes to the Skies!

For the third time in less than two years, Goddard's Shuttle Solar Backscatter Ultraviolet (SSBUV) instrument flew aboard a space shuttle when it headed to the skies as part of the STS-43 mission. The SSBUV's mission is to calibrate similar ozone measuring instruments aboard NASA and the National Oceanic and Atmospheric Administration (NOAA) satellites. At

press time, as the SSBUV and the Space Shuttle Atlantis were still orbiting, SSBUV Experiment Manager Don Williams, Code 916, said that while they would not be able to evaluate the data until the SSBUV returned to Earth, so far, "It's been a real good flight for us." The SSBUV was designed to fly as many as 10 missions between 1989 and 2000.

INSIDE

Dr. Michael King: An Eye on the Sky

by Tanya Jones

Dr. Michael D. King, Code 913, is a man with his head in the clouds, but he isn't daydreaming. King is an atmospheric scientist in the Climate and Radiation Branch. Even when he isn't studying cloud properties, his eyes are trained on the sky as he enjoys his hobby, bird-watching. King has seen "a fair amount" of birds, 630 in North America and several hundred more abroad.

The son of the president of a department store chain, King is the only scientist in his family. His brother chose to pursue a business-related field, but King chose to become a scientist. In 1971, he graduated Magna Cum Laude from Colorado College, Colorado Springs, with a B.A. in Physics. He went on to the University of Arizona, Tucson, where he received his M.S. in Atmospheric Sciences in 1973 and a Ph.D. in the same discipline in 1977. In January, 1978 King moved across the country, from Arizona to Maryland, to work as a physical scientist in the Laboratory for Atmospheres here at Goddard.

This easy-going man has been making his mark in the field of atmospheric science ever since. His 13 and a half years at Goddard were interrupted from 1986 to 1987 when he took a year's sabbatical to teach graduate courses at the University of Washington as a visiting professor. He taught advanced graduate courses on atmospheric radiation and remote sensing of the atmosphere. He still has close ties with the faculty at the university. King's role as an educator did not end there. Today, he continues to help others who are pursuing post-graduate degrees as well as post-doctoral research associates. He has lectured at summer courses for graduate students at the University of Colorado and at the International School of Physics Enrico Fermi on Lake Como, Italy.

The development of his instrument, the cloud absorption radiometer which measures the absorption of solar radiation by clouds, is his proudest achievement, says King. He developed and published the theory of a new method of measurement, built the instrument that would make the measurements, then used it to make measurements which he analyzed himself and then published.

"Most scientists never get to work in theory, experiment and analysis. I worked in all three from start to finish. That whole project is a complete science investigation. That's pretty satisfying."

SMOKING GUN

The radiometer, which King operates aboard a University of Washington research aircraft, has made measurements of the properties of clouds that have been modified by pollution from ships off the coast of California. He calls his findings "a smoking gun in the global change business" because they show that human activities cause pollution which may counterbalance the greenhouse effect by actually changing cloud properties and creating a cooling effect. King is planning an experiment next summer in the Azores, an island chain about 900 miles west of Portugal, to make further measurements of clouds modified by ship tracks.



Photo: P. Baltzell

JET-SETTING ATMOSPHERIC SCIENTIST -- When he's not studying cloud properties in such far-away places as Kuwait and Alaska, Dr. Michael King, Code 913, an atmospheric scientist in the Laboratory for Atmospheres, looks at the photographs decorating his office to remind of him of his many travels. At his desk, King is framed by pictures of the Kuwait oil-fire smoke he recently studied, right, and global data products from the Earth Radiation Budget Experiment (ERBE), left.

Recently, King found himself in Bahrein and in the smoky skies above Kuwait's burning oil fields. King's main purpose was to measure the absorption and scattering properties of the smoke using his cloud absorption radiometer. As a member of a team of 27 U.S. scientists, he participated in an investigation of the effects on climate of the smoke plumes produced by Kuwait's burning oil fields, a result of the Persian Gulf War.

The swiftly planned expedition began with an electronic mail inquiry from Japan and a few phone calls in March and "two months later, we were there" in Bahrein. The investigative flights took place in four

weeks from May 16 to June 12 and used the University of Washington's Convair 131A aircraft with King's radiometer aboard flying within the smoke. The oil fire smoke plumes provided the scientists an opportunity to investigate conditions that might be similar to a nuclear winter.

King's projects also reach beyond the clouds into orbit. In 1983 he was a member of the team with decision making authority over the launch of the Earth Radiation Budget Satellite (ERBS) from the Space Shuttle Challenger. The satellite was launched during the STS-41G mission. King enjoyed the experience of being in the Payload Operations Control Center here at Goddard. "In the control room we were turning on instruments and checking them out before it was released from the shuttle; it was a very interesting experience."

In 1985 King received the NASA Exceptional Service Medal for his role in ERBS as well the Earth Radiation and Budget Experiments (ERBE) which are now orbiting aboard NOAA Satellites Nine and 10.

SHARING KNOWLEDGE

Even with all these projects in the works, King finds time to contribute to the spread of knowledge in his field. As well as working with graduate and doctoral students, he is active in the American Meteorological Society, and was elected as a fellow last year. As associate editor he contributes to the society's "Journal of Atmospheric Sciences." In addition to the journal, King has more than 20 refereed publications to his credit; he has contributed chapters based on his atmospheric activities to several books; and has worked with colleagues on conference and symposium papers.

With a career that takes him all around the world, King, a native of Kansas, is fortunate to have a hobby that travels with him. Having seen most of the birds found locally, he now sees new species mostly when his work takes him to such places as Alaska, Europe and Asia. Bird-watching is a family affair as King's wife and two children are expert birders as well. This Silver Spring resident also serves as Committee Chairman of his son's Boy Scout troop. An Eagle Scout himself, he enjoys such activities as accompanying the troop to Scout Camp.



Congratulations to the following employees on their recent appointments: **RICHARD J. KEEGAN**, Chief of the Institutional Procurement Division, Management Operations Directorate, Code 240 . . .



GRADY

KENT POTTER, Head of the newly established Design and Construction Section D, Code 271.5 . . . **MARK FONTAINE**, Deputy Project Manager/Resources for the Flight Telerobotic Servicer/Demonstration Test Flight Project, Code 409 . . . **KEVIN GRADY**, Deputy Project Manager for the Earth Observing System (EOS) Observatory Project, Code 421 . . . **ARLENE PETERSON**, Deputy Project Manager for the EOS Instruments Project, Code 422 . . . **LAWRENCE ZEIGENFUSS**, Deputy Project Manager for the Space Network Project Office, Code 504. . . **GOPALAKRISHNA RAO**, Head of the Space Technology



SCHOEBERL

Division's Energy Storage Section, Code 711.5 . . . **JOSEPH SKLADANY**, Head of the newly established Advanced Analytical Section in the Thermal Engineering Branch, Code 732.6 . . . **WILLIAM WEST**, Head of the Instrumentation Engineering Branch in the Engineering Division of the Suborbital Projects and Operations Directorate, Code 822 . . . **DR. MARK SCHOEBERL**, Head of the Atmospheric Chemistry and Dynamics Branch, Code 916 . . . **EDWARD MASUOKA**, Head of the Computing Systems Office in the Laboratory for Terrestrial Physics . . . **DR. HORACE MITCHELL**, Head of the Computational Methods and Analysis Facility in the Space Data and Computing Division, Code 932.

Photos: M. Small



Photo: D. McCullum

HONORING THOSE WHO SAVE LIVES -- On July 17, Goddard honored employees who have worked to save lives by giving one gallon or more of blood since June 1989. Associate Director Dr. James Trainor, the keynote speaker, said that the Goddard bloodmobile has saved 10,000 lives during the past two years. Pictured from left to right, standing in the back row are Michael Mantzouranis, Swales and Associates, Inc.; James Trainor, Code 100; Lynn Dalkiewicz, Code 205.2; Robert Hoffman, Code 696; Robert Austin; Steven Wadding, Code 511.2; Temp Johnson, ST Corp. (STX); Erico Sabatino; Carolyn Dent, Code 514; Lawrence Ryan, Code 663.2; Pamela Brown, Code 210; Roy Nakatsuka; Rex Elliott, Code 284.2; Francis Gormley; Edwin Vaughn, Code 563.3; Keith Evans, STX; Mark Beckman, Code 554; Oren Sheinman, Code 731.1; John McWilliams, NSI Technical Services, Corp. (NSI); William McGunigal, Code 728.2; and Ved Gupta, (NSI). In the front row, seated, are Allison Lopez, STX; David McComas, Code 512.1; Jorge Otero, Code 212.2; John Spohr, Bendix Field Engineering Corp. (BFEC); Marlyn Bitzer; Harold Geller; Philip Smith, Code 725.3; Howard Dew, Code 511.1; Paul Trahan, NSI; Thomas Cynarowicz, Code 713.4; and Cathy Long.

Retirees

Congratulations to the following employees who recently retired!

Name	Code	Years	Name	Code	Years
Sidney Alterescu	702	44	Joseph Siry	971	49
Phyllis B. Bayne	696	23	Russell N. Shoemaker	291	20
Robert A. Burns	823	35	Dorothyann Stoops	470	22
Michael J. CuvIELLO	440	25	Maxwell Strange	924	34
Luis Gonzales	430	30	John E. Weaver	822	30
Laurence M. Goodman	405	30	Anice M. Wells	263	28
David J. Haykin	480	30	Genevieve Wiseman	280	37
Straton Laios	540	29	John H. Wolsh	403	36
William H. Miller	420	31	Joseph P. Young	421	30
J. Earle Painter	733	31			

Space Trivia

1. How many thermal tiles does the Space Shuttle Columbia have on its surface?
2. What was the booster used to loft the last of the Mercury flights?
3. The LANDSAT satellite, famous for its innovative photos of Earth started life under a different name. What was it called originally?

1. There are 32,000 tiles on Columbia. By comparison, the Space Shuttle Endeavour has about 24,000.
 2. While the Redstone was used initially for the suborbital Mercury flights, the last flights took off using Atlas.
 3. LANDSAT started life as the Earth Resources Technology Satellite (ERTS).

A Trivial Explanation

In the June issue, one trivia question asked about the only man-made feature on Earth that can be seen from space. The answer given was the Great Wall of China. This answer was incorrect, according to a number of our readers. Mary Cleave, deputy project manager for the Sea Viewing Wide Field Sensors project and former astronaut, says that many man-made features can be seen from space. In fact, according to Cleave, Goddard could be seen if the shuttle were at the correct orbit and inclination.

CENTER Lines

WELDING IN SPACE -- A joint international conference on "Welding in Space and the Construction of Space Vehicles by Welding" will be held September 24-26 in New Carrollton, MD. The conference, which will include such topics as "Welding of the Superfluid Helium On-Orbit Transfer (SHOOT) Flight Demonstration Tanks and Hardware" and "Welding Equipment for Space Applications," is co-sponsored by the American Welding Society and the E.O. Paton Electric Welding Institute, USSR. Goddard will play a large role in the conference. Center Director Dr. John M. Klineberg will present the keynote address and Goddard employees will present a variety of papers. Sidney McClure, Code 752.1, an award-winning welder and engineering technician at Goddard will be presenting one session and chairing another. There will be a banquet the night before the conference begins. Astronaut Jay Apt, who helped deploy Goddard's Gamma Ray Observatory, will speak at the banquet. Also scheduled to speak that night is Cosmonaut General V. Dzhanibekov. Dzhanibekov is known as the "John Glenn of the Soviet Union." For more information about the conference or anyone interested in attending should contact McClure at x6-2103.

NEW HOME FOR THE HEALTH UNIT -- Goddard's Health Unit, formerly located in Building 5, opened for business July 12 in its new home, Building 97. The facility is now located near the Goddard Child Development Center. Building 97 was formerly a plant maintenance support facility but was remodeled for the Health Unit and attached Fitness Lab.

GODDARD SPONSORS "TOTAL QUALITY COMMUNITY" CONFERENCE -- On November 7, GSFC will sponsor a unique conference, "Building a Total Quality Community," at the Turf Valley Country Club, Ellicott City, MD. The conference is co-sponsored by the Goddard contractor community and the Maryland Center for Quality and Productivity. The conference will feature top executives from state and local government, private industry and academia. It will focus on critical issues such as Applying Total Quality Management in Education and Community Partnerships--Improving Local Quality of Life. For more information contact Lisa Rivera at (301) 964-7843.

Goddard Instrument Observes Solar Eclipse and Confirms New Theory

by Susie Marucci

When the total solar eclipse occurred on July 11, a team of Goddard scientists tested and confirmed a theory that atomic processes, rather than heat, created mysterious lines of emission in the Sun's atmosphere. These unusual readings from the Sun were discovered in the early 1980s.

The experiment, called the 12-Micron Solar Eclipse Experiment, focused on emission lines at 12-microns wavelength and used a new cryogenic grating spectrometer developed by Goddard's Dr. Donald Jennings, Code 693.2. Because the distribution of these emission lines is so localized, some of their characteristics can only be studied during an eclipse.

Normally, emission lines would be formed by thermal processes in the chromosphere, a relatively hot, thin region of the solar atmosphere just above the Sun's surface. The purpose of this experiment was to test a new and alternative theory that suggested that the emission lines are produced by atomic processes in a region of the atmosphere below and much cooler than the chromosphere. Emission lines formed in that region must have been created by non-thermal means, explained Goddard's Dr. Drake Deming, Code 693.1, principal investigator for the experiment.

During the eclipse, the Sun itself was hidden, and using Goddard's new spectrometer, the scientists studied the solar atmosphere, seeing where the emission lines occur. Deming believed that the data his team received would prove the atomic-process theory. Before the eclipse Deming said, "We think our experiment will show that these lines are caused by non-thermal processes." The experiment showed he was right.

Before the eclipse, Deming thought the experiment would not only prove the theory about atomic-process formation of the emission lines, but he was hoping to gather even more information about them.

"We plan to get a complete profile of the emission throughout the solar atmosphere," Deming said at that time. Now Deming says, "We have that, we're working on it now."

In addition to this experiment, an X-ray telescope was carried by a Wallops sounding rocket and launched from White Sands, NM, to study the solar corona. Its results are still being reviewed.

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